

Royal Dutch Society  
for Physical Therapy



VvOCM  
Vereniging van  
Oefentherapeuten  
Cesar en Mensendieck

# ***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**

### **Practice guideline**

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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.

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# Practice guideline

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## A General information

### A.1 Introduction

The revised guideline Osteoarthritis of the hip-knee by the Royal Dutch Society for Physical Therapy (KNGF) serves as a guide to the general physical therapist and exercise therapist in the treatment of people with osteoarthritis of the hip and/or knee, including the pre-operative and post-operative phase of joint replacement surgery.

Where this document refers to therapist/therapy, this can mean either physical therapist/physical therapy or exercise therapist/exercise therapy (Cesar/Mensendieck). In this guideline, the term "exercise therapy" refers to the intervention of exercise therapy and not the profession as practiced by exercise therapists. A number of non-exercise therapy interventions in this guideline are not included in the competency profile of the exercise therapist and can be given by physical therapists only. This guideline describes which interventions this involves. If the treating exercise therapist is of the opinion that the patient has an indication for such an intervention, then the patient should be referred to a physical therapist.

This is the practice guideline. Part A of this practice guideline provides information about the condition, the care that is available and the way in which this care is offered. Parts B and C describe the diagnostic and therapeutic process respectively.

This practice guideline contains a system of notes, with a more detailed description of the topic (if applicable). Moreover, a description is provided of the way in which the recommendations were formed.

The justification of this practice guideline contains the literature on which this practice guideline is based and the result of any literature study per topic.

### A.2 Background on osteoarthritis

[Explanation: refer to Note 1]

Osteoarthritis is the most common condition affecting the musculoskeletal system, with the hip and the knee being two of the most commonly affected areas. This condition is characterised by a slow and varying progressive loss of joint cartilage. In addition to the loss of cartilage, changes to the subchondral bone can also take place and proliferation of the bone can occur near the joint margins (formation of osteophytes). The synovial membrane can become irritated periodically, resulting in joint inflammation.

The risk of osteoarthritis increases with age, with a peak around 79 years of age, after which the risk decreases. Based solely on demographic developments, the absolute number of individuals with osteoarthritis is expected to increase further. If a future increase in the occurrence of (severe) obesity is also taken into consideration, then the prevalence of osteoarthritis in the future may be even higher.

In 2015, there were an estimated 927,300 people with osteoarthritis of the hip and/or knee in the Netherlands (osteoarthritis of the hip 381,200 and osteoarthritis of the knee 546,100; 323,100 men and 604,200 women). Based on the incidence figures from 2015, the number of new patients per year with osteoarthritis of the hip is estimated at 34,800 (12,700 men and 22,100 women) and the number of new patients with osteoarthritis of the knee is estimated at 52,800 (19,100 men and 33,700 women).

The use of care as a result of osteoarthritis of the hip and/or knee is significant. The total costs of care for people with osteoarthritis in the Netherlands was 1.1 billion Euro in 2011, with over half of this amount spent on hospital care. Approximately 4% of the costs were attributable to primary care (including physical therapy and exercise therapy). Approximately half of all patients with osteoarthritis of the hip and knee who are receiving treatment from their general practitioner will receive physical therapy over the course of a year.

Some patients with osteoarthritis of the hip and/or knee undergo joint replacement surgery. The national implant register had registered a total of 343,545 total hip prostheses and 266,278 total knee prostheses as of 4 March 2018. A total of 27,082 joint replacing hip surgeries and 28,798 joint replacing knee surgeries were performed in 2015.

### A.3 Clinical presentation and course

[Explanation: refer to Note 2]

#### A.3.1 General clinical presentation

For most people, pain is the most important symptom of osteoarthritis of the hip and/or knee. This pain initially occurs when the person starts moving and with prolonged strain; the pain often increases as the day progresses. In later stages, the pain also occurs at rest and during the night. Stiffness caused by osteoarthritis is usually start-up stiffness, which disappears after a few minutes. Bony swellings (osteophytes) are palpable along the joint margins,

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which can be sensitive to pressure. In addition to bony swelling, a swelling of the soft tissues or intra-articular swelling (hydrops or synovitis) can also occur.

Characteristics of osteoarthritis include crepitations, which can be heard and felt and are probably caused by rough joint surfaces and the bony swellings along the joint margins that rub along the ligaments. Sometimes an inflammatory reaction occurs on the synovium of the hip or knee, a flare that can result in pain, swelling and an increase in temperature in the joint. Another characteristic of osteoarthritis is restricted mobility of the joint. In addition, increasing destruction of the joint structures can result in changes in position, such as varus or valgus deformity of the knee. These changes in position can result in symptoms of instability. Stability of a joint can be defined as “the ability to maintain the position of a joint or to be able to control movements affected by external forces”. The passive support structure (ligaments, capsule) and the active neuromuscular system (muscle strength, proprioception) provide joint stability. Achieving stability of a joint should be considered as a process that is affected by a number of factors (including strength, proprioception and laxity).

In the case of osteoarthritis of the hip and/or knee, problems can occur in performing daily activities such as walking, climbing stairs, sitting and getting up again and putting on socks and shoes as a result of pain, stiffness, restricted movement, abnormal position and/or instability. Problems with stability can result in feelings of uncertainty when performing activities. The disruptions and restrictions of daily activities can result in reduced participation in society, such as work, recreation and/or sport.

In general, the relationship between the clinical presentation and the degree of radiologically detectable abnormalities is weak for osteoarthritis of the hip and/or knee.

#### A.3.2 Clinical presentation, specific to hip osteoarthritis

In the case of osteoarthritis of the hip, the clinical presentation is formed by: age 45 years or older, pain symptoms lasting more than three months and mainly with stress placed on the joint, pain that does not become worse when sitting down, pain in the groin or thigh and sometimes the buttock or lower back, reduced endorotation, exorotation, extension and flexion, a bony end feeling, loss of strength of the hip abductors, start-up pain and/or stiffness during movement and pain upon palpation of the inguinal ligament.

#### A.3.3 Clinical presentation, specific to knee osteoarthritis

In the case of osteoarthritis of the knee, the clinical presentation is formed by: age 45 years or older, pain symptoms lasting more than three months and morning stiffness lasting less than 30 minutes. Other common symptoms include: pain with stress placed on the joint, crepitations during motion examination, sensitivity of the bony structures, a bony swelling, no warmth on palpation, loss of strength of the knee extensors and start-up pain and/or stiffness with movement.

#### A.3.4 Course of hip and knee osteoarthritis

The natural course of hip and knee osteoarthritis is very heterogeneous. In general, osteoarthritis is a slow, ongoing process

in which periods of relative stability without a lot of symptoms alternate with periods of more symptoms. The speed at which the osteoarthritis develops depends on – among other things – a number of prognostic factors.

#### A.4 Prognostic factors for course of the condition

[Explanation: refer to Note 3]

Several factors play a role in an unfavourable course of hip and/or knee osteoarthritis.

##### *Functions and anatomical characteristics*

- a lot of pain
- reduced strength of the quadriceps muscles
- major radiologically detectable abnormalities at initial presentation

##### *Activities and participation*

- a lot of restrictions in daily activities

##### *Personal and environmental factors*

- advanced age
- being female
- genetic predisposition
- being overweight
- poorer general health and reduced vitality
- musculoskeletal co-morbidity:
  - condition affecting other joints than the affected joint, such as osteoarthritis of the (other) hip or knee, lower back, hands, feet
- other co-morbidity, for example:
  - heart or lung conditions, diabetes, vision or hearing problems
- psychosocial functioning (depression, anxiety, coping style, cognition)

Not all prognostic factors apply to osteoarthritis of the hip and knee to the same extent. For example, being overweight is a much stronger risk factor for progression of knee osteoarthritis than for progression of hip osteoarthritis and advanced age, being female and having radiologically detectable abnormalities at first diagnosis are stronger risk factors for progression of hip osteoarthritis than for progression of knee osteoarthritis.

Between 68% and 85% of the patients with osteoarthritis of the hip and/or knee has one or more other conditions that can have a negative effect on the course of the symptoms. In addition, the co-morbidity can affect the limitations experienced by the patient and the treatment options. Common forms of co-morbidity in people with osteoarthritis of the hip and/or knee are: cardiovascular diseases, diabetes mellitus (DM) type II, chronic obstructive pulmonary disease (COPD), obesity, vision and hearing problems, chronic low back pain, generalised osteoarthritis, inflammatory rheumatic conditions, hypertension and depression. Age, but also common mechanism of development of various conditions, can play an important role in the relatively common occurrence of co-morbidity.

Almost all of the aforementioned prognostic factors also play a role in the functional recovery following joint replacement surgery. In addition, the course after total hip or knee replacement surgery is partly determined by the extent and speed of recovery after the

Table 1. Example of a stepped care strategy within the conservative treatment of people with osteoarthritis of the hip and/or knee.

	Phase 1	Phase 2	Phase 3
Diagnostics	<ul style="list-style-type: none"> <li>• medical history</li> <li>• physical examination</li> </ul>	<ul style="list-style-type: none"> <li>• medical history</li> <li>• physical examination</li> <li>• inventory of pain behaviour and psychosocial factors</li> </ul>	<ul style="list-style-type: none"> <li>• X-ray diagnostics</li> <li>• secondary care consultation</li> </ul>
Interventions	<ul style="list-style-type: none"> <li>• education</li> <li>• lifestyle advice (including exercise, diet)</li> <li>• medication                             <ul style="list-style-type: none"> <li>- paracetamol</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• education</li> <li>• exercise therapy</li> <li>• referral to dietician</li> <li>• medication                             <ul style="list-style-type: none"> <li>- NSAIDs</li> <li>- topical NSAIDs</li> <li>- opioids</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• multi-disciplinary (team) treatment</li> <li>• knee injections                             <ul style="list-style-type: none"> <li>- corticosteroids</li> </ul> </li> </ul>
Evaluation	after 3 months	after 3 to 6 months	after 3 to 6 months

procedure (including wound healing) and aspects such as fear of the surgery and the consequences of this.

**A.5 Stepped care and the role of the therapist**

[Explanation: refer to Note 4]

**A.5.1 Stepped care**

In the care provided to people with osteoarthritis of the hip and/or knee, we can distinguish between conservative care (non-medicinal and medicinal) and surgical treatment.

In general, the stepped care principle is applied in diagnosis and treatment. This means that, in consultation with the patient, treatment is started with relatively simple modalities and only introduce more complex, intensive or invasive forms of care at a later stage. An example of a step-by-step approach in conservative care is provided in Table 1.

This example demonstrates that various interventions are implemented simultaneously in the treatment, such as the combination of exercise therapy, education (information and lifestyle advice) and the use of pain medication.

If adequately implemented conservative treatment does not produce (sufficient) results, then referral to the orthopaedic surgeon can be considered to discuss a possible indication for joint replacement surgery.

The range of possible interventions clearly demonstrates that care providers from multiple disciplines can be involved in the treatment of people with osteoarthritis of the hip and/or knee, including the general practitioner, physical therapist, exercise therapist, occupational therapist, psychologist, dietician, podiatrist, social worker, rheumatologist, rheumatology nurse, orthopaedic surgeon, rehabilitation physician, geriatric care specialist and/or occupational health physician. The involvement of the various disciplines depends on many factors, including the nature of the request for help, the patient's preference and the local availability. If several healthcare providers are involved in the treatment of the patient, it is important that they focus on common treatment goals that meet the patient's needs.

In some cases the problems can be so complex that – in addition to the general practitioner and therapist – several other disciplines need to be involved simultaneously. Examples of this include patients with psychosocial problems and multiple co-morbidity. The care provided by several healthcare providers in a multidisciplinary team can take place in a primary care setting or in a secondary care facility (hospital or rehabilitation centre). Such a multidisciplinary team is coordinated by a rehabilitation physician, a rheumatologist or an orthopaedic surgeon, depending on the treatment setting.

**A.5.2 The therapist**

The therapist plays an important role in the treatment of osteoarthritis of the hip and/or knee, particularly in the areas of education, lifestyle advice and exercise therapy. This applies in the case of conservative treatment, but the therapist can also play an important role in the pre-operative and post-operative phase of joint replacement surgery. In current daily practice, the general practitioner and the therapist are often the first healthcare providers who come into contact with people with osteoarthritis of the hip and/or knee. Good coordination and cooperation between the general practitioner and the therapist is therefore very important in providing optimal care.

**B Diagnostic process**

**B.1 Clinical diagnosis**

[Explanation: refer to Note 5]

The clinical diagnosis of osteoarthritis of the hip and/or knee is based on the medical history and physical examination. The clinical classification criteria of the "American College of Rheumatology" (ACR) (table 2) are used here.

Although the clinical classification criteria are not diagnostic criteria, they can be helpful in recognising specific clinical signs of hip and knee osteoarthritis. An X-ray is not indicated for making a clinical diagnosis.



Table 2. Clinical classification criteria of the ACR for hip and knee osteoarthritis.

Hip	Knee
<p>pain in the hip in combination with the following characteristics:</p> <ul style="list-style-type: none"> <li>- endorotation of the hip &lt; 15°</li> <li>- flexion of the hip ≤ 115°</li> </ul> <p>or</p> <p>pain in the hip in combination with the following characteristics:</p> <ul style="list-style-type: none"> <li>- age &gt; 45 years</li> <li>- morning stiffness of the hip ≤ 60 minutes</li> <li>- pain during endorotation of the hip</li> <li>- endorotation of the hip &gt; 15° *</li> </ul>	<p>pain in the knee in combination with at least 3 of the following characteristics:</p> <ul style="list-style-type: none"> <li>- age &gt; 45 years</li> <li>- morning stiffness &lt; 30 minutes</li> <li>- crepitations</li> <li>- pain upon palpation of the bone</li> <li>- bony swelling</li> <li>- no warmth upon palpation</li> </ul>

\* These criteria define pain upon endorotation without limitation in the range of motion.

## B.2 Medical history taking

[Explanation: refer to Note 6]

The aim of taking a medical history is to create an inventory of health problems to find starting points for the treatment that lie within the competencies of the therapist. This is achieved using the “International Classification of Functioning Disability and Health (ICF) Core Set” for Osteoarthritis, which includes the most relevant aspects for people with osteoarthritis in the domains: functions and anatomical properties, activities, participation, external factors and personal factors. This ICF Core Set for Osteoarthritis forms the foundation for the medical history taking of patients with osteoarthritis of the hip and/or knee. The medical history also provides information about the presence

of general contra-indications and red flags and those specific to osteoarthritis. This information may form an occasion to consult with the general practitioner or specialist (refer to the current KNFG Guideline for Physical Therapy Record-Keeping). In addition, the risk factors for the development of osteoarthritis and the prognostic factors for the progression of physical functioning and pain as described in A.4 should also be discussed. Finally, if applicable, measurement instruments should be used as described in section B.4.

Table 3 lists the questions that are relevant to the medical history of patients with osteoarthritis of the hip and/or knee. The sample questions should be adapted to suit the therapist's communication style and the communication level of the patient.

Table 3. Relevant questions about medical history for patients with osteoarthritis of the hip and/or knee.

<p><b>Central</b></p> <ul style="list-style-type: none"> <li>• What is the patient's request for help? (Patient-Specific Complaints; PSC)</li> <li>• What are the expectations regarding therapy?</li> <li>• What are the expectations regarding the course of the symptoms?</li> </ul> <p><b>Functions and anatomical characteristics</b></p> <ul style="list-style-type: none"> <li>• Is the patient suffering from: pain with exertion? pain at rest and/or at night? pain that comes and goes? What is the localisation and the duration of the pain? (Numeric Pain Rating Scale; NPRS)</li> <li>• Is the patient suffering from (severe) pain and swelling at rest? (potential red flag)</li> <li>• Did the pain start suddenly? (potential red flag for joint replacement surgery)</li> <li>• Does the patient feel pain in the calf when lifting the foot? (potential red flag for joint replacement surgery of the knee)</li> <li>• Does the patient suffer from morning stiffness and/or start-up stiffness? If so, for how long?</li> <li>• Are the movements of the hip and/or knee restricted and if so, in which direction?</li> <li>• Does the patient have reduced muscle strength in the legs? If so, with which activities? (risk factor for occurrence and course)</li> <li>• Does the patient have a fever? (specific red flag for joint replacement surgery)</li> <li>• How is the wound healing process? (point of interest in the case of joint replacement surgery)</li> <li>• How did the symptoms develop? (suddenly/gradually)</li> <li>• Is the patient suffering from swelling of the knee? (local/diffuse; left/right comparison) (potential red flag, depending on severity and combination with temperature)</li> <li>• In the case of hip problems, is the patient suffering from swelling in the groin? (potential red flag)</li> <li>• Does the knee feel warm? (potential red flag, depending on severity and combination with swelling)</li> <li>• Has the mobility of the joint changed?</li> </ul>
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Table 3. Relevant questions about medical history for patients with osteoarthritis of the hip and/or knee. (continued)

**Functions and anatomical characteristics**

- Does the patient experience a sensation of giving way or instability?
- Does the joint exhibit an abnormal position? (potential risk factor for occurrence)
- Is there any history of surgeries or traumas? (potential risk factor for occurrence)
- Does the patient weigh too much? (height and weight?) (high BMI is a risk factor for occurrence and course)
- Does the patient have any congenital abnormalities of the hip? (potential risk factor for occurrence)
- Does the patient experience locking symptoms (knee)? (potential red flag)
- Are there any symptoms in other joints? (potential risk factor for occurrence and potential predictor of course)
- Is the patient experiencing any sensory and/or motor loss of function? (potential nerve damage as a complication of joint replacement surgery)

**Activities**

- Does the patient experience limitations in performing the following activities: walking indoors and outdoors, walking up and down stairs, sitting down and getting up again, bending, standing (for long periods), sitting (for long periods), getting (un)dressed, washing, lifting, going to the toilet, getting in and out of a car? (potential predictive factors for course)
- Does the patient experience any restrictions when cycling, driving a car or using public transport?
- Are there any circumstances or activities that exacerbate or reduce the symptoms?
- To what extent is the patient able to bear weight on the hip and/or knee during ADL?
- Has the patient suffered any falls in the past year? If so, how often?
- To what extent is the patient able to bear weight on the hip and/or knee during the day? (In the case of joint replacement surgery, the patient should be informed that a very active lifestyle could shorten the lifespan of the prosthesis.)
- The “Hip Injury Osteoarthritis Outcome Score” (HOOS) ADL sub-scale or the “Knee Injury Osteoarthritis Outcome Score” (KOOS) ADL sub-scale is a supporting questionnaire to record the physical functioning and to use as a baseline measurement for the treatment.

**Participation**

- Does the patient experience problems with work (paid or as a volunteer), sport or other forms of leisure activities?
- Does the patient have a job, or play a sport that places a significant strain on the hip and/or knee? (including heavy lifting, crouching, kneeling)
- Has the patient performed heavy manual labour in the past? (potential risk factor for occurrence)
- Does the patient experience problems with social contacts as a result of the hip or knee problems?

**External factors**

- Is there a family history of osteoarthritis?
- How do the people surrounding the patient (partner, family, friends, work) respond to the symptoms?
- Does the patient use modifications, aids or provisions for ADL, household tasks, at work or during sport or leisure activities?
- What is the patient’s living situation? Does the home have stairs and is the patient able to walk up and down stairs?
- Have (additional) medical diagnostic tests taken place? (X-ray, blood tests, collection of joint fluid). If yes, what were the results?
- Has the patient undergone any previous therapeutic treatment? If yes, which treatment and what was the result?
- Is a medical specialist or other healthcare provider involved? (related to hip and/or knee problem or related co-morbidity)
- Does the patient use medication, such as painkillers and/or anti-inflammatories, and what is the effect?
- Does the patient use nutritional supplements? If so, what is the effect?
- Does the patient use a walking aid (walking stick, Nordic walking sticks, walker, walking next to bicycle), electric bicycle or cycling instead of walking? If so, what is the effect?
- Does the patient use an aid to perform activities? (standing support, (adapted) chair, wheeled stool, knee support). If so, what is the effect?
- Has the patient suffered any trauma in the past that has resulted in joint damage of the hip or knee? If so, how long ago did this take place and how did the recovery progress? (potential risk factor for occurrence)
- Has any surgery been performed in the past (for example, joint replacement surgery or meniscus surgery)? If so, how long ago did this take place and how did the recovery progress? (potential risk factor for occurrence)

Table 3. Relevant questions about medical history for patients with osteoarthritis of the hip and/or knee. (continued)

**Personal factors**

- Does the patient have any co-morbidity (such as diseases affecting the heart or lungs, diabetes mellitus, vision problems, hearing problems, lower back problems and/or depression)? If so, have these affected the patient's ability to function during movement / exertion tolerance? (potential predictors for course/measurement instrument Cumulative Illness Rating Scale (CIRS) optional to support the estimate of the effect of co-morbidity on functioning)
- Does the patient have a history of any non-traumatic joint conditions of the hip or knee (for example, reactive arthritis, crystal arthritis or septic arthritis), resulting in joint damage or faster progression? If so, how long ago did this take place and how did the recovery progress?
- To what extent does the patient rest when experiencing pain? Does the patient lead an active lifestyle?
- Are there any cognitive problems? (for example, dementia)
- To what extent does the patient have thoughts that moving is harmful?
- To what extent does the patient have a fear of falling or moving?
- Is the patient motivated to get/keep moving?
- Which measures has the patient already taken to influence the symptoms (for example, rest/movement, use of medication, braces, walking aids, discussing problems with employer and obtaining aids at work if there are any problems at work) and was this helpful?

**B.3 Physical examination**

[Explanation: refer to Note 7]

The physical examination of the patient with hip and/or knee osteoarthritis consists of evaluating (the quality of) functioning during movement. As with the medical history, this is achieved using the ICF Core Set for Osteoarthritis, which includes the most relevant aspects for people with osteoarthritis in the domains: functions and anatomical properties, activities, participation, external factors and personal factors. This includes the use of the

clinical classification criteria for hip and/or knee osteoarthritis to determine the clinical diagnosis of osteoarthritis.

The physical examination also takes into consideration the contraindications for exercise therapy, red flags and the risk of an unfavourable progression of the osteoarthritis. An overview of relevant points of attention during the physical examination of patients with osteoarthritis of the hip and/or knee has been included in table 4.

Table 4. Relevant points of attention during the physical examination of patients with osteoarthritis of the hip and/or knee.

**Functions and anatomical characteristics***Inspection*

- Where is the pain reported?
- Do you currently observe mild, moderate or severe swelling? (knee)
- If so, where is the swelling located? Is the swelling diffuse or localised?
- Are there any changes in colour? (knee)  
**N.B.** A red lower leg after joint replacement surgery can be a red flag.
- Are there any changes in position compared to the non-affected side:
  - of the knee and/or hip joint?
  - of the pelvis or the spinal column?
  - of the lower leg compared to the upper leg (for example, varus/valgus position) and/or the foot?
  - of the lower/upper leg?
- Is there any difference in the circumference of the musculature compared to the other leg regarding the musculature of the calf, thigh and/or buttock?
- How is the wound healing process? (in the case of joint replacement surgery)  
**N.B.** A wound that remains very swollen and red after joint replacement surgery could be a red flag.

*Palpation*

- Is there any swelling? (knee)
- Is there any temperature increase of the joint? (knee)
- Is there any synovial or osseous thickening (knee) around the joint space? Is palpation painful? (knee)
- Is there any pain upon patellofemoral compression? (knee)
- Is there any increase in the muscle tone of the lumbar extensors, the adductors of the hip (for hip osteoarthritis) or the tensor fasciae latae (for knee osteoarthritis)?

Table 4. Relevant points of attention during the physical examination of patients with osteoarthritis of the hip and/or knee. (continued)

**Functions and anatomical properties** (continued)*Functional examination*

- Active movement examination, in which you ask the patient about their ability to:
  - flex/extend the knee;
  - flex/extend, abduct/adduct and exorotate/endorotate and flex/extend the hip,
  - dorsal/plantar flexion and pronation/supination of the ankle/foot.
- Passive movement examination of the knee and hip with evaluation of the total range of motion, including the valgus/varus movement of the knee.
 

**N.B.** Caution is advised during the passive examination in the first two weeks following joint replacement of the knee, because of the wound healing process.

Following joint replacement surgery of the knee, if the mobility of the knee stops below 80–90 degrees during the recovery phase, then the treating orthopaedic surgeon should be contacted following consultation with the patient.

No passive movement examinations should be performed following joint replacement surgery of the hip, due to the risk of dislocation in the first six weeks post-surgery.
- Passive movement examination of the ankle/foot.
- Evaluation of the end sensation and pain provocation of the hip/ankle/foot.
- Evaluation of muscle strength/muscle stamina (including the m. quadriceps femoris and the mm. gluteii), stability, muscle length of the affected and non-affected leg and the proprioception.
- Evaluation of balance (both static and dynamic).
- Evaluation of aerobic capacity.
- Evaluation of the mobility/load-bearing ability of the lumbar spine (mainly in the case of hip osteoarthritis).
- Evaluation of joint function of the upper extremities and cervical spine (due to the potential use of walking aids).
- The Six Minute Walking Test is a supporting function test to estimate the physical functioning and to use as a baseline measurement for the treatment.
- Optional measurement instruments can be used to support the movement examination (for example, a score > 11 sec. on the Timed Up & Go test (TUG) points to an increased risk of falling; this score is also a predictor of reduced physical functioning after surgery).

**Activities***Inspection*

- Evaluation of “standing”, “standing on one leg”, “walking (up/down stairs)”, “getting up/sitting down” and other ADL activities relevant to the patient. To what extent can the hip/knee be used? What is the patient’s walking speed?
 

**N.B.** If the patient is in the rehabilitation phase after joint replacement surgery and is no longer able to stand on the leg, whilst he/she was able to do so before, then this could be a red flag.
- Evaluation to determine whether certain movements are being avoided or compensated by other movements.
- Evaluation of balance reactions compared to those of the non-affected side when standing and walking.
- Evaluation of (the quality of movement during) functional activities, such as sitting down and getting up again, bending, transfers, getting (un)dressed and walking up/down stairs.
- Evaluation of specific activities that are restricted during work, sports or other leisure activities.
- Evaluation of the use of aids.
- Evaluation of performing other specific activities where symptoms are reported.

**B.4 Measurement instruments**

[Explanation: refer to Note 8]

This section describes measurement instruments that can be used during the diagnostic phase and the evaluation of the treatment in patients with osteoarthritis of the hip and/or knee.

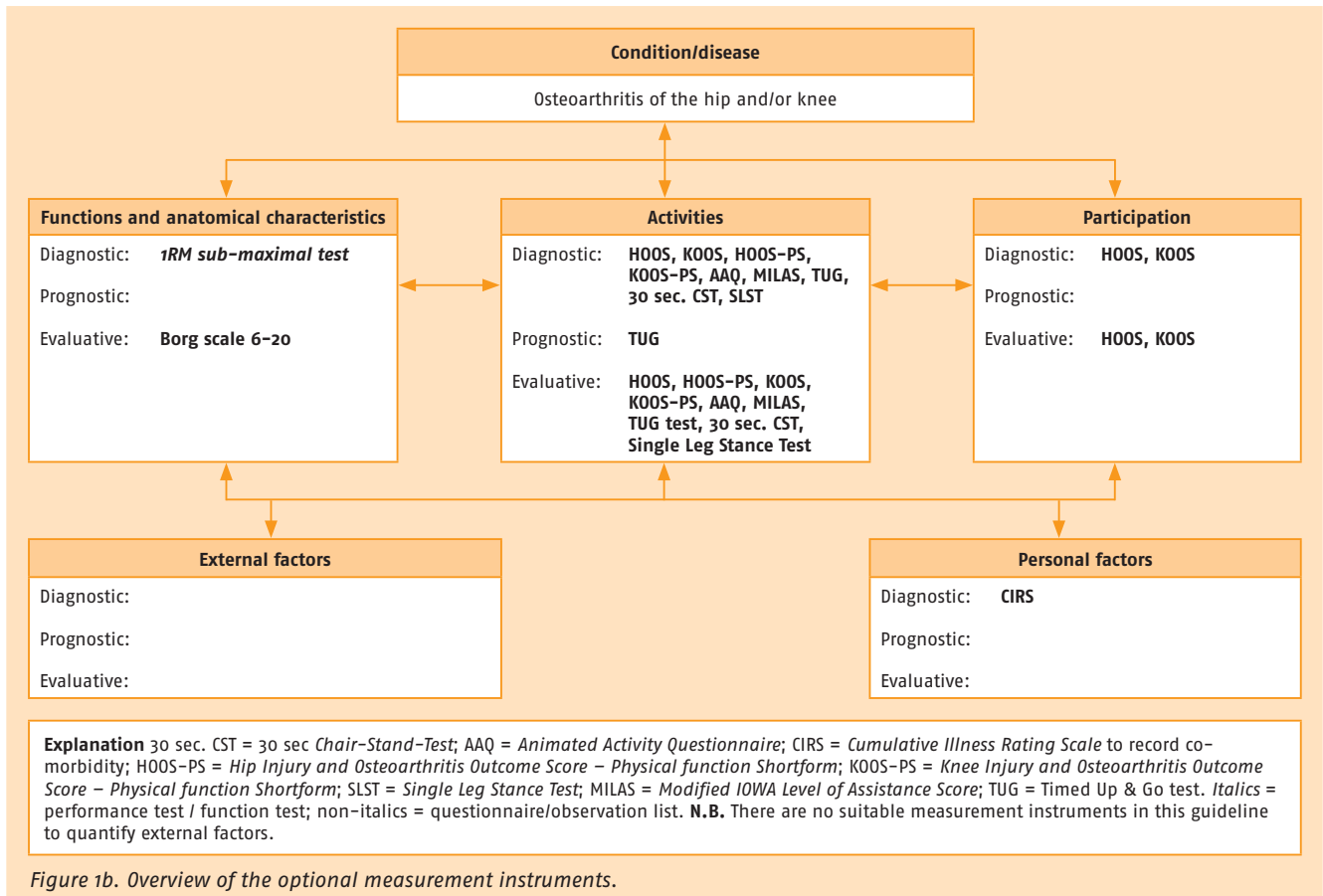
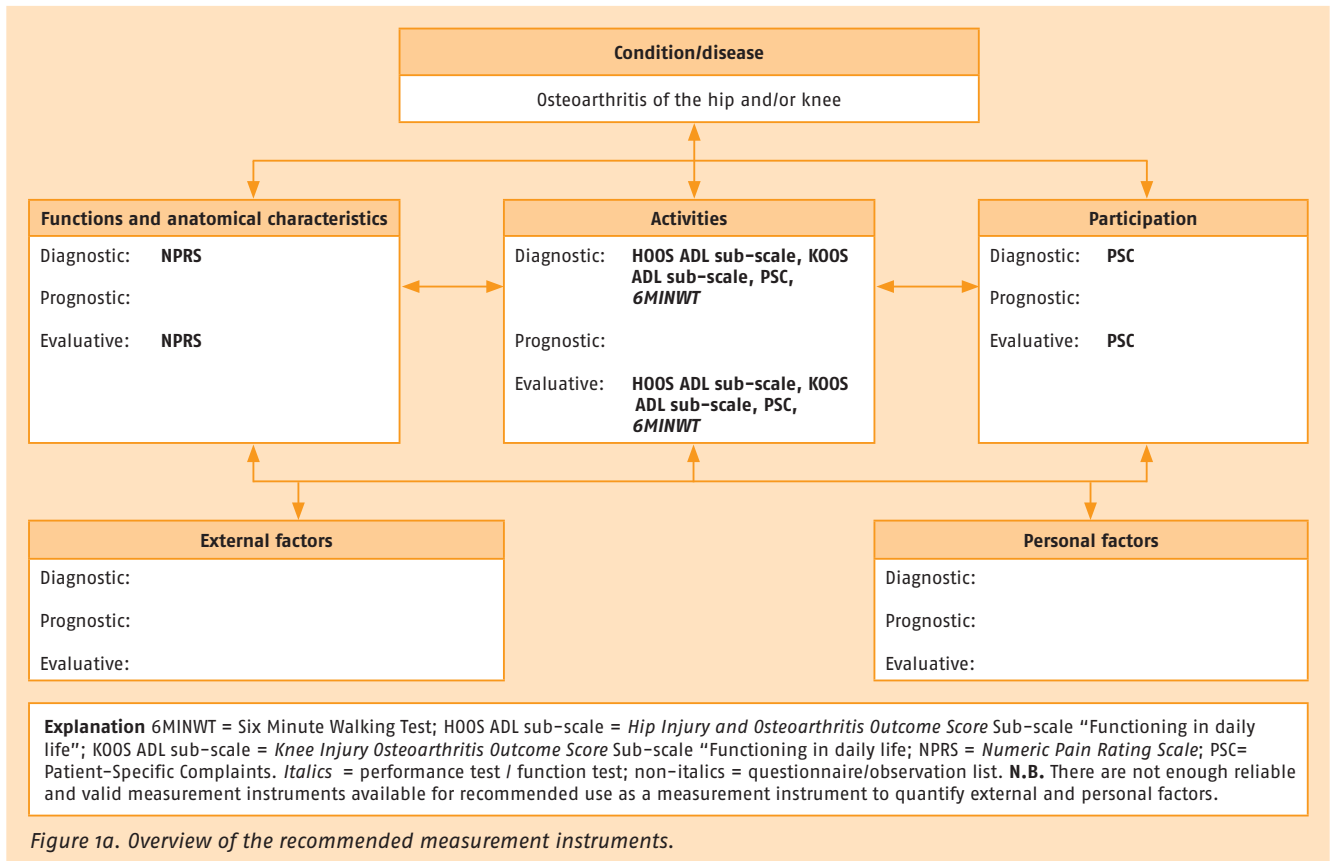
**B.4.1 Recommended measurement instruments**

Figure 1a provides an overview of the recommended measurement instruments. These instruments can be applied if there is a justifi-

cation for this in practice. It is preferable to use a combination of a self-reported questionnaire and a performance-based test.

**B.4.2 Optional measurement instruments**

The optional measurement instruments are listed in figure 1b. These instruments can be applied if there is a justification for this in practice. All these measurement instruments are available via [www.meetinstrumentenzorg.nl](http://www.meetinstrumentenzorg.nl).



## B.5 Indication, contra-indications and red flags

[Explanation: refer to Note 9]

There is an indication for physical therapy/exercise therapy treatment if:

- the patient has a need for assistance in the field of hip and/or knee problems and the related limitations in daily activities and/or social participation; and/or
- the patient is unable to achieve or maintain an adequate level of physical functioning independently, with this adequate level of physical functioning being related to the need for assistance, coping strategies and the level of physical activity in comparison to physical activity guidelines.

Depending on the patient's health status and the extent to which patients are capable of self-management, we can distinguish between four indications.

### Indication 1. Indication for a short period of education, advice and exercise/movement instruction

A short period of education, advice and exercise/movement instruction by the therapist is indicated for people with osteoarthritis of the hip and/or knee and:

- a need for education, advice, instruction and practical tips during exercise and (return to) being mobile; and/or
- a need for more insight into the condition, the symptoms and the course, and the consequences for physical functioning and social participation; and/or
- a need for more insight into the treatment options and the patient's own role in this; and/or
- a need for more insight into the potential health benefits of appropriate exercises and an active lifestyle and the patient's own role in this; and/or
- a need for more insight into the practical possibilities of taking part in regular or adapted types of sports and exercise – independently or with the aid of others (e.g. carers, healthcare providers other than the therapist, sports/fitness instructors, etc.) – in order to achieve and maintain adequate levels of physical activity.

### Indication 2. Indication for education, advice and a short period of guidance for exercise and physical activity

A short period of guidance by the therapist is indicated if the patient has a need for assistance that cannot be resolved with a brief period of education, advice and instruction alone.

- The patient needs guidance to be able to perform an exercise programme independently and achieve and maintain adequate levels of physical activity.
- The patient's need for assistance can be due to various aspects, for example: self-management, social support and availability of exercise options.

### Indication 3. Indication for education, advice and a prolonged period of guidance for exercise and physical activity

Prolonged guidance by the therapist is indicated if the patient with osteoarthritis of the hip and/or knee is experiencing limitations in basic daily activities and participation, who is not able to achieve

or maintain an adequate level of independent functioning to perform basic daily activities, as a result of:

- the presence of risk factors for delayed recovery that could hamper exercise therapy (e.g. co-morbidity); and/or
- the presence of psychosocial factors (yellow flags) in combination with inadequate pain coping.

### Indication 4. Indication for education, pre-operative and/or post-operative exercise therapy before or after joint replacement surgery of the hip and/or knee

Guidance by the therapist in the pre-operative and/or post-operative phase is indicated if:

- there is a need for education, advice, instruction and practical tips during activities of daily life, exercise and (re)mobilisation after the operation; and/or
- there is a need for more insight into the impact of the joint replacement surgery, increasing the ability to bear weight on the joint and the course of the recovery; and/or
- joint replacement surgery of the hip and/or knee has been scheduled and it has been determined that pre-operative exercise therapy will contribute to faster recovery after surgery; taking into consideration any prognostic factors that are present for an unfavourable progression and the general mental and physical condition of the patient prior to the surgery and help available in the home situation; and/or
- joint replacement surgery of the hip and/or knee has taken place in an individual who requires guidance in performing basic daily activities independently, or in performing an exercise programme aimed at recovery of hip or knee function and/or an individual who requires guidance to achieve and maintain adequate levels of physical activity in the long term; the frequency and duration of the assistance will depend on the normal progression and any prognostic factors for an unfavourable progression that are present.

In the case of all four treatment indications, the treatment should be stopped if:

- the need for assistance has been met and the goals have been achieved; and/or
- interim evaluations show that no or inadequate therapeutic effect has been achieved; and/or
- there are contra-indications; and/or
- the patient does not adhere to the therapy, despite various attempts to improve this.

#### B.5.1 Contra-indications

In the case of all four treatment indications, therapy is contra-indicated if:

- there are indications supporting the presence of impeding medical factors (such as severe co-morbidity), for which intervention by the therapist could exacerbate the symptoms;
- the patient has a co-morbidity for which specific contra-indications for exercise therapy exist.

The absolute contra-indications for patients with co-morbidity are listed in the text box.

**Absolute contra-indications for exercise therapy in patients with osteoarthritis of the hip and/or knee and common co-morbidity****Cardiac problems**

- progressive increase in symptoms of heart failure
- severe ischaemia of the heart muscle during exertion
- respiratory rate of more than 30 breaths per minute
- resting heart rate > 110 bpm,  $VO_{2max}$  10 mL/kg/minute; ventricular tachycardia with increasing exertion
- recent embolism (< 3 months ago) with severe haemodynamic strain
- thrombophlebitis; acute pericarditis, myocarditis, endocarditis
- presence of severe aortic stenosis or mitral valve stenosis
- acute myocardial infarction in the last three months
- presence of unstable angina pectoris, for example chest pains that do not respond to specific medication
- chest pains prior to exercise therapy
- changes to existing or new cardiac arrhythmias
- patient with *New York Heart Association* (NYHA) classification level 4
- atrial fibrillation with a rapid ventricular response at rest (> 100 bpm)
- presence of shortness of breath in rest
- weight gain of > 2 kg in two days
- exercise within ten days after a period of fever or when there is a fever

**COPD**

- pneumonia
- exceptional weight loss (10% in the past six months or > 5% in the past month)

**Hypertension**

- resting systolic blood pressure > 180 mmHg or diastolic blood pressure > 110 mmHg

Therapy is also contra-indicated if:

- severe cognitive problems are present that would hamper the treatment too much;
- one or more red flags are present, defined either as general red flags or red flags specific to osteoarthritis of the hip and/or knee (section B.5.2).

**B.5.2 Red flags**

[Explanation: refer to Note 9]

If a person diagnosed with osteoarthritis of the hip and/or knee registers with a therapist without a referral (by direct access), then a screening will first be performed. This screening aims to determine whether therapeutic treatment is indicated. The therapist should obtain an overview of the complaints and symptoms and the presence of any so-called yellow and red flags. Yellow flags are indications for psychosocial or behavioural risk factors for maintaining and/or exacerbating the health problems related to osteoarthritis of the hip and knee. Red flags are patterns of symptoms or signs (warning signals) which could point to more or less severe pathology and which warrant additional medical diagnostic tests. Recognition of the pattern of symptoms specific to osteoarthritis of the hip and/or knee is important in order to determine whether any red flags are present that do not fit this pattern. The red flags for osteoarthritis of the hip and/or knee are listed in the text box.

If warranted by one or more red flags, the therapist must inform the patient about this. In that case, the general practitioner should also be informed about the red flags, following consultation with the patient. In addition, the patient will be advised to contact their general practitioner or treating specialist. In the event of red

flags, communication between therapist and general practitioner / specialist can take place via local agreements that are in place. If there is any uncertainty about the diagnosis or if there is any suspicion of an osteoarthritis presentation other than the flare, then the patient will be advised to contact their general practitioner, who can refer the patient to a rheumatologist. The rheumatologist can perform further examinations, for example to rule out systemic arthritis.

**Specific red flags for osteoarthritis of the hip and/or knee**

- warm and swollen (red) knee
- inexplicable severe pain in the hip and/or knee
- swelling in the groin
- severe locking of the knee
- (severe) pain in rest and swelling (without trauma)

In the presence of one or more joint replacing prostheses (post-operative):

- developing a fever of 38.5 °C or higher;
- if the wound remains very swollen and red;
- if the wound starts or continues to ooze;
- sudden severe pain in the joint containing the prosthesis, with or without preceding fall or other trauma;
- increased pain in the knee that does not respond to painkillers;
- if the patient is no longer able to stand on the leg, whilst he/she was previously able to do so;
- developing pain in the calf whilst lifting the toes;
- red discolouration of the lower leg and developing pain in the lower leg.

## C Therapeutic process

### C.1 Information and advice

[Explanation: refer to Note 10]

Information and advice are provided in both the conservative phase and the pre-operative and/or post-operative phase.

The information and advice can be given verbally, but the information should be supported in writing and/or digitally. This depends on the wishes, preferences and health skills of the patient.

#### C.1.1 Conservative phase

**Recommendation** Offer information and advice to all patients with osteoarthritis of the hip and/or knee in the conservative phase, in order to increase knowledge about the condition and to increase treatment options and promote self-management.

**Addition** Tailor the information and advice to suit the situation of the individual patient, but at least discuss the following topics:

##### *The condition and the possible consequences*

- Osteoarthritis affects the entire joint. Not only the cartilage, but also the bone, the muscles and tendons are involved in the condition.
- Osteoarthritis is not an unavoidable part of the ageing process (not an age-related condition).
- An X-ray is not necessary to make the diagnosis of osteoarthritis (but in some cases an X-ray is required to rule out other conditions); the severity of the joint damage visible on an X-ray does not provide any insight into the severity of the symptoms.
- The severity and the course of the symptoms of osteoarthritis vary significantly from person to person and periods with more or fewer symptoms can alternate over time.

##### *The importance of exercise and a healthy lifestyle (self-management)*

- Regular physical activity and individually tailored exercises / movement activities (to strengthen the muscles surrounding the joint, to improve the patient's condition and the ability to perform daily activities) can reduce pain and improve daily functioning. Please note that even a small number of exercises can produce results, if they are performed regularly (preferably daily).
- The integration of several exercises / movement activities in daily life is a useful way of sticking to such a programme.
- Sedentary behaviour (too much time spent sitting) can worsen the symptoms of osteoarthritis and can increase the risk of developing other (age-related) conditions, such as DM type II and cardiovascular diseases.
- It may sometimes be necessary to reduce the mechanical burden on the painful joint (e.g. by taking short breaks or using aids).
- If the patient is overweight/obese, it is important for them to lose weight and then maintain a healthy weight by means of an individually tailored plan, which consists of changes in diet and increased physical activity.

##### *The treatment options*

- The symptoms caused by osteoarthritis can be reduced significantly with conservative

treatment options (in other words, without surgical intervention), meaning that many people with osteoarthritis of the hip and/or knee do not need to undergo joint replacement surgery.

- The most important recommended conservative (non-surgical) treatment options are education/advice focusing on self-management (exercise, healthy lifestyle), physical therapy/exercise therapy, pain medication (although this can cause side effects) and losing weight if the patient is overweight/obese.
- If adequate reduction in pain and improvement in daily functioning are not achieved after a recommended period of optimum use of recommended conservative treatment options, then joint replacement surgery is an option for end-stage osteoarthritis.

The patient can be referred to various (digital) information sources, to supplement the information and advice provided by the therapist:

- [www.defysiotherapeut.com](http://www.defysiotherapeut.com)
- [www.thuisarts.nl](http://www.thuisarts.nl)
- [www.reumafonds.nl](http://www.reumafonds.nl)
- *Handboek Artrose [Osteoarthritis Manual]* (not yet published)

#### C.1.2 Pre-operative and/or post-operative phase

**Recommendation** Offer information and advice to all patients undergoing joint-replacement surgery due to osteoarthritis of the hip and/or knee, in order to increase knowledge about the condition, to prepare for surgery and to promote the recovery process after surgery.

**Addition** Tailor the information and advice to suit the situation of the individual patient, but at least discuss the following topics:

- the surgery, the subsequent rehabilitation period and the possible use of external assistance;
- the importance of (maintaining) adequate muscle strength and general fitness prior to the surgery and other factors that play a role in the recovery after the surgery;
- the lifestyle rules for the first phase after surgery, if provided by the hospital via the orthopaedic surgeon.

The patient can be referred to various digital information sources, to supplement the information and advice provided by the therapist:

- [www.defysiotherapeut.com](http://www.defysiotherapeut.com);
- [www.mijnheupprothese.nl/](http://www.mijnheupprothese.nl/);
- [www.zorgvoorbeweging.nl/totale-heupprothese-thp](http://www.zorgvoorbeweging.nl/totale-heupprothese-thp);
- [www.zorgvoorbeweging.nl/de-knieprothese](http://www.zorgvoorbeweging.nl/de-knieprothese).

### C.2 Exercise therapy

[Explanation: refer to Note 11]

Exercise therapy is recommended, making use of the FITT principles:

- in the conservative phase of both hip and/or knee osteoarthritis;
- post-operatively in case of joint replacement of the hip.

Exercise therapy can be considered, making use of the FITT principles:

- pre-operatively in case of joint replacement of the hip and/or knee;
- post-operatively in case of joint replacement of the knee.



### General aspects of exercise therapy

- Offer exercise therapy regardless of patient characteristics such as age, severity of pain symptoms and severity of joint damage.
- Always offer exercise therapy in combination with education/advice and a movement plan (incl. short-term and long-term goals to (continue) perform(ing) movement activities), which is set out together with the patient.
- Always offer exercise therapy as a combination of supervised exercise therapy and unsupervised exercise therapy performed independently. Determine together with the patient – based partly on the degree of independence/motivation, personal preferences and practical considerations – the ratio of supervised and independent exercise therapy.
- Consider the use of eHealth applications to support the patient in (continuing to) perform(ing) exercises independently and/or to reduce the degree of supervision.
- Consider offering exercise therapy in a group setting, if not much individual supervision is required.
- Consider offering exercise therapy in the water during the initial phase of the treatment, if the patient experiences severe pain during the exercises.

When considering whether or not to offer exercise therapy pre-operatively and/or post-operatively, the therapist should take into consideration the risk factors for delayed recovery following the surgery and/or complications (section A.4).

Both during the treatment period and upon completion of treatment, the therapist should advise the patient about the ways in which the patient can achieve and maintain an active lifestyle consistent with the patient's individual situation.

#### C.2.1 Conservative phase

[Explanation: refer to Notes 12 and 13]

**Recommendation** Offer exercise therapy to all patients with osteoarthritis of the hip and/or knee in the conservative phase and make use of the FITT principles.

#### C.2.2 Pre-operative phase of joint replacement for osteoarthritis of the hip and/or knee

[Explanation: refer to Notes 14 and 15]

**Recommendation** Consider offering exercise therapy in the pre-operative phase if the patient has an *increased risk of delayed recovery* following joint replacement for osteoarthritis of the hip and/or knee. Make use of the FITT principles.

**Recommendation** Consider limiting exercise therapy in the pre-operative phase to teaching the patient exercises that he/she patient can perform independently and monitor how the exercises are performed, if the *risk of delayed post-operative recovery is not increased*. Also teach all patients to use a walking aid that will be needed in the post-operative phase.

#### C.2.3 Post-operative phase following joint replacement for osteoarthritis of the hip

[Explanation: refer to Note 16]

**Recommendation** Preferably offer exercise therapy in the post-operative phase following joint replacement for osteoarthritis of the hip and/or knee if the patient has an *increased risk of delayed recovery and/or if complications occur*. Make use of the FITT principles.

**Recommendation** Consider limiting exercise therapy in the post-operative phase to teaching the patient exercises that he/she patient will perform independently and monitor how the exercises are performed, if the risk of delayed post-operative recovery *is not elevated* and there are *no post-operative complications*.

#### C.2.4 Post-operative phase following joint replacement for osteoarthritis of the knee

[Explanation: refer to Note 17]

**Recommendation** Consider exercise therapy in the post-operative phase following joint replacement for osteoarthritis of the knee if the patient has an *increased risk of delayed recovery and/or if complications occur*. Make use of the FITT principles.

**Recommendation** Consider limiting exercise therapy in the post-operative phase to teaching (and monitoring the execution of) exercises that the patient can perform independently, if the risk of delayed post-operative recovery *is not increased* and there are *no post-operative complications*.

#### C.2.5 FITT principles

[Explanation: refer to Note 18]

**Recommendation** Offer exercise therapy according to the described frequency, intensity, type and time duration (FITT). These principles are described individually below.

It is essential to combine **supervised exercise therapy** with **independently performed exercise therapy**, and to reduce supervised exercise therapy during the treatment period.

#### Frequency

- Aim to have the patient perform aerobic exercises for at least 30 minutes per session at least 5 days per week and muscle strengthening/functional exercises at least 2 days per week but preferably daily, thereby also ensuring that the patient meets the exercise guidelines of the Dutch Health Council.
- Start with supervised exercise therapy once or twice per week, supplemented by exercises performed independently and gradually reduce the supervision over the treatment period.

#### Intensity

- Aim to achieve the following minimum intensity for muscle strength and aerobic training:

- *muscle strength training*: 60–80% of 1 repetition maximum (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.
- Ensure that the intensity is increased gradually throughout the programme and apply the following training principles:
  - Perform a warming-up before the training and a cooling down after the training.
  - Determine the starting intensity of the strength training and monitor the intensity throughout the treatment using the 1RM sub-maximum test.
  - Determine the starting intensity of the aerobic training and monitor the intensity throughout the treatment using the heart rate and/or Borg score.
  - Gradually increase the intensity of the training (i.e. 1 time per week) to the maximum level that is possible for the patient.
  - Reduce the intensity of the next training, if pain in the joint increases after the training and persists for more than 2 hours.
  - Start with a short period of 10 minutes (or less if necessary) for aerobic exercises, for patients who are untrained and/or are limited by joint pain and joint mobility.
  - Offer alternative exercises that involve the same muscle groups and energy systems, if the exercise results in an increase in joint pain.
  - When modifying the training intensity, use variation in sets and repetitions (for strength training), intensity, duration of the session or exercise, type of exercise and breaks and discuss these modifications with the patient.

**Type**

Offer a combination of muscle strength training, aerobic training and functional training.

**Muscle strength training**

- Choose exercises primarily aimed at the large muscle groups surrounding the knee and hip joint (particularly knee extensors, hip abductors and knee flexors).
- Have the patient perform these exercises for both legs (for both unilateral and bilateral osteoarthritis).
- Exercises that place major mechanical strain on the knee (e.g. the leg extension machine) should preferably be avoided in the case of osteoarthritis of the knee and following joint replacement surgery of the knee.

**Aerobic training**

- Opt for activities with a relatively low burden on the joints, such as walking, cycling, swimming, rowing and elliptical machine.

**Functional training**

- Opt for (components of) activities that pose a problem for the patient in daily life (e.g. walking, walking up/down stairs, sitting down and getting up from a chair).

**Please note**

- During one treatment session, focus primarily (at least 75% of the treatment time) on one type of training – muscle strength training or aerobic training – for an optimum treatment result and give the patient instructions to perform the type of training that was not covered in as much detail in the treatment session independently. With both muscle strength training and aerobic training a combination is made of functional exercises (for example, using the patient's own body weight) and exercises on machines.
- Consider offering specific balance and/or coordination/neuromuscular training in addition to the exercise therapy, if there are any disruptions in balance and/or coordination/neuromuscular control that inhibit the patient's functioning.
- Consider offering (active) range-of-motion or muscle stretching exercises in addition to the exercise therapy, if there are any shortened muscles and/or reversible limitations in movement of the joint that inhibit the patient's functioning.

**Time duration**

- Aim for a treatment period between eight and twelve weeks, supplemented by one or more follow-up sessions upon completion of this treatment period (e.g. 3 and 6 months after completion of the treatment period), to stimulate therapy compliance.
- Encourage the patient to continue exercising independently after the treatment period.

**Points of attention for specific indications**

[refer to section B.5]

**Specific to indication 1, brief exercise and movement instruction**

Do not offer supervised exercise therapy, but only give instructions about exercising independently and monitor the correct execution of the exercises, in combination with education/advice and a movement plan. Aim for a maximum of 3 sessions, spread across the treatment period (8–12 weeks).

**Specific to indication 2, brief supervision of exercises and physical activity**

Make use of the general FITT principles (no modifications required).

**Specific to indication 3, prolonged supervision of exercises and movement**

Make use of the the general FITT principles, but modify them as follows:

- Extend the time between the start and the completion of the treatment to 16–24 weeks, to ensure a more gradual increase in volume and intensity.
- Modifications for patients with co-morbidity that affects their physical functioning and the exercise therapy are described in section C.2.6.
- Modifications for patients with inadequate pain coping are described in section C.2.7.

**Specific to indication 4, pre-operative exercise therapy prior to joint replacement surgery**

Follow the general FITT principles, but modify them as follows:

- Supplement the exercise therapy with instructions and exercises aimed at teaching the use of a walking aid (including

training the upper limbs if necessary for the use of a walking aid).

- Adjust the frequency and duration of the exercise therapy based on the period still available prior to the surgery.

#### **Specific to indication 4, post-operative phase after joint replacement surgery**

Follow the general FITT principles, but modify them as follows:

Post-operative, clinical phase:

- Focus the exercise therapy on performing transfers independently and safely, such as getting out of bed, sitting down and getting up from a chair, going to the toilet, walking (with a walking aid) and – if necessary – walking up/down stairs (with a walking aid) and exercises to improve the active range of motion in the case of joint replacement surgery of the knee.

Post-operative, post-clinical phase:

- Focus the exercise therapy on the same types of training as during the conservative phase, but place greater emphasis on:
  - functional training (transfers, walking and walking up/down stairs, use of a walking aid);
  - balance training (static and dynamic balance);
  - (supervised) active range-of-motion training (for joint replacement surgery of the knee).
- Observe the (minimum) lifestyle rules prescribed by the treating orthopaedic surgeon with regards to bearing weight on the joint and joint mobility.
- Adjust the FITT principles according to the individual patient, taking into consideration the presence of any risk factors for delayed recovery, wound healing, any sutures in the first two weeks after surgery and the signals that could point to reduced ability of the joint to bear weight (increased pain symptoms, lack of reduction in swelling).
- When determining the frequency and duration of the exercise therapy, take into consideration that the post-operative progression can vary significantly between individual patients.
- Reduce the use of a walking aid after six weeks, or sooner if possible and/or depending on the type of surgery (preferably in consultation with the treating orthopaedic surgeon).
- Contact the treatment orthopaedic surgeon and/or the general practitioner, if the recovery process appears to stall and/or if (severe) complications of the surgery occur (refer to section B.5.2).

#### **C.2.6 Modifications for exercise therapy for co-morbidity**

[Explanation: refer to Note 19]

A decision model has been developed for the decision-making process about whether or not to offer exercise therapy in the presence of co-morbidity (figure 2).

**Recommendation** If there are any absolute contra-indications for exercise therapy related to co-morbidity, do not offer exercise therapy and refer to the primary care physician or specialist

**Addition** Examples of contra-indications are listed in paragraph B.5.1.

**Recommendation** If there are no absolute contra-indications related to co-morbidity, but co-morbidity is present, then assess to what extent this co-morbidity affects the physical functioning of the patient and the exercise therapy.

**Addition** If the treating therapist can not assess the effect of the co-morbidity due to a lack of knowledge and skills, then advice should be sought from a therapist who is able to assess this effect, or from the primary care physician or treating specialist. The general rule here is that “unqualified is unauthorized”.

**Recommendation** If the co-morbidity has an effect on physical functioning and exercise therapy (such as unstable diabetes mellitus type II that is hard to control with medication), then offer exercise therapy with modifications specific for the co-morbidity. The COOA protocol can be consulted. This is a protocol that observes safety with regard to co-morbidity.

**Addition** In addition to knowledge and skills relating to osteoarthritis, this modified exercise therapy also requires knowledge and skills of these co-morbidities. Once again, the general rule is that “unqualified is unauthorized”. If the treating therapist does not possess the required knowledge and skills to an adequate degree, then the therapist should refer the patient to a therapist who does have the required knowledge and skills.

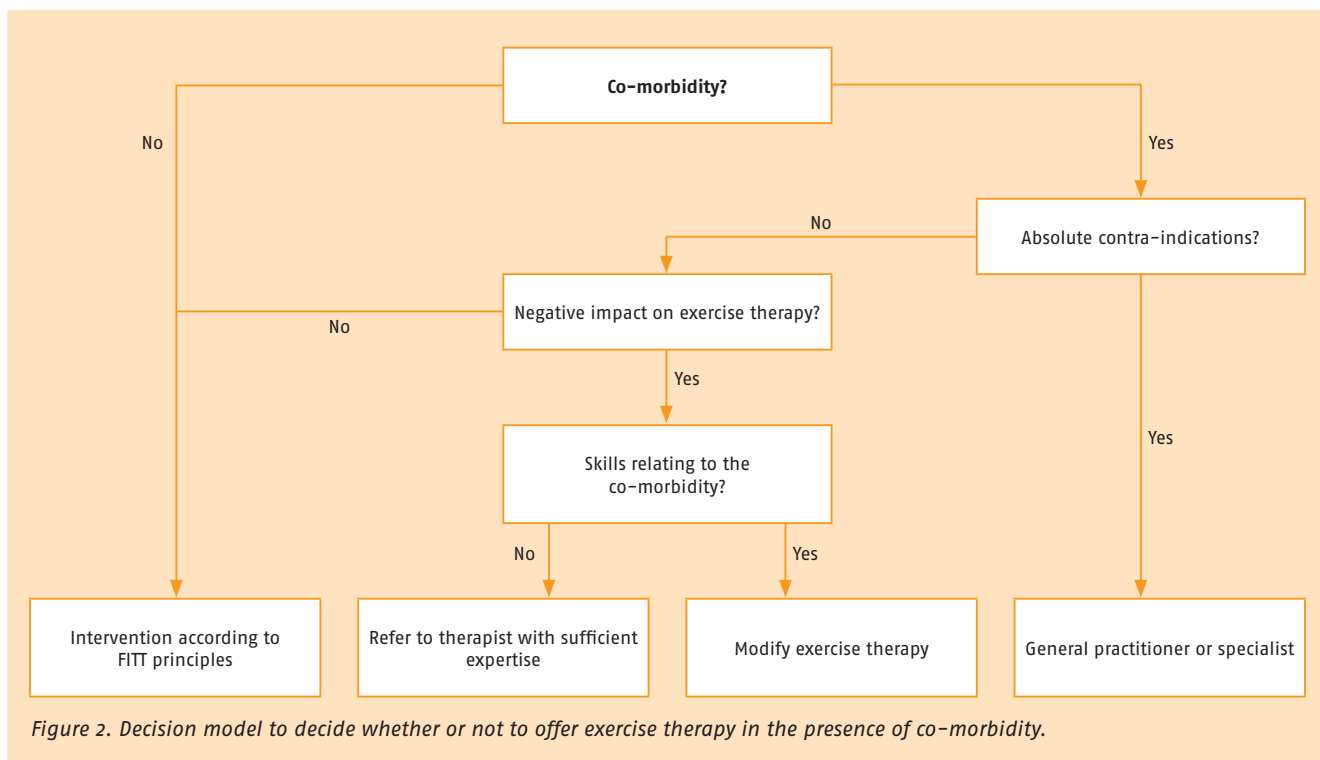
**Recommendation** If the co-morbidity has no or little effect on the physical functioning and exercise therapy (such as a cardiac arrhythmia that is properly controlled with medication), then offer exercise therapy based on the general FITT principles

#### **C.2.7 Modifications for exercise therapy for inadequate pain coping**

[Explanation: refer to Note 20]

**Recommendation** For patients with osteoarthritis of the hip and/or knee and inadequate pain coping (e.g. fear of movement, passive coping style, pain catastrophizing, low self-efficacy, anxiety, depression), consider applying the exercise therapy according to a time contingent approach (graded activity) and combining it with pain education and training of pain coping skills.

**Addition** In addition to the knowledge and skills relating to osteoarthritis, the modification of exercise therapy for patients with osteoarthritis of the hip and/or knee and inadequate pain coping also requires specific knowledge and skills relating to graded activity, pain education and training of pain coping skills. If the treating therapist does not have the required knowledge and skills (relating to both osteoarthritis and inadequate pain coping) to a sufficient extent, then the therapist should refer the patient to a therapist who does have this knowledge and these skills. An interdisciplinary treatment by various healthcare providers who have the required knowledge and skills can be considered.



**C.3 Non-exercise therapy interventions\***

[Explanation: refer to Notes 21 through 31]

Education/advice and exercise therapy should form the focal points of the treatment of patients with osteoarthritis of the hip and/or knee by the therapist. The implementation of other, non-exercise therapeutic interventions is generally not recommended. [Note 21]

**Recommendation** The following non-exercise therapeutic interventions should preferably not be offered to patients with osteoarthritis of the hip and/or knee in order to improve their physical functioning.

- massage [Note 22];
- TENS (consider the use of TENS only as a brief intervention for pain reduction to support the exercise therapy, if the exercise therapy is being hampered by severe pain symptoms) [Note 23].

**Recommendation** The following non-exercise therapeutic interventions should not be offered to patients with osteoarthritis of the hip and/or knee in order to improve their physical functioning:

- continuous passive motion (following joint replacement surgery) [Note 24];
- electromagnetic field [Note 25];
- low level laser therapy [Note 26];
- passive mobilisations [Note 27];
- shock wave [Note 28];
- taping [Note 29];
- thermotherapy (heat and cooling therapy) [Note 30];
- ultrasound [Note 31].

\* With the exception of continuous passive motion and passive mobilisations, the non-exercise therapeutic interventions described here fall beyond the competency profile of the exercise therapist (Cesar/Mensendieck).

**C.4 Evaluation and completion of the therapeutic process**

The evaluation and completion takes place according to the current KNGF Guideline on Record-keeping.

During each therapist-patient contact, the relevant treatment data are registered systematically according to the SOAP principle (subjective, objective, analysis and plan). In the case of interventions over longer periods, clear agreements are made about when to perform interim evaluations of the treatment goal(s) that have been set. Measurement instruments are used where possible.

The treatment is completed when:

- the need for assistance has been met and the goals have been achieved; and/or
- interim evaluations reveal that no or inadequate therapeutic effect has been achieved; and/or
- exercise therapy is not possible due to (a) contra-indication(s); and/or
- the patient does not adhere to the therapy, despite various attempts to improve this.

The therapist should advise the patient about how to maintain the goals that have been achieved. The therapist can, for example, give the patient tips about maintaining an adequate level of physical activity in daily life.

# Notes

## Note 1. The clinical presentation of osteoarthritis in the Netherlands

### Clinical question

**What is the pathophysiology of osteoarthritis of the hip and knee, how often does osteoarthritis of the hip and knee occur in the Netherlands and what are the costs to society resulting from osteoarthritis of the hip and knee?**

This question was answered by describing the pathophysiology, the epidemiology and the social costs relating to these topics. (Scientific) literature was consulted for this.

### Pathophysiology of hip and knee osteoarthritis

Osteoarthritis is one of the most common conditions of the musculoskeletal system[1] and the most common joint condition.[2] It is a condition that usually has a multi-factorial origin. It is not yet clear which factors play a role in which patients. Factors that have an effect on the development of osteoarthritis of the hip and/or knee are divided into systemic factors and local biomechanical factors (refer to Table 1.1).

Table 1.1. Risk factors for the development of osteoarthritis of the hip and/or knee.[3-9]

systemic factors	biomechanical factors	
<ul style="list-style-type: none"> <li>• age</li> <li>• ethnicity*</li> <li>• genetic predisposition*</li> <li>• gender</li> <li>• being overweight**</li> <li>• generalised osteoarthritis</li> </ul>	intrinsic factors <ul style="list-style-type: none"> <li>• a history of trauma</li> <li>• joint disease (including septic arthritis, reactive arthritis or crystal arthritis)</li> <li>• congenital (including congenital hip dysplasia, Perthes disease and femoral epiphysis)</li> <li>• surgery (including meniscectomy)</li> <li>• muscle weakness**</li> <li>• laxity**</li> <li>• malalignment (knee)</li> </ul>	extrinsic factors <ul style="list-style-type: none"> <li>• being overweight**</li> <li>• physically demanding work (a lot of lifting, crouching and kneeling)</li> <li>• sport (particularly elite athletes in for example football, ballet)</li> <li>• sitting in a crouched position**</li> </ul>
* To a lesser extent for knee osteoarthritis. ** To a lesser extent for hip osteoarthritis.		

Systemic factors determine the individual sensitivity of the joint to the effects of local biomechanical factors, resulting in osteoarthritis of a certain joint with a certain severity. Based on the systemic factors, osteoarthritis is more common in women than in men, people of more advanced age have a higher risk of developing osteoarthritis and it has been demonstrated that certain genetic factors and obesity play a role in the development of osteoarthritis of the hip and/or knee. Examples of biomechanical factors include: traumatic or non-traumatic joint injury (e.g. history of septic, reactive or crystal arthritis or a congenital joint abnormality), physically significant local strain due to profession or sport and/or obesity, muscle weakness and laxity. The pathogenesis of osteoarthritis is not yet fully understood. Osteoarthritis is characterised by changes to the joint cartilage. Chondrocytes contribute to the homeostasis of the joint cartilage; they ensure that the continuous production and breakdown of cartilage components are at an equilibrium and that any damage caused by micro-trauma is repaired. Various factors, such as age-related changes and the presence of cytokines, can cause chondrocytes to differentiate and produce more proteolytic enzymes, or to die off, resulting in a reduction in the quantity and quality of the cartilage.[1,10] Research has demonstrated that not only the cartilage, but also other structures surrounding the joint – such as the subchondral bone, the joint capsule, menisci and soft tissues such as ligaments, muscles and the synovial membranes – are involved in the pathogenesis of osteoarthritis.[1,11,12] The role of the subchondral bone in particular and probably the small lesions caused by mechanical strain are important in this process. These lesions are associated with sclerosis, the development of subchondral cysts and damage to the joint cartilage. In addition, new bone formation is observed along the joint margins in osteoarthritis, in the form of osteophytes, which probably develop in response to mechanical instability and under the influence of so-called growth factors. Local synovitis is less extensive in the case of osteoarthritis[3] compared to inflammatory joint conditions, such as rheumatoid arthritis, and is observed in both the early and late stages of osteoarthritis. Synovitis as a result of osteoarthritis probably develops second-

dary to the breakdown of cartilage and changes in the subchondral bone.[1]

The objective changes to the cartilage and bone in osteoarthritis have a moderate correlation to the clinical presentation.[4]

### Epidemiology

The estimated incidence (i.e. the number of new cases of the disease per year) and prevalence (i.e. the total number of disease cases per thousand people) is based on information from registrations by general practitioners up to 1 January 2015 (85%) and supplemented by data from the NIVEL Care Registrations in primary care (15%) (Table 1.2).

Table 1.2. Incidence and prevalence in 2015 of hip and knee osteoarthritis according to gender.

	New disease cases: incidence		Total number of disease cases: prevalence	
	men	women	men	women
per 1,000 people				
hip osteoarthritis	1,5	2,6	15,8	29,1
knee osteoarthritis	2,3	3,9	22,7	41,6
total			38,5	70,7
absolute numbers				
hip osteoarthritis	12.700	22.100	132.700	248.500
knee osteoarthritis	19.100	33.700	190.400	355.700
total			323.100	604.200

Source: [www.volksgezondheidszorg.info](http://www.volksgezondheidszorg.info).

As many patients with osteoarthritis are not known to the general practitioner, the actual number of patients with osteoarthritis of the hip and knee is expected to be higher.[15] The following developments could have an effect (positive or negative) on the occurrence of osteoarthritis in the future: the age structure of the population, the number of people who are overweight, the number of accidents resulting in damage to joints and the number of people performing work that places a strain on the joints.[15]

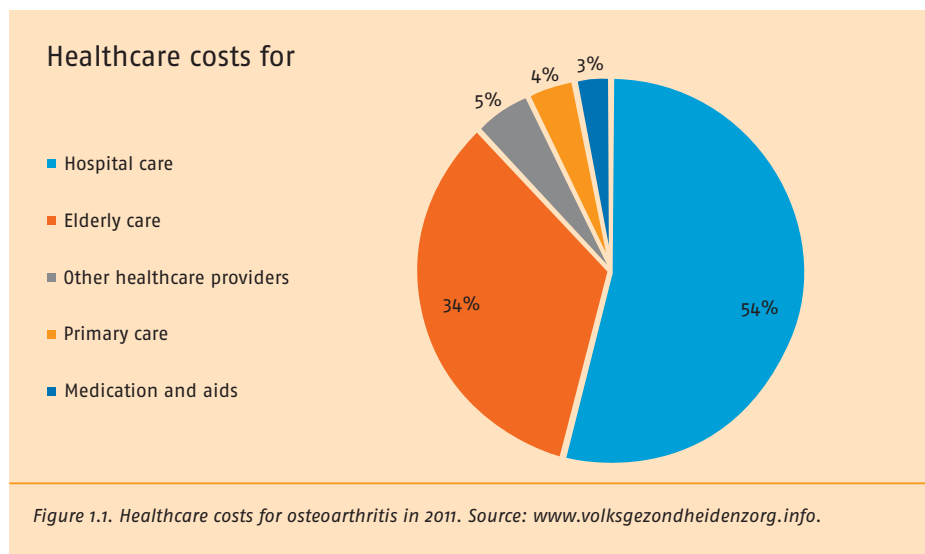
The most recent information about the number of joint replacement surgeries of hip and knee stems from 2016 and was adopted from the National Registration of Orthopaedic Implants (NROI).[16]

### Costs to society

In 2011, the total costs of caring for people with osteoarthritis in the Netherlands amounted to 1.1 billion Euro.[17] This equates to 21.5% of the total healthcare costs incurred as a result of diseases affecting the musculoskeletal system and 1.2% of the total costs of all healthcare in the Netherlands.[17] The majority (54%) of costs for osteoarthritis was spent on hospital care. This includes the costs of joint replacement surgeries.[18] In addition, 34% of the costs were related to elderly care (e.g. home nursing care as a result of reduced mobility). Caution is advised in the interpretation of the social figures, considering the recent developments in the funding and determining the indication for care and accommodation.

The costs incurred in primary care, including physical therapy and exercise therapy, amounted to 4% of the total costs (figure 1.1).[17] Approximately half (48%) of the people with osteoarthritis who were known to the general practitioner in 2015 received physical therapy over a period of 12 months.[17] During a survey conducted in 2016 amongst 177 patients with osteoarthritis from the National Panel for Chronically Ill and Handicapped (NPCH), 48% were found to be making use of physical therapy at the time.[19] The majority of people with osteoarthritis (84%) had taken out additional insurance cover for physical therapy and exercise therapy in 2016.[17]

A questionnaire survey amongst 174 patients who had undergone hip or knee replacement, or who were on the waiting list for joint replacement surgery, revealed that 27% of these patients had never received physical therapy, which indicates that this service is under-used.[20]



### Employment problems

The costs of osteoarthritis should also include the costs related to reduced labour productivity at work, absenteeism and incapacity to work. As the retirement age and the labour participation of older people increase, the number of working people with osteoarthritis can be expected to increase over the coming years.[21] People who participate in the labour market and have osteoarthritis of the hip and/or knee, may require workplace adjustments (such as provisions for store staff who are required to stand for long periods or provisions for road workers who work in a kneeling position). These adjustments may affect their range of tasks, the workplace or the working hours or working times. This depends on the symptoms, the nature of the work and the individual patient. For some of the patients, the hip and knee problems will result in absenteeism and incapacity to work.[22] A survey was conducted in 2016 amongst people with osteoarthritis and aged 40 to 65 years, who formed part of the National Panel Chronically Ill and Handicapped (NPCH); 45% of them were found to be in paid employment. [19] A study involving 659 patients with osteoarthritis in England found that in the years 2000 to 2010, 12.6% of the patients with osteoarthritis had become unemployed as a result of illness or limitations, whilst this applied to 9.3% of healthy peers.[23]

A study was also performed to look into employment problems in working people with osteoarthritis who underwent joint replacement surgery of the hip or knee. This revealed that the majority returned to paid employment, but some did not or only partially returned.[24]

Factors that appear to promote a successful return to work are: gender (male), a strong sense of needing to return to work, being an entrepreneur and low absenteeism due to illness.[25]

## Note 2. Clinical presentation and progression

### Clinical question

#### What is the clinical presentation and the progression of osteoarthritis of the hip and knee?

This question was answered by describing the clinical presentation and the progression of osteoarthritis of the hip and knee. (Scientific) literature was consulted for this.

#### Clinical presentation of hip and knee osteoarthritis

The clinical presentation is based on the clinical classification criteria for the hip[1] and the knee[2]. In general, the relationship between the clinical presentation and the degree of radiologically detectable abnormalities is weak for osteoarthritis of the hip and/or knee.

- **Pain.** For most people, pain is the most important symptom of osteoarthritis of the hip and/or knee. This pain initially occurs when the person starts moving and with prolonged strain; the pain often increases as the day progresses. In later stages, the pain also occurs at rest and during the night.[3,4] There is a limited correlation between radiologically detectable or clinically objective joint abnormalities and pain perception. Chronic pain can cause hypersensitivity of the nociceptors, which can result in allodynia, hyperalgesia and altered central pain processing, also referred to as central sensitisation.[5] Psychosocial factors, such as anxiety and depression, also play an important role in pain perception in people with osteoarthritis of the hip and/or knee.[4]

- *Stiffness.* Stiffness caused by osteoarthritis is usually start-up stiffness, which disappears after a few minutes of movement.[3,4]
- *Swelling.* Bony swellings (osteophytes) are palpable along the joint margins, which can be sensitive to pressure. In addition to bony swelling, a swelling of the soft tissues or intra-articular swelling (hydrops or synovitis) can also occur. A transient inflammatory reaction, which is associated with pain, swelling and possibly a temperature increase of the joint, is also called a flare.[3,4,6]
- *Crepitations.* Crepitations form a characteristic of osteoarthritis, which can be heard and felt and are probably caused by rough joint surfaces and the bony swellings along the joint margins that rub along the ligaments.[4]
- *Limitation of movement.* Another characteristic of osteoarthritis is restricted movement of the joint. In the case of the hip, it is mainly the rotations that are limited (endorotation is more limited than exorotation), but extension and flexion are also limited. In the case of inadequate extension, the hip is not stretched sufficiently when walking, which causes the patient to lean forward when walking, and inadequate flexion causes problems, for example, when putting on socks and shoes. In the case of the knee, it is mainly the flexion and extension that are limited, with the patient often noticing limitations in extension sooner than limitations in flexion, because a limitation in extension will make it harder for the patient to walk. The limitation in flexion primarily causes problems with crouching or kneeling.[4]
- *Deformation and changes in position.* Increasing destruction of the joint structures can result in changes in position, such as varus or valgus deformity of the knee. These changes in position can, along with other factors, result in symptoms of instability. Stability of a joint can be defined as "the ability to maintain the position of a joint or to be able to control movements affected by external forces". The passive support structure (ligaments, capsule) and the active neuromuscular system (muscle strength, proprioception) provide joint stability. Achieving stability of a joint should be viewed as a process that is influenced by a number of factors (including strength, proprioception and laxity).[7-9]

#### *Progression of hip and knee osteoarthritis*

The progression of hip and knee osteoarthritis varies strongly between patients. To illustrate this, a cohort study examining the progression of pain caused by knee osteoarthritis over a period of six years distinguished between the following forms of progression: mildly non-progressive course (35% of the patients), strongly progressive course (25% of the patients), a slightly progressive course (22% of the patients), improvement over time (12% of the patients) and severe pain that did not improve (3% of the patients).[10] Comparable variation in progression was also observed in other studies into the course of physical functioning for osteoarthritis of the hip and knee.[11,12,13,14]

In general, there is a poor correlation between radiologically detectable abnormalities on the one hand and the clinical presentation and progression on the other hand. However, a stable course is more common in people with few radiologically detectable abnormalities (Kellgren and Lawrence grade I), whilst an increase in pain and deterioration of functioning were more common in people with more radiologically detectable abnormalities or progression.[15,16]

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

#### **Clinical question**

**Which prognostic factors play a role in the course 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, and which forms of co-morbidity are common in people with hip and knee osteoarthritis?**

This question was answered by describing prognostic factors and the co-morbidity that play a role in the course of the physical functioning and pain in patients with osteoarthritis of the hip and/or knee. (Scientific) literature was consulted for this.

#### **Prognostic factors for the progression of physical functioning and pain**

##### *Conclusion from the literature study*

The progression of osteoarthritis of the hip and/or knee can be affected by body structure and functions (degree of pain, strength of m. quadriceps, radiologically detectable abnormalities on initial presentation), activities and participation (extent of limitations in daily activities), environmental and personal factors (advanced age, female gender, being overweight, general health and vitality, co-morbidity) and psychosocial functioning (depression, anxiety, coping style, cognition).



Examples of prognostic factors described in the literature for an unfavourable progression of pain and physical functioning as a result of osteoarthritis of the hip and/or knee are listed in Table 3.1.

*Table 3.1. Examples of prognostic factors described in the literature for the progression of pain and physical functioning in people with osteoarthritis of the hip and/or knee.[1-3]*

	Hip		Knee	
	Pain	Physical functioning	Pain	Physical functioning
<b>functions and anatomical characteristics</b>				
bilateral knee pain		++	++	
a lot of knee pain when symptoms start			++	++
pain upon patellofemoral compression				++
low muscle strength of m. quadriceps				++
reduced range of motion at start of symptoms		+		+
severe and/or progressive radiologically detectable abnormalities in the knee				++
<b>activities and participation</b>				
more restrictions of activities				++
lower walking speed				++
physical inactivity	++			
<b>personal factors</b>				
advanced age		+		+
female gender	+	+		
involvement of contralateral joint or other weight-bearing joint	+	+	+	+
presence of various forms of co-morbidity		++		++
being overweight		+		++
poorer general health				++
low vitality		++		++
poorer mental health (including depression, cognition, coping)			++	++
genetic factors	+	+	+	+
<b>environmental factors</b>				
no supervised physical therapy	+			
++ strong evidence, + moderate evidence				

Similar prognostic factors play a role in the functional recovery following joint replacement surgery of the hip or knee. In addition, the progress after total hip or knee replacement surgery is partly determined by the extent and speed of recovery after the procedure (including wound healing) and aspects such as fear of the surgery and the consequences of the surgery.

Examples of prognostic factors described in the literature for an unfavourable progression of pain and physical functioning in people with osteoarthritis of the hip and/or knee are listed in Table 3.2.

*Table 3.2. Examples of prognostic factors described in the literature for unfavourable progression of pain and physical functioning in people with osteoarthritis of the hip and/or knee who have undergone joint replacement surgery.[4-12]*

	Total hip		Total knee	
	Pain	Physical functioning	Pain	Physical functioning
<b>functions and anatomical characteristics</b>				
pain in other places			++	+
a lot of pain prior to surgery			++	++

Table 3.2. Examples of prognostic factors described in the literature for unfavourable progression of pain and physical functioning in people with osteoarthritis of the hip and/or knee who have undergone joint replacement surgery.[4-12] (continued)

	Total hip		Total knee	
	Pain	Physical functioning	Pain	Physical functioning
<b>functions and anatomical characteristics</b>				
severe lower back pain	+	+		
reduced muscle strength of m. quadriceps				++
<b>activities and participation</b>				
severe elbow, wrist or hand problems				+
reduced pre-operative physical functioning			++	++
Timed Up & Go test score >11		+		+
<b>personal factors</b>				
advanced age		++		
female gender		+		
fear of the surgery			++	++
several forms of co-morbidity		++	++	++
dizziness in combination with falling		+	+	+
asthma or COPD		+		+
cardiac problems	+			
vision problems			+	+
body mass index (BMI) > 30		++		+
Catastrophization			++	+
poorer mental health (including depression)		++		+
++ strong evidence, + moderate evidence				

The higher the level of physical functioning before the surgery, the better the physical functioning and the less pain the patient experiences after the surgery. However, patients with a poorer level of physical functioning before the surgery make more progress after the surgery in terms of physical functioning and pain compared to patients with a better level of physical functioning before the surgery.[13]

In daily practice, this means that if one or more of the described prognostic factors are present in the patient, these factors should be included in the entire clinical decision-making process. However, the exact progression of the symptoms or the outcome of the treatment cannot be predicted based on these factors.

### Co-morbidity

Co-morbidity can be defined as “every obvious clinical co-condition that is present or can develop during the clinical course of the symptoms experienced by the patient in addition to the index disease (arthritis)”. [14]

Co-morbidity occurs in 68-85% of patients with osteoarthritis of the hip and/or knee.[15,16] In the case of osteoarthritis of the hip or knee, a relatively high number of patients also suffers from osteoarthritis in other joints, such as the (other) hip or knee, lumbar or cervical spine, hands or feet (generalised osteoarthritis). In addition to age, common pathophysiological mechanisms can play a role in different chronic conditions, such as the systemic impact of being overweight.[17]

Some forms of co-morbidity are common in people with osteoarthritis of the hip or knee, namely conditions affecting the eye, the ear, the nose or the throat (96%; mainly vision problems), cardiovascular diseases (54%), endocrine and metabolic diseases (46%; mainly diabetes mellitus type II); hypertension (32%), chronic lower back pain (30%), chronic obstructive pulmonary disease (COPD) (29%), psychological problems (26%; mainly depression).[15,16] Both the total number and the nature and severity of the various forms of co-morbidity are associated with more limitations in performing daily activities and more pain [18] and also with the increase of these symptoms over time.[19-24] Research involving patients with osteoarthritis of the hip or knee who underwent joint replacement surgery revealed that 86% had one or more forms of co-morbidity, with a patient having more forms of co-morbidity being related to poorer physical functioning one year after surgery. [20]

When treating people with osteoarthritis of the hip and knee, healthcare providers should be aware of the

fact that there is an increased risk of the presence of co-morbidity. This co-morbidity can have an effect on the symptoms and the physical functioning. In addition, the co-morbidity can affect the treatment options for both conservative[25] and surgical treatment[26].

#### **Note 4. Stepped care and the role of the therapist**

##### **Clinical question**

##### **Which treatment options and organisation of care are recommended for people with osteoarthritis of the hip and knee?**

This question was answered by describing the organisation of care in terms of the stepped care principle and by explaining the role of the therapist. (Scientific) literature was consulted for this.

##### *Stepped care*

The literature provides various examples of stepped care models for the treatment of osteoarthritis of the hip and/or knee.[1,2] In these models, various interventions are implemented simultaneously, such as the combination of exercise therapy, education (information and lifestyle advice) and the use of pain medication. Surgical treatment only becomes an option once it has been determined that conservative treatment options are not or inadequately effective.[3]

##### *Education and lifestyle advice*

Depending on the treatment setting, education and lifestyle advice can be provided by the treating physician, physical therapist, exercise therapist, occupational therapist, nursing specialist or 'physician assistant'. Where possible, carers should be involved when information is supplied to vulnerable elderly people with osteoarthritis. More information about information and advice is available in section C.1.

##### *Exercise therapy*

Exercise therapy should take place under the supervision of a therapist and is always offered in combination with education and lifestyle advice. Both during the treatment period and upon termination, specific advice is provided about the way in which an active lifestyle can be achieved and/or maintained in the patient's daily life, as described in the movement guideline of the Dutch Health Council [4].

More information about exercise therapy is available in section C.2.

##### *Losing weight*

A person is defined as being overweight at a BMI of 25–30 kg/m<sup>2</sup> and obese at a BMI > 30 kg/m<sup>2</sup>. Weight loss is recommended for patients who are overweight or obese. This can be achieved by means of a weight loss diet in combination with physical activity.[5–10] Research demonstrates that a 5% reduction in weight can result in a clinically significant reduction in pain for knee osteoarthritis.[11,12] The effect of weight loss on pain and functioning for hip osteoarthritis is less obvious. The general practitioner can refer a patient who is overweight and suffering from knee osteoarthritis to a dietician, if the patient is not sufficiently able to implement general dietary advice in practice.

##### *Aids, orthoses and modifications of the home or work situation*

If a patient is restricted in his/her ability to walk as a result of osteoarthritis of the hip and/or knee and if there is an inadequate (expected) effect of an intervention that is aimed at improving hip and/or knee function, then walking aids (walking stick, elbow crutch or walker) can be used, or in very specific cases a knee brace can be recommended. For people with hip osteoarthritis and a limited flexion of the hip, a sock aid or a long shoehorn can be a practical aid.[5] If bending is a problem, a 'helping hand' (a long stick with a manually operated grasper at the end) can be used to pick up objects from the floor.

Functioning can be made easier through modifications of the home or work situation. Examples of such modifications include: a raised toilet, brackets, a shower stool, a working stool in the kitchen or a chair adjustment at work. These provisions are suitable for patients who struggle to stand for long periods, or who have problems when sitting down or getting up. A bicycle with electrical pedal assistance (e-bike), which can make it easier – for example – to cycle against a headwind or on hilly terrain, is now so common that it can no longer be viewed as a modification or aid.

**Treatment with medication**

Treatment with medication is offered by the general practitioner, medical specialist, nursing specialist or 'physician assistant'. The first step in offering treatment with medication usually consists of the use of paracetamol at an adequate dose to reduce the pain,[5] although the effect of paracetamol on the pain caused by osteoarthritis is a topic that is increasingly being debated.[13] If paracetamol proves ineffective, non-steroidal anti-inflammatory drugs (NSAIDs) are recommended according to an 'on-demand' schedule.[7,13] If the patient has a relative contra-indication for NSAIDs, a physician will often recommend paracetamol in combination with tramadol or another weak opioid.[14] Tramadol can also be prescribed as mono-therapy if NSAIDs are contra-indicated or prove inadequately effective.[2,7-9] If paracetamol proves inadequately effective, oral morphine preparations can also be considered instead of NSAIDs or tramadol, particularly for elderly patients. Topical NSAIDs (NSAID as a cream or ointment) can also be used for pain reduction. The administration of intra-articular corticosteroid injections is a treatment option if the patient is suffering a flare with knee osteoarthritis or if analgesics provide inadequate pain relief.[7] Intra-articular injections of hyaluronic acid are not recommended for knee osteoarthritis in the Guideline "Non-traumatic knee problems" by the Dutch College of General Practitioners (NHG)[7] and the Stance on "Sensible choices within orthopaedics"[3] by the Dutch Orthopaedic Association (NOV). Orthopaedics surgeons will only consider this treatment if the patient, in an end-stage of radiologically detectable osteoarthritis, no longer has an indication for surgical intervention due to severe co-morbidity.

For all medicinal treatment options, the medication policy for osteoarthritis should be adjusted to suit the individual, depending on the presence of co-morbidity and possible interactions with other medications, among others in elderly patients.

**Surgical treatment**

The orthopaedic surgeon can be consulted if conservative treatment has resulted in no or inadequate effect after three to six months.[3,15,16] Joint replacement surgery of the knee or hip can be an effective treatment option in this case.[17-19] If a decision is made to perform a surgical intervention, then the therapist can play an important role in the pre-operative and post-operative phases regarding education and lifestyle advice. Refer to section C.1. In addition, pre-operative and/or post-operative exercise therapy can be considered. Refer to section C.2.

**Note 5. Clinical diagnosis**

**Clinical question**

**How is the diagnosis made in people with hip and knee osteoarthritis?**

This question was answered by describing the way in which the clinical diagnosis of osteoarthritis of the hip and/or knee can be made. (Scientific) literature was consulted for this.

The clinical diagnosis of osteoarthritis of the hip and/or knee can be made based on a medical history and physical examination and the clinical classification criteria as defined by the American College of Rheumatology (ACR).[1,2]

The clinical diagnosis can be made without performing X-ray diagnostics.[3,4]

The criteria for making the diagnosis of hip or knee osteoarthritis based on both clinical and radiological characteristics have been developed in the secondary care setting and could therefore be less relevant in the primary care setting (Table 5.1).

*Table 5.1. Clinical, radiological and laboratory classification criteria for hip and knee osteoarthritis.[1,2]*

Hip	Knee
pain in the hip and at least 2 of the following characteristics: <ul style="list-style-type: none"> <li>• endorotation of the hip &lt; 15°;</li> <li>• sedimentation ≤ 20 mm;</li> <li>• femoral or acetabular osteophytes;</li> <li>• narrowing of the joint space (superior, axial and/or medial).</li> </ul>	pain in the knee and at least 5 of 9 characteristics: <ul style="list-style-type: none"> <li>• age &gt; 45 years;</li> <li>• stiffness &lt; 30 minutes;</li> <li>• crepitations;</li> <li>• pain upon palpation of the bone;</li> <li>• bony swelling;</li> <li>• no warmth upon palpation;</li> <li>• sedimentation &lt; 40 mm after 1 hour;</li> <li>• rheumatoid factor negative;</li> <li>• synovial fluid consistent with osteoarthritis and osteophytes.</li> </ul>

If there are any doubts about the diagnosis, or another condition is suspected, then conventional X-ray diagnostic tests and/or laboratory tests can be performed to rule out an inflammatory joint condition such as rheumatoid arthritis. The inflammation parameters will be normal in the case of osteoarthritis and abnormal in the case of rheumatoid arthritis (RA). The sedimentation rate or the CRP concentration (C-reactive protein) will be elevated in the case of RA. Conventional X-ray examinations can visualise any narrowing of the joint space, osteophytes, subchondral sclerosis and cysts.[5,6]

Ultrasound examination can play a role in the differential diagnostic process in exceptional cases. Magnetic resonance imaging (MRI) is not indicated for the diagnosis of hip or knee osteoarthritis in daily practice. However, there is significant interest in the use of MRI in scientific research, as bone marrow oedema detected by MRI can be a predictor of increased radiologically detectable abnormalities.[5,6]

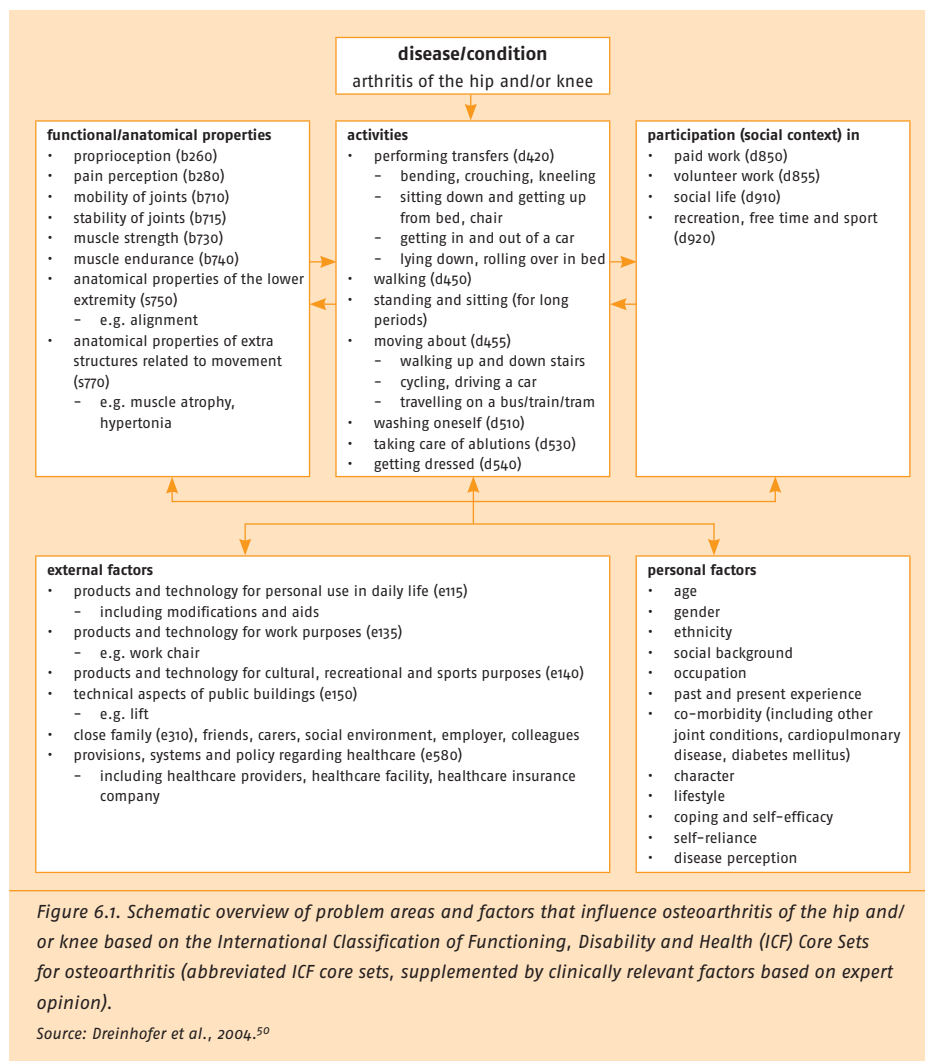
**Note 6. Medical history**

**Clinical question**

**Which ICF domains should be quantified during the diagnostic process?**

This question was answered by describing the domains from the International Classification of Functioning Disability and Health (ICF) Core Set for Osteoarthritis, which are relevant to the medical history, divided according to Functions and anatomical properties, Activities, Participation, External and Personal factors.

This ICF Core Set for Osteoarthritis forms the foundation for the medical history of patients with osteoarthritis of the hip and/or knee (Figure 6.1).



The aim of the diagnostic process is to create an overview of the severity, the nature and the degree of ability to influence the health problem. The medical history forms part of this. The therapist takes into consideration the clinical classification criteria for hip and knee osteoarthritis when determining a clinical diagnosis of osteoarthritis.[1,2]

The starting point is the need for assistance formulated by the patient. The therapist determines the need for assistance and the related health problems using the ICF Core Set Osteoarthritis, with modifications specific to hip and knee osteoarthritis.[3,4] The therapist also lists any contra-indications and red or yellow flags. The presence of these should be taken into consideration during the treatment. The yellow flags can also form a reason to consult with the general practitioner / physician about seeking the assistance of another healthcare provider. (Refer to the KNGF guideline Physiotherapeutic File-keeping from 2016.)

The risk factors for the development of osteoarthritis and the prognostic factors for the progression of physical functioning and pain should also be discussed. These are described in sections A.2 and A.4 respectively. When recording the medical history, measurement instruments can be used to support the process, as described in paragraph B.4.

Absolute contra-indications and red flags play a role in exercise therapy during the conservative phase, but also in the event of joint replacement surgery. Please refer to section B.5 for a description.

### Note 7. Physical examination

#### Clinical question

##### Which ICF domains should be quantified during the diagnostic process?

This question was answered by describing the domains from the International Classification of Functioning Disability and Health (ICF) Core Set for Osteoarthritis, which are relevant to the physical examination, divided according to Functions and anatomical properties, Activities, Participation, External and Personal factors.

The aim of the diagnostic process is to create an overview of the severity, the nature and the degree of ability to influence the health problem. The physical examination forms part of this.

The physical examination takes into consideration the use of the clinical classification criteria for hip and/or knee osteoarthritis to determine the clinical diagnosis of osteoarthritis (section B.1).[1,2]

Recommended and optional measurement instruments are available for the physical examination (section B.4). The foundation of the physical examination is formed by the ICF Core Set for Osteoarthritis.

#### Inspection: activities

The posture is examined during the general inspection. This can be affected by, for example, a restriction in extension of the knee or loss of strength in the hip musculature. In the case of knee osteoarthritis, it is important to assess the position of the knee in the frontal plane (varus or valgus deformity), as such deformities pose an increased risk of deterioration in physical functioning (section A.4).[3-5]

When assessing the daily activities, it is important to focus on the activities that cause problems for the patient. This can include activities performed during sport, hobbies and (volunteer) work. Many limitations are related to walking, walking up/down stairs, sitting down and getting up. Observing how the patient moves can provide an impression of how someone deals with pain and limitations (compensation, fear of movement, avoiding movement) and whether someone is underloaded or overloaded.

A significant proportion of the people with knee osteoarthritis will experience instability of the knee, particularly when walking.[6,7] It is therefore important to assess the degree of instability objectively during the inspection.

As loss of strength and pain play a major role, the person's gait should be assessed. Examples of an abnormal gait include a Duchenne gait or Trendelenburg gait. The person may avoid using the affected side due to the pain and this can result in a left-right difference in stride length and support, or foot strike and trunk rotation can be reduced.

#### Inspection: functions and anatomical characteristics

Local inspection focuses primarily on abnormalities in and around the joint itself, thereby gaining an impression of local pain, swelling and (in the case of knee osteoarthritis) temperature increase in the joint. Osteoarthritis can be associated with (some) local inflammatory activity.[8,9]

#### Palpation

Examination by palpation is performed to gain an impression of symptoms such as pressure pain, temperature changes and swelling (hydrops and/or changes to the bone as a result of osteoarthritis).[8] Examination by palpation is performed mainly in the case of knee osteoarthritis.

**Functional examination**

During an active movement examination, it is possible to determine – for example – whether the patient is suffering any loss of strength and/or coordination. The movement examination assesses the passive movement in the joint, with the range of motion and the final sensation giving an impression of whether a restriction in movement is still reversible. Tests are available to evaluate the strength, balance/coordination, the aerobic capacity and the ability to perform activities (section B.4). In addition, a function examination gives an impression of the active stability of the joint.

**Measuring height and weight**

If height and weight are measured, then the BMI can be determined. Being overweight plays a significant role in the development and progression of osteoarthritis (section A.2 and A.4). Weight reduction can affect the progression.

**Joint replacement surgery**

There are other points of attention to focus on in the case of joint replacement surgery. It is important to take wound recovery into consideration. This recovery will determine which exercises can be performed.

If necessary, the sutures will be removed after approximately two weeks. The swelling should reduce after the surgery. Looking for signs of infection is recommended.

A difference in leg length can occur after hip surgery. In the case of knee surgery, the patella may not move in proper alignment with the lower leg, a situation that can result in pain and problems with bending. A prosthesis can also detach after a longer period.

**Note 8. Measurement instruments****Clinical question**

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

This question was answered by describing the recommended and optional measurement instruments that can be used during the diagnostic process. The Clinimetric Framework for Evidence-Based Products was used for this.[3]

The recommended measurement instruments support the diagnostic process. The aim is to get an impression of:

- the degree of pain:
  - using the Numeric Pain Rating Scale (NPRS);
- the functioning:
  - using the Six Minute Walking Test (6MINWT);
  - the Hip Injury and Osteoarthritis Outcome Score (HOOS) ADL sub-scale, and/or
  - the Knee Injury and Osteoarthritis Outcome Score (KOOS) ADL sub-scale, and
  - the Patient-Specific Complaints (PSC).

When measuring the physical functioning, the scores on self-reported questionnaires did not correlate strongly to the scores on function tests.[1,2] This is due to the fact that both instruments assess different aspects of physical functioning and they can therefore supplement each other well when outlining these aspects.

The recommended measurement instruments can also be used to evaluate the pain (NRS pain) and functioning (6MINWT and PSC).

There are not enough reliable and valid measurement instruments available for recommended use as a measurement instrument to quantify external and personal factors (refer to the Clinimetric Framework for Evidence-Based Products by the KNGF).[3]

Optional measurement instruments can be selected based on clinical reasoning, to support the diagnostic process or for evaluation purposes, namely:

- The 1RM sub-maximum test. This test should be used to determine the training intensity if a strength machine is used during the muscle strength measurement.
- The Borg scale 6–20. This measurement instrument can be used instead of the heart rate measurement (for example, when it is not possible to measure the heart rate).

- The HOOS and the KOOS. These questionnaires can be used for the hip or the knee respectively, to evaluate the treatment. These are the more detailed versions of the HOOS-PS and KOOS-PS, which not only record functioning in daily life, but also have sub-scales to record pain, stiffness, symptoms, functioning in sport and leisure time and quality of life.
- The HOOS Physical Shortform (HOOS-PS) and the KOOS Physical Shortform (KOOS-PS). These measurement instruments can be used to measure functioning if the patient has undergone joint replacement surgery of the hip and/or knee and information about the score for these questionnaires in the hospital is available. These questionnaires are used within orthopaedic surgery, which makes it easier to compare results after the patient has been discharged from the hospital.
- The Animated Activity Questionnaire (AAQ). This computer animated questionnaire is suitable for all patients with osteoarthritis of the hip and/or knee and measures physical functioning, in which the measurement of perception (as is the case with questionnaires) and functioning (as is the case with physical tests) is combined. The AAQ uses animated films and is therefore particularly suitable for people with limited reading skills or people who do not speak Dutch very well or who cannot perform much physical activity.
- The Modified IOWA Level of Assistance Score (MILAS). This questionnaire can be used if a patient has undergone joint replacement surgery of the hip or knee. The MILAS aims to measure whether transfers can be made independently and safely, a condition for discharge from the hospital.
- The Timed Up & Go test (TUG). This physical test can be used to evaluate the treatment if the Six Minute Walking Test is too much for the patient. For example, someone with a very moderate condition, a lot of co-morbidity or in the early phase after joint replacement surgery of the hip or knee. This test also gives an impression of the muscle strength of the thighs and whether the patient has an increased risk of falling. In patients who have undergone joint replacement surgery, this test can be performed to assess whether there is an increased risk of delayed recovery.
- The 30 sec. Chair Stand Test (CST). This test can be used to evaluate the specific functional activity 'sitting down and getting up', an activity that is often restricted in people with osteoarthritis of the hip and/or knee. This test also gives an impression of the muscle strength of the thighs and whether the patient has an increased risk of falling.
- The Single Leg Stand Test (SLST). This test can be used if the patient has balance problems, to evaluate whether the patient has an increased risk of falling and whether balance training will have any effect.
- The Cumulative Illness Rating Scale (CIRS). This questionnaire can be used to determine the presence of other conditions and to evaluate the effect of these on physical functioning.

The selected measurement instruments are listed in Table 8.1.

<i>Table 8.1 Selected measurement instruments with accompanying interpretation and clinically relevant differences (all measurement instruments are available via <a href="http://www.meetinstrumentenzorg.nl">www.meetinstrumentenzorg.nl</a>).</i>	
Measurement instrument	Interpretation / Clinically relevant difference
<b>Functions and anatomical characteristics</b>	
Numeric Pain Rating Scale (NPRS) [1]	<ul style="list-style-type: none"> <li>• Higher score means more pain.</li> <li>• Clinically relevant difference is 2 points on the scale of 0–10. [2]</li> </ul>
1RM sub-maximum test [16,17,18]	<ul style="list-style-type: none"> <li>• Interpretation and clinically relevant difference do not apply, because this measurement instrument is a test to determine the training intensity.</li> </ul>
Borg scale 6–20 [19,20]	<ul style="list-style-type: none"> <li>• Interpretation and clinically relevant difference do not apply, because this is a measurement instrument to determine and monitor the training intensity.</li> </ul>
<b>Activities and participation</b>	
Hip Injury and Osteoarthritis Outcome Score (HOOS) [1]	<ul style="list-style-type: none"> <li>• Higher score means greater difficulty in performing the activity.</li> <li>• Clinically relevant difference is 15–20 points on the scale of 0–104 (depending on sub-scale).*</li> </ul>
Knee Injury and Osteoarthritis Outcome Score (KOOS) [1,5]	<ul style="list-style-type: none"> <li>• Higher score means greater difficulty in performing the activity.</li> <li>• Clinically relevant difference is 15–20 points</li> </ul>
Patient-Specific Complaints (PSC) [1]	<ul style="list-style-type: none"> <li>• Higher score means greater difficulty in performing the activity.</li> <li>• Clinically relevant difference is 2 points on the scale of 0–10.</li> </ul>



Table 8.1 Selected measurement instruments with accompanying interpretation and clinically relevant differences (all measurement instruments are available via [www.meetinstrumentenzorg.nl](http://www.meetinstrumentenzorg.nl)). (continued)

Measurement instrument	Interpretation / Clinically relevant difference
<b>Activities and participation</b>	
Six Minute Walking Test (6MINWT) [1]	<ul style="list-style-type: none"> <li>The more metres covered, the better the functioning.</li> <li>The clinically relevant difference is not known for hip and knee osteoarthritis, but is set at 25-50 metres based on other conditions.</li> <li>Calculate the standard values as follows: distance = <math>218 + (5.14 \times \text{height [cm]} - 5.32 \times \text{age}) - (1.80 \times \text{weight}) + 51.31 \times \text{gender}</math> [1 = male, 0 = female]</li> <li>Precondition for the use of this formula: the length of the course is 50 m.</li> </ul>
Hip Injury and Osteoarthritis Outcome Score, abbreviated version (HOOS-PS) [21]	<ul style="list-style-type: none"> <li>Measures changes in symptoms and restrictions in patients with hip problems.</li> <li>Score of 0-100, with a higher score equating to better functioning.</li> <li>Clinically relevant difference is not known.</li> </ul>
Knee Injury and Osteoarthritis Outcome Score, abbreviated version (KOOS-PS) [22]	<ul style="list-style-type: none"> <li>Measures changes in symptoms and restrictions in patients with knee problems.</li> <li>Score of 0-100, with a higher score equating to better functioning.</li> <li>Clinically relevant difference is 15 points.</li> </ul>
Animated Activity Questionnaire (AAQ) [10,11]	<ul style="list-style-type: none"> <li>Computer animated questionnaire that measures restrictions in activities and is suitable for foreign-language patients or semi-literate patients.</li> <li>Score of 0-100, with a higher score equating to better functioning. (also refer to <a href="https://www.myaag.com">https://www.myaag.com</a>)</li> <li>Clinically relevant difference is 14 points.[12]</li> </ul>
Modified Iowa Level of Assistance Scale (MILAS) [13,14,15]	<ul style="list-style-type: none"> <li>Measures independence in the hospital following joint replacement surgery.</li> <li>Score ranges from 0-6. A score of 0 means that the patient is able to perform transfers independently. A score of 1-3 means that someone should be present at home to assist with transfers.</li> </ul>
Timed Up & Go test (TUG) [1,5]	<ul style="list-style-type: none"> <li>A score of &gt; 11 sec. indicates an elevated risk of falling and (in the case of joint replacement surgery) an elevated risk of delayed recovery.</li> <li>A score &lt; 20 sec. means that the patient can perform ADL tasks independently and can walk around outside the home.</li> <li>A score of 20-29 sec. means that walking aids may be required and the patient can only walk outside the home with supervision.</li> <li>A score &gt; 30 sec. means that the patient requires assistance for many ADL activities and transfers, that walking aids should be used and that the patient cannot walk up/down stairs.</li> <li>Clinically relevant difference is 2.5 seconds.[5]</li> </ul>
30s Chair Stand Test (30 sec. CST) [5]	<ul style="list-style-type: none"> <li>A score &gt; 11 is considered an acceptable score after therapeutic treatment.</li> <li>A score &lt; 8 indicates an increased risk of falling.</li> <li>Clinically relevant difference is 2-3 repetitions.[9]</li> </ul>
Single Leg Stance Test [1]	<ul style="list-style-type: none"> <li>A score &lt; 5 indicates an increased risk of falling.</li> <li>Clinically relevant difference is 8-12 seconds (target group elderly).[7,8]</li> </ul>
<b>Personal factors</b>	
Cumulative Illness Rating Scale (CIRS) [1]	<ul style="list-style-type: none"> <li>Not applicable, because the CIRS is intended to register co-morbidity. This can be measured reliably in patients with hip and knee osteoarthritis and the test is therefore not used to measure change for this target group.</li> </ul>

## Note 9. Determining the indication

### Clinical question

**What is the indication for physical therapy/exercise therapy in people with osteoarthritis of the hip and/or knee and based on which criteria and/or red flags should people with osteoarthritis of the hip and/or knee be referred back to the general practitioner or treating specialist?**

This question was answered by describing the indication for physical therapy/exercise therapy and the red flags and contra-indications that apply to treatment. (Scientific) literature was consulted for this.

### Indications

The physiotherapeutic treatment and in particular exercise therapy are recommended in various (inter)national guidelines and healthcare standards for the treatment of people with hip or knee osteoarthritis.[1-7] None of these guidelines is specific about the indications and contra-indications for physical therapy for this condition. In practice, the use of therapy can take place to meet various needs for assistance from these patients. A distinction is made between needs for assistance relating to education (information and advice) about the condition, the progression and the treatment – particularly the role of self-management – and the actual guidance and supervision in performing daily activities, specific exercises aimed at increasing muscle strength and aerobic capacity and achieving and maintaining adequate levels of general physical activity. However, none of the guidelines or healthcare standards specifically describe indications in relation to when the therapy should be implemented and which distinction should be made in nature, duration, frequency or intensity based on the underlying need for assistance or problems.

### Contra-indications

As far as exercise therapy is concerned, contra-indications have been specifically described for certain forms of severe co-morbidity.[8]

The contra-indications for therapy following joint replacement surgery are based on information about complications, as stated on the website of the Dutch Orthopaedic Association (NOV).[9-11]

### Red flags

An important aspect within the screening is the evaluation of whether the symptoms are 'OK' or 'not OK'.

The therapist will aim to identify any red flags. The conclusion 'OK' or 'not OK' will be made by the individual therapist, based on his/her perspective. If the therapist reaches the conclusion 'not OK', then the patient will be informed about this and will be referred (back) to the general practitioner or physician. Refer to the KNGF guideline Physiotherapeutic File-keeping (2016).

An infection following joint replacement surgery can cause symptoms such as fever, pain, redness and swelling (knee). The risk of infection is higher for people who smoke or have diabetes mellitus type II or rheumatoid arthritis. If an infection is suspected, the therapist should refer the patient back to the orthopaedic surgeon, who can implement appropriate measures according to the "Recommendation on Working Method for treatment of Prosthetic Infections in Orthopaedics".[12]

In 2015, 2667 revisions of a total knee were performed, with 16.3% of these revisions being caused by an infection and 2.3% by a peri-prosthetic fracture. Of the 3809 hip revisions performed, 17.8% were due to infection and 11.4% due to a peri-prosthetic fracture.[13]

## Note 10. Information and advice

### Clinical question

**What type of information and advice is recommended for patients with osteoarthritis of the hip and/or knee in the conservative phase and at the time of joint replacement surgery for osteoarthritis of the hip and/or knee?**

This question was answered by describing what type of education should be provided and what advice should be given in the conservative phase and at the time of joint replacement surgery. (Scientific) literature was consulted for this.

### Conservative phase

Information and advice tailored to the individual patient with osteoarthritis of the hip and/or knee form an essential component of the conservative treatment and is strongly recommended in international guidelines in the field of osteoarthritis.[1-2] A list of the most essential topics has been drafted for patients with osteoarthritis of the hip and/or knee. At the very least, these topics should be discussed.

Various international initiatives have also been developed with the aim of creating an overview of the most important points that should be discussed when providing information and advice.[3-6] In addition, the KNGF has taken the initiative to write an educational leaflet based on existing education modules about osteoarthritis, which is aimed at investigators, therapists and patients.[7] Education aims to increase the knowledge about the condition and the treatment options, in addition to promoting self-management.

#### *Recommendation*

Offer information and advice to all patients with osteoarthritis of the hip and/or knee in the conservative phase, to increase their knowledge about the condition and treatment options and to promote self-management. This information and advice can be provided verbally, but should be supported in writing and/or digitally, depending on the wishes, preferences and health skills of the patient.

#### *Pre-operative and post-operative treatment*

A list of the most essential topics has been drafted for patients undergoing joint replacement surgery for osteoarthritis of the hip and/or knee, which should at the very least be discussed when providing information and advice. These topics are based on the information supplied by the professional association for orthopaedic surgeons (NOV) [8-10], scientific literature [11] and the expert opinion of investigators and physical therapists involved in the research project PATIO. The main aim is to promote a favourable progression after surgery (section A.4) and to provide lifestyle rules to prevent dislocations after total hip replacement surgery. In practice, these lifestyle rules differ significantly between hospitals and also depend on the type of surgery and the approach used during surgery. There is a trend towards less strict lifestyle rules in order to stimulate the patient to resume daily activities as soon as possible. A systematic review was published recently (moderate quality of evidence; Amstar score 5), which concluded that less strict lifestyle rules following total hip replacement surgery did not result in more dislocations compared to more strict lifestyle rules, but did result in faster and better resumption of activities and higher patient satisfaction.[11]

#### *Recommendation*

Offer information and advice to all patients undergoing joint replacement surgery for osteoarthritis of the hip and/or knee, to expand their knowledge about the surgery, to ensure that they are well prepared for the surgery and to promote recovery after surgery. This information and advice can be provided verbally, but should be supported in writing and/or digitally, depending on the wishes, preferences and health skills of the patient.

### **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**

#### **Clinical question**

##### **Is exercise therapy recommended for people with hip osteoarthritis?**

This clinical question was answered by means of a systematic literature study. The conclusion is based on 21 RCTs.[2-16, 18-23]

#### **Conclusion from the literature study**

- a. Measure of outcome 'physical functioning' (patient-reported outcomes). There is a moderate effect of exercise therapy on physical functioning in people with hip osteoarthritis, compared to no exercise therapy. The quality of the evidence is moderate to high.
- b. Measure of outcome 'pain' (patient-reported outcomes). There is a moderate effect of exercise therapy on pain in people with hip osteoarthritis, compared to no exercise therapy. The quality of the evidence is moderate to high.
- c. Measure of outcome 'quality of life' (patient-reported outcomes). There is no effect of exercise therapy on the quality of life in people with hip osteoarthritis, compared to no exercise therapy. The quality of the evidence is low to moderate.
- d. Measure of outcome 'health gain per invested euro'. The cost-effectiveness analysis reveals that exercise therapy results in a greater health gain per invested euro than standard care (i.e. no exercise therapy).

#### **From evidence to recommendation**

There is evidence of moderate quality to suggest that exercise therapy is effective in improving physical functioning (moderate effect) and pain (moderate effect). Based on the likelihood of a (moderate) effect, the limited side effects, the demonstrated cost-effectiveness and a high acceptability of exercise therapy, the working group is of the opinion that the intervention can be strongly recommended ("offer the intervention").

#### **Recommendation**

Offer exercise therapy to all patients with hip osteoarthritis in the conservative phase according to the FITT principles.

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

#### **General clinical question**

##### **Is exercise therapy recommended for the treatment of people with knee osteoarthritis?**

This clinical question was answered by means of a systematic literature study. The conclusion is based on 58 RCTs.[2-54, 57-62]

#### **Conclusion from the literature study**

- a. Measure of outcome 'physical functioning' (patient-reported outcomes). Immediately after the intervention, exercise therapy for knee osteoarthritis has a moderate effect on physical functioning compared to no exercise therapy.
- b. Measure of outcome 'pain' (patient-reported outcomes). Immediately after the intervention, exercise therapy for knee osteoarthritis has a major effect on pain compared to no exercise therapy. The quality of the evidence is moderate.
- c. Measure of outcome 'quality of life' (patient-reported outcomes). Immediately after the intervention, exercise therapy for knee osteoarthritis has a minor effect on quality of life compared to no exercise therapy. The quality of the evidence is moderate.
- d. Measure of outcome 'health gain per invested euro'. The cost-effectiveness analysis reveals that exercise therapy results in a greater health gain per invested euro than standard care (i.e. no exercise therapy).

*From evidence to recommendation*

There is evidence of moderate to high quality to suggest that exercise therapy is effective in improving physical functioning (moderate effect), pain (major effect) and quality of life (minor effect). Based on the (significant) likelihood of a (moderate to high) effect, the limited side effects, the demonstrated cost-effectiveness and a high acceptability of exercise therapy, the working group is of the opinion that the intervention can be strongly recommended ("offer the intervention").

*Recommendation*

Offer exercise therapy to all patients with knee osteoarthritis in the conservative phase according to the FITT principles.

**Note 14. Pre-operative exercise therapy prior to joint replacement for osteoarthritis of the hip****Clinical question****Is exercise therapy recommended prior to joint replacement surgery for hip osteoarthritis?**

This clinical question was answered by means of a systematic literature study. The conclusion is based on four RCTs.[2-5]

*Conclusion from the literature study*

Measure of outcome 'physical functioning' (patient-reported outcomes). Exercise therapy applied during the pre-operative phase for patients who are due to undergo joint replacement surgery for hip osteoarthritis has a moderate effect on physical functioning compared to no exercise therapy in the pre-operative phase. The quality of the evidence is moderate.

*From evidence to recommendation*

There is evidence of moderate quality to suggest that exercise therapy is effective in improving physical functioning (moderate effect). Based on the reasonable likelihood of a (moderate) effect, the limited side effects and the likely acceptability of exercise therapy, the working group is of the opinion that the intervention can be considered for specific patients ("consider implementation").

*Recommendation*

Consider offering exercise therapy in the pre-operative phase if there is an increased risk of delayed recovery following joint replacement surgery for hip osteoarthritis. Follow the FITT principles.

Consider limiting exercise therapy in the pre-operative phase to teaching (and monitoring the execution of) exercises that the patient can perform independently, if the risk of delayed post-operative recovery is not increased. Also teach all patients to use a walking aid that will be needed in the post-operative phase.

**Note 15. Pre-operative exercise therapy prior to joint replacement for osteoarthritis of the knee****Clinical question****Is exercise therapy recommended prior to joint replacement surgery for knee osteoarthritis?**

This clinical question was answered by means of a systematic literature study. The conclusion is based on four RCTs.[2-5]

*Conclusion from the literature study*

Measure of outcome 'physical functioning' (patient-reported outcomes). Exercise therapy applied during the pre-operative phase for patients who are due to undergo joint replacement surgery for knee osteoarthritis has a moderate effect on physical functioning compared to no exercise therapy in the pre-operative phase. The quality of the evidence is low.

*From evidence to recommendation*

There is evidence of low quality to suggest that exercise therapy is effective in improving physical functioning (moderate effect). Based on the major uncertainty due to the low quality of the evidence, the limited side effects and the likely acceptability of exercise therapy, the working group is of the opinion that the intervention can be considered for specific patients ("consider implementation").

**Recommendation**

Consider offering exercise therapy in the pre-operative phase if there is an increased risk of delayed recovery following joint replacement surgery for knee osteoarthritis. Follow the FITT principles.

Consider limiting exercise therapy in the pre-operative phase to teaching (and monitoring the execution of) exercises that the patient can perform independently, if the risk of delayed post-operative recovery is not increased. Also teach all patients to use a walking aid that will be needed in the post-operative phase.

**Note 16. Post-operative exercise therapy following joint replacement for osteoarthritis of the hip****Clinical question****Is exercise therapy recommended after joint replacement surgery for hip osteoarthritis?**

This clinical question was answered by means of a systematic literature study. The conclusion is based on four RCTs.[2-5]

**Conclusion from the literature study**

Measure of outcome 'physical functioning' (patient-reported outcomes). Exercise therapy applied during the post-operative phase for patients who have undergone joint replacement surgery for hip osteoarthritis has a moderate effect on physical functioning compared to no exercise therapy in the post-operative phase. The quality of the evidence is high.

**From evidence to recommendation**

There is evidence of high quality to suggest that exercise therapy is effective in improving physical functioning (moderate effect). Based on the high probability of a (moderate) effect, the limited side effects and the likely acceptability of exercise therapy, the working group is of the opinion that the intervention can be given a weak recommendation ("preferably offer this intervention").

**Recommendation**

Preferably offer exercise therapy in the post-operative phase if the patient has an increased risk of delayed recovery and/or if complications occur following joint replacement for osteoarthritis of the hip. Follow the FITT principles.

Consider limiting exercise therapy in the post-operative phase to teaching (and monitoring the execution) of exercises that the patient will perform independently, if the risk of delayed post-operative recovery is not elevated and there are no post-operative complications.

**Note 17. Post-operative exercise therapy following joint replacement for osteoarthritis of the knee****Clinical question****Is exercise therapy recommended after joint replacement surgery for knee osteoarthritis?**

This clinical question was answered by means of a systematic literature study. The conclusion is based on seven RCTs.[2-8]

**Conclusion from the literature study**

Measure of outcome 'physical functioning' (patient-reported outcomes). Exercise therapy applied during the post-operative phase for patients who have undergone joint replacement surgery for knee osteoarthritis has a minor effect on physical functioning compared to no exercise therapy in the post-operative phase. The quality of the evidence is high.

**From evidence to recommendation**

There is evidence of high quality to suggest that exercise therapy is effective in improving physical functioning (minor effect). Based on the high probability of only a minor effect, the limited side effects and the likely acceptability of exercise therapy, the working group is of the opinion that the intervention can be considered for specific patients ("consider implementation").

**Recommendation**

Consider exercise therapy in the post-operative phase if the patient has an increased risk of delayed recovery and/or if complications occur following joint replacement for osteoarthritis of the knee. Follow the FITT principles.

Consider limiting exercise therapy in the post-operative phase to teaching (and monitoring the execution) of exercises that the patient will perform independently, if the risk of delayed post-operative recovery is not elevated and there are no post-operative complications.

**Note 18. FITT principles****Frequency****Clinical question**

**Which frequency (number of sessions per week) of exercise therapy is recommended for the treatment of people with osteoarthritis of the hip and/or knee?**

This clinical question was answered by using the previously included systematic literature study about the effectiveness of exercise therapy in the conservative phase of hip and knee osteoarthritis.[1]

**Conclusion from the literature study**

In studies of hip and/or knee osteoarthritis, supervised exercise therapy was offered 1 to 3 times per week (median: 1 time per week), with a session lasting 30–90 minutes (median: 60 minutes). It is not yet clear which frequency of exercise therapy is the most effective for people with osteoarthritis of the hip and/or knee, but the effect estimates of exercise therapy on physical functioning appear to be greater as the frequency (sessions per week) increases, for both hip and knee osteoarthritis.

**Other considerations**

The *American College of Sports Medicine* (ACSM) recommends the following minimum training frequency specifically for people with rheumatic disorders:[1]

- at least 2–3 days per week of muscle strengthening exercises
- at least 5 days per week of aerobic exercises lasting at least 30 minutes per session.

The Dutch Health Council recommends the following training frequency for adults and elderly:[2]

- 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.

**Recommendation**

Apply exercise therapy according to the described principles regarding frequency. Refer to section C.2.5 in the *Practice Guideline*.

**Intensity****Clinical question**

**Which intensity of exercise therapy is recommended for the treatment of people with osteoarthritis of the hip and/or knee?**

This clinical question was answered by means of a systematic literature study. The conclusion is based on two RCTs.[2,3]

**Conclusion from the literature study**

It is not yet clear which intensity of exercise therapy is the most effective for people with osteoarthritis of the hip and/or knee. Both low-to-moderate intensity and high intensity exercise therapy are effective at improving physical functioning in people with knee osteoarthritis, with high intensity exercise therapy appearing to have no greater effect on physical functioning in people with knee osteoarthritis than low-to-moderate intensity exercise therapy. This is not yet clear for people with hip osteoarthritis.

**Other considerations**

Although the scientific evidence relates to knee osteoarthritis only, the working group is of the opinion that these conclusions can also be adopted for hip osteoarthritis.

The ACSM recommends the following minimum training intensity specifically for people with rheumatic disorders: at least 60–80% of 1RM (or 50–60% of 1 RM for people who are not used to strength training), with 2–4 sets of 8–15 repetitions and 30–60 second breaks between sets for muscle strengthening exercises; at least 60% of the maximum heart rate (or 40–60% of the maximum heart rate for people not used to aerobic exercise) for aerobic exercises. In addition, the ACSM has described a number of general training principles for people with osteoarthritis of the hip and/or knee.[4]

#### **Recommendation**

Apply exercise therapy according to the described principles regarding intensity. Refer to section C.2.5 in the *Practice Guideline*.

### **Type**

#### **Clinical question**

**Which type (of exercises) of exercise therapy is recommended for the treatment of people with osteoarthritis of the hip and/or knee?**

This clinical question was answered by means of a systematic literature study. The conclusion is based on the most recent systematic review.[5]

#### **Conclusion from the literature study**

It is still unclear which (combination of) type of exercise therapy is most effective for people with osteoarthritis of the hip and/or knee. Exercise therapy aimed at improving muscle strength, aerobic capacity or functional activities (including walking, balance and coordination training) and combinations of these are all effective at improving physical functioning in people with knee osteoarthritis. Exercise therapy that primarily focuses (>75% of the treatment time) on one type of training (muscle strength or aerobic training) during one treatment session may be more effective than exercise therapy that focuses on several types of training within one treatment session.

#### **Other considerations**

Although the scientific evidence relates to knee osteoarthritis only, the working group is of the opinion that these conclusions can also be adopted for hip osteoarthritis.

The ACSM specifically recommends range-of-motion exercises for people with rheumatic conditions.[6] Westby et al. provide recommendations about the type of exercise therapy that can be used for patients in the pre-operative and post-operative phase of joint replacement surgery of the hip and/or knee.[7]

#### **Recommendation**

Apply exercise therapy according to the described principles regarding type of exercise. Refer to section C.2.5 in the *Practice Guideline*.

### **Time duration**

#### **Clinical question**

**Which time duration (weeks) of exercise therapy is recommended for the treatment of people with osteoarthritis of the hip and/or knee?**

This clinical question was answered by using the previously included systematic literature study about the effectiveness of exercise therapy in the conservative phase of hip and knee osteoarthritis.[1]

#### **Conclusion from the literature study**

The majority of the studies in the report by Verhagen et al. had an exercise therapy duration of 8 to 12 weeks. It is not yet clear which duration of exercise therapy is the most effective for people with osteoarthritis of the hip and/or knee. Short-term exercise therapy (up to 12 weeks) is effective at improving physical functioning of people with osteoarthritis of the hip and/or knee. The benefits of prolonged exercise therapy (longer than 12 weeks) on physical functioning of people with osteoarthritis of the hip and/or knee have not been studied in enough detail to draw any conclusions about this. The benefits of exercise therapy may be conserved more effectively for the longer term by offering additional return sessions in the follow-up period after completion of the treatment.[1]



**Recommendation**

Apply exercise therapy according to the described principles regarding duration. Refer to section C.2.5 in the *Practice Guideline*.

**Note 19. Modifications of exercise therapy in the presence of co-morbidity****Clinical question**

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

This clinical question was answered by means of a systematic literature study. The conclusion is based on three RCTs.[1-3]

**Conclusion from the literature study**

Exercise therapy in which modifications are introduced in a systematic manner (according to the COOA protocol) for people with knee osteoarthritis in combination with a co-morbidity (namely heart failure / coronary artery disease, COPD, diabetes mellitus type II, hypertension, obesity) that has an effect on physical functioning is effective with regard to the physical functioning and safe compared to standard care. The quality of the evidence is low.

**Other considerations**

- Patients with osteoarthritis of the hip and/or knee regularly present in daily practice with a combination of one or more forms of co-morbidity, a situation that can affect the exercise therapy. In order to achieve an optimum treatment result, it is important to take into consideration not only the osteoarthritis, but also the co-morbidity during the active exercise therapy.
- If a certain form of co-morbidity is present that inhibits the physical functioning, then the treating therapist should – in addition to knowledge and skills relating to osteoarthritis – also have sufficient knowledge and skills about how to take this co-morbidity into consideration during the treatment. If the treating therapist does not have the required knowledge and skills to a sufficient extent, then the therapist should refer the patient to a therapist who does have this knowledge and skills.

**Recommendation**

- If there are absolute contra-indications for exercise therapy related to co-morbidity, then do not offer exercise therapy and refer the patient back to the general practitioner or specialist (examples of contra-indications are listed in section B.5.1).
- If no absolute contra-indications related to co-morbidity are present, but the patient does have a co-morbidity, then it is important to assess to what extent this co-morbidity affects the patient's physical functioning and the exercise therapy.
- If the co-morbidity has an effect on the physical functioning and the implementation of the exercise therapy (such as unstable diabetes mellitus type II that is hard to control with medication), then exercise therapy should be implemented with modifications specific to the co-morbidity. The COOA protocol, for example, can be used. This is a protocol that takes into consideration the safety regarding a co-morbidity.
- If the co-morbidity has no or only a small effect on the physical functioning and the implementation of the exercise therapy (such as a cardiac arrhythmia that is properly controlled with medication), then exercise therapy should be implemented with the general FITT principles applied as a starting point.

The restrictions and modifications of exercise therapy for people with osteoarthritis of the hip and/or knee and a co-morbidity are listed in Table 19.1.

Table 19.1. Restrictions and modifications of exercise therapy for people with osteoarthritis of the hip and/or knee and co-morbidity.[1]

<b>Cardiac problems</b>	
<b>Restrictions</b>	<b>Modifications</b>
<ul style="list-style-type: none"> <li>Chest pains prior to or during exercise therapy.</li> </ul>	<ul style="list-style-type: none"> <li>Postpone the exercise therapy. Ask the patient to sit on a chair and wait for the chest pains to subside. If the chest pains have not subsided within 5 minutes: ask the patient whether he/she uses nitrospray. If yes, use the spray. If the chest pains do not subside, consult the specialist.</li> </ul>
<ul style="list-style-type: none"> <li>Cardiac arrhythmias during exercise (fast heart rate that is not proportional to the level of exertion, irregular heart rate, changes in existing cardiac arrhythmias), abnormal changes in blood pressure during exertion during the exercise (diastolic change <math>\geq</math> 20 mmHg), decrease in systolic blood pressure during the exercise (<math>&gt;</math> 10 mmHg), fainting, dizziness, vegetative reactions (e.g. excessive sweating, pallor), shortness of breath that is not proportional to the exertion, abnormal fatigue that is not proportional to the exertion.</li> </ul>	<ul style="list-style-type: none"> <li>Postpone the exercise therapy, ask the patient to sit on a chair and consult with the specialist about further actions.</li> </ul>
<ul style="list-style-type: none"> <li>Insufficient knowledge about the cardiac condition and options for exertion / exercise therapy</li> </ul>	<ul style="list-style-type: none"> <li>Provide information about the cardiac condition and options for exertion.</li> </ul>
<ul style="list-style-type: none"> <li>Fear of exertion</li> </ul>	<ul style="list-style-type: none"> <li>Coach the patient about gaining confidence (allow the patient to have positive exercise experiences by – for example – starting at a low training intensity and providing positive, constructive criticism).</li> </ul>
<b>Extra for heart failure</b>	
<b>Restrictions</b>	<b>Modifications</b>
<ul style="list-style-type: none"> <li>Symptoms of deterioration: increasing (unexpected) shortness of breath, increasing or developing symptoms of AP, unexpected increase in weight (more than 2 kg in 2–3 days) or visible fluid retention (e.g. belt buckle needs to be loosened, shoes feel tighter), increasing fatigue during familiar activities, persistent or recurrent dizziness or collapse, agitation or cognitive changes or confusion, palpitations, problems sleeping as a result of nocturnal shortness of breath, sudden unexplained problems with mobility, abdominal pain or feeling full, loss of appetite, needing to urinate more often, less during the day than at night, has elevated the bed or is using extra pillows.</li> </ul>	<ul style="list-style-type: none"> <li>Postpone the exercise therapy. Contact the treating physician and/or heart failure nurse.</li> </ul>

Table 19.1. Restrictions and modifications of exercise therapy for people with osteoarthritis of the hip and/or knee and co-morbidity.[1] (continued)

Extra for heart failure	
Restrictions	Modifications
<ul style="list-style-type: none"> <li>Left ventricular ejection fraction &lt; 30%</li> </ul>	<ul style="list-style-type: none"> <li>For patients of NYHA class 2 or 3, check on the first few occasions whether the patient is having a good or a bad day, check the resting heart rate and respiratory rate before the training (exclusion criteria for training: Resting HR &gt; 100 bpm, respiratory rate &gt; 30 per minute; shortness of breath whilst talking).</li> <li>Extend the warming-up and cooling down sessions to reduce the risk of cardiac decompensation.</li> <li>Be careful when performing Valsalva manoeuvres and changes in body position – such as from lying down to standing position – due to the patient's reduced capacity to regulate blood pressure.</li> <li>Caution is advised for exercises with a high static load, due to a rapid increase in blood pressure during exertion.</li> <li>Start at a lower training intensity and consider high intensity interval training (HIIT).</li> <li>Avoid any rapid increase in peripheral resistance training for patients with heart failure, as this increases the afterload and the risk of decompensation. To improve muscle strength, start at 30–40% of 1RM for 2 weeks and then gradually increase the resistance from 50% to 70% to 80% of 1RM.</li> </ul>
<ul style="list-style-type: none"> <li>NYHA class 3</li> </ul>	<ul style="list-style-type: none"> <li>Start with peripheral resistance training in order to reduce the peripheral blood pressure and cardiac strain during aerobic training.</li> </ul>
<ul style="list-style-type: none"> <li>Reduced ability to recover</li> </ul>	<ul style="list-style-type: none"> <li>Monitor the recovery after the training. The patient must be able to resume normal daily activities within 3–4 hours after training. If the patient has a reduced recovery, lower the training intensity.</li> </ul>
<ul style="list-style-type: none"> <li>Fatigue</li> </ul>	<ul style="list-style-type: none"> <li>Patients with heart failure have a limited amount of energy. It is important to avoid severe fatigue (primarily NYHA class 3).</li> </ul>
General modifications	
<ul style="list-style-type: none"> <li>If present, use the results of the “maximum of symptom limited exercise test” in order to determine the training intensity for patients with cardiac problems. If the patient is using beta blockers, the training intensity should be determined based on results of this test with the use of beta blockers.</li> <li>If there are no test results for an exertion test, then use the Shuttle Walking Test (SWT) and/or the Six Minute Walking Test (6MINWT). The optimum training intensity can be determined by using the Karvonen formula.</li> <li>Train at an intensity of 40–50% of <math>VO_{2max}</math> for the first 2 weeks and gradually increase this to 50–80% of <math>VO_{2max}</math> or <math>VO_{2reserve}</math>. Patients with a <math>VO_{2max} &lt; 10.5</math> mL/kg/min (3 MET/25 to 50 W) appear to benefit most from very short, but frequent training sessions.</li> <li>If the <math>VO_{2max} &gt; 10.5</math> mL/kg/min but less than 17.5 mL/kg/min (3–5 MET/40 to 80 W), then the frequency of the training sessions can be reduced to 1 or 2 training sessions per day lasting 15 minutes. Patients with a <math>VO_{2max} &gt; 17</math> mL/kg/min can perform 2–3 training sessions per week, lasting 20–30 minutes per session.</li> <li>Base the training intensity on the percentage of the maximum capacity expressed in METs and/or the Borg scale 6–20, if the patient's heart rate does not increase adequately during exertion during a “maximum of symptom limited exercise test” [4].</li> <li>Start with a good, gentle warming-up and cooling down to reduce the risk of cardiac strain. This will also reduce the risk of myocardial ischaemia.</li> <li>Start with interval training and not with endurance training for cardiac patients with a low capacity for exercise. Perform dynamic exercises instead of static exercises, to avoid increases in blood pressure.</li> <li>Patients with an implantable cardioverter-defibrillator (ICD) should not raise their arms above 90 degrees.</li> <li>During and after the intervention, it is important that the therapist watches for signs of cardiac strain.</li> </ul>	

Table 19.1. Restrictions and modifications of exercise therapy for people with osteoarthritis of the hip and/or knee and co-morbidity.[1] (continued)

General modifications	
<ul style="list-style-type: none"> <li>Weight loss is not routinely recommended for patients with moderate or severe heart failure who are overweight, in order to prevent further progression of heart failure, unintended weight loss and cachexia.</li> </ul>	
Diabetes mellitus type II	
Restrictions	Modifications
<ul style="list-style-type: none"> <li>Use of medication that elevates the blood insulin concentration (insulin-dependent patients)</li> </ul>	<ul style="list-style-type: none"> <li>Measure the blood glucose values of insulin-dependent diabetes patients before and after the training session and in the evening. These patients are at increased risk of hypoglycaemia 24–72 hours after the exertion (complete a diabetes diary).</li> <li>Reduce medication / insulin therapy in the case of a low blood glucose concentration (&lt; 4.2 mmol/L, &lt; 75 mg/dL) or symptoms of hypoglycaemia before the training.</li> <li>Increase the consumption of carbohydrates in the case of a low blood glucose concentration (&lt; 5.5 mmol/L, 100 mg/dL) or symptoms of hypoglycaemia before the training.</li> <li>Modify the training modalities (reduce the total training load in the case of a low blood glucose concentration or symptoms of hypoglycaemia).</li> <li>Postpone the training session in the case of blood glucose values <math>\leq 5</math> and <math>\geq 15</math> mmol/L or signs of hypoglycaemia. Regulation of the blood glucose concentration is essential: use a medication diary.</li> <li>Administer insulin more than 1 hour before the exercise. Do not administer near a muscle that will be used in exercise.</li> <li>Ask the patient to consume enough carbohydrates before the start of the training.</li> <li>The dose of insulin will change with regular exercise (ask the patient to discuss this with the diabetes nurse).</li> </ul>
<ul style="list-style-type: none"> <li>Poorly regulated diabetes. This situation is characterised by a high (&gt; 53 mmol/mol) HbA1c or a strongly fluctuating blood glucose concentration (high or low) and frequent hypoglycaemia.</li> </ul>	<ul style="list-style-type: none"> <li>Consult with the medical specialist (internist) about use of medication (type, dose) and physical activity.</li> <li>Monitor the blood glucose values before and after the training session and in the evening.</li> <li>Be aware of the symptoms of hypoglycaemia/hyperglycaemia and complications as a result of diabetes.</li> </ul>
<ul style="list-style-type: none"> <li>Delayed wound recovery</li> </ul>	<ul style="list-style-type: none"> <li>Start with a low training intensity and increase gradually.</li> </ul>
<ul style="list-style-type: none"> <li>Foot ulcer (for example, as a result of peripheral neuropathy)</li> </ul>	<ul style="list-style-type: none"> <li>Avoid weight-bearing exercises if the patient has wounds on the feet.</li> <li>Consult the diabetes nurse or podiatrist if foot care is required.</li> </ul>
<ul style="list-style-type: none"> <li>Loss of sensation (for example, as a result of peripheral neuropathy)</li> </ul>	<ul style="list-style-type: none"> <li>Be cautious with exercises that require tactile feedback (e.g. balance) and consider adding exercises on machines (patients can experience problems with sensation, for example holding dumbbells, with the risk that they might drop them).</li> <li>Avoid hypertension (systolic blood pressure &gt; 180 mmHg) during the exercise.</li> <li>Avoid high intensity training (&gt; 80% of the maximum oxygen consumption (<math>VO_{2max}</math>) and Valsalva manoeuvres).</li> </ul>
<ul style="list-style-type: none"> <li>Nephropathy</li> </ul>	<ul style="list-style-type: none"> <li>Avoid hypertension (systolic blood pressure &gt; 180 mmHg) during the exercise.</li> </ul>
<ul style="list-style-type: none"> <li>Retinopathy</li> </ul>	<ul style="list-style-type: none"> <li>Avoid high intensity training (&gt; 80% of the maximum oxygen consumption (<math>VO_{2max}</math>) and Valsalva manoeuvres).</li> </ul>

Table 19.1. Restrictions and modifications of exercise therapy for people with osteoarthritis of the hip and/or knee and co-morbidity.[1] (continued)

<b>Diabetes mellitus type II</b>	
<b>Restrictions</b>	<b>Modifications</b>
<ul style="list-style-type: none"> <li>Autonomous neuropathy with a reduced cardiovascular response to exertion, reaction to fluid regulation, thermoregulation, postural hypotension and/or reduced maximum aerobic capacity.</li> </ul>	<ul style="list-style-type: none"> <li>Regularly check the patient's heart rate and blood pressure at rest and during the exercise.</li> </ul>
<ul style="list-style-type: none"> <li>Inadequate knowledge of diabetes, medication and training</li> </ul>	<ul style="list-style-type: none"> <li>Provide information about diabetes and training options.</li> </ul>
<ul style="list-style-type: none"> <li>Fear of exertion</li> </ul>	<ul style="list-style-type: none"> <li>Coach the patient about gaining confidence, for example consider starting at a low training intensity, and provide positive feedback.</li> </ul>
<b>General modifications</b>	
<ul style="list-style-type: none"> <li>Ensure adequate hydration and consumption of carbohydrates before the training session.</li> <li>Regularly check patients with diabetes mellitus type 2 for wounds on the feet and sensory deficits.</li> <li>Check training footwear.</li> <li>Start with interval training and not with endurance training for patients with a low capacity for exercise.</li> <li>In case of fever: postpone the training session until the body temperature has normalised.</li> <li>Consult a physician if any conditions develop or become worse that could be related to diabetes, such as hypertension, angina pectoris, cardiac arrhythmias, tachycardia at rest, intermittent claudication, fasting hyperglycaemia, frequent episodes of hypoglycaemia, wounds on the lower limbs, cachexia, autonomous neuropathy or vision problems.</li> </ul>	
<b>COPD</b>	
<b>Restrictions</b>	<b>Modifications</b>
<ul style="list-style-type: none"> <li>Peripheral muscle atrophy and muscle weakness</li> </ul>	<ul style="list-style-type: none"> <li>Pay extra attention to strength training.</li> </ul>
<ul style="list-style-type: none"> <li>Reduced respiratory muscle function</li> </ul>	<ul style="list-style-type: none"> <li>Add inhalatory muscle training (IMT) if respiratory muscle weakness is present (or consider referring to a specialised COPD therapist).</li> </ul>
<ul style="list-style-type: none"> <li>Inadequate control of breathing and coughing techniques</li> </ul>	<ul style="list-style-type: none"> <li>Teach the patient coughing techniques / huffing techniques and add breathing exercises, depending on the severity and the causes of obstruction. Provide advice and exercises aimed at improving posture and breathing if hyperinflation is present. Breathing exercises aimed at reducing the (dynamic) hyperinflation and improving gas exchange: pursed lip breathing (PLB), slow and deep breathing and active exhalation.</li> </ul>
<ul style="list-style-type: none"> <li>Worsening of the disease (flare-up)</li> </ul>	<ul style="list-style-type: none"> <li>Interval training and strength training can be used to reactivate the patient.</li> </ul>
<ul style="list-style-type: none"> <li>Severe shortness of breath</li> </ul>	<ul style="list-style-type: none"> <li>Based on the evaluation of the limiting factor in performing the exercise:               <ul style="list-style-type: none"> <li>Reduce the training intensity or consider interval training and strength training.</li> <li>Strength training should be performed for both the upper and lower extremities, with an intensity of at least 60–80% of 1 RM.</li> <li>2–3 sets of 8–12 repetitions per muscle group are preferable.</li> <li>Consider breathing exercises and exercises aimed at posture.</li> </ul> </li> </ul>
<ul style="list-style-type: none"> <li>Inadequate knowledge of the use of medication combined with exertion</li> </ul>	<ul style="list-style-type: none"> <li>Provide information about the disease, training options and use of medication.</li> </ul>
<ul style="list-style-type: none"> <li>Fear of exertion / fear of shortness of breath</li> </ul>	<ul style="list-style-type: none"> <li>Coach the patient about gaining confidence; i.e. consider starting at a lower training intensity and provide positive feedback.</li> <li>Coach the patient about reducing the fear of exertion caused by shortness of breath.</li> </ul>

Table 19.1. Restrictions and modifications of exercise therapy for people with osteoarthritis of the hip and/or knee and co-morbidity.[1] (continued)

<b>COPD</b>	
<b>General modifications</b>	
<ul style="list-style-type: none"> <li>• Use the results of a symptom-limited exertion test with gas analysis to calculate the individual aerobic training intensity.</li> <li>• Begin with interval training for patients with COPD with a limited lung function or reduced oxygen transport in the lungs (hypoxaemic (saturation &lt; 90%) hypocapnic (<math>P_{aCO_2} &gt; 55</math> mmHg) during the training). Start endurance training when patient is able to walk at 70% of the maximum watt level for at least 10 minutes.</li> <li>• Use the Borg scale (0-10) for dyspnoea, to be measured during the exercise. A figure for shortness of breath between 4 and 6 on a scale of 0-10 is the recommended training intensity.</li> <li>• Check the saturation level: <math>O_2</math> saturation (<math>SaO_2</math>) must remain at <math>\geq 90\%</math> during the training and must not decrease by 4% or more.</li> <li>• Many COPD patients are underweight, be aware of their poor nutritional status.</li> </ul>	
<b>Hypertension</b>	
<b>Restrictions</b>	<b>Modifications</b>
<ul style="list-style-type: none"> <li>• With an increased risk of high blood pressure, particularly in the case of left ventricular hypertrophy</li> <li>• Abnormal changes in the blood pressure with exertion during the exercise (diastolic change <math>\geq 20</math> mmHg); reduction of the systolic blood pressure during exertion (<math>&gt; 10</math> mmHg)</li> </ul>	<ul style="list-style-type: none"> <li>• If the plan is to have the patient exercise at a moderate to high intensity (<math>40-60\% \dot{V}O_{2max}</math>), then request a stress test first.</li> <li>• Postpone the exercise session and refer the patient to the GP or medical specialist.</li> </ul>
<b>General modifications</b>	
<ul style="list-style-type: none"> <li>• Be aware that medicines that lower blood pressure, such as beta blockers, can have a negative effect on the maximum exertion tolerance and can reduce the heart rate during exertion. A reduction in trainability and resulting reduced training effects are only observed in patients with high blood pressure (who use beta blockers only to reduce their blood pressure and not due to angina pectoris or arrhythmias).</li> <li>• Beta blockers and diuretics can have a negative effect on thermoregulation.</li> <li>• If the blood pressure is elevated: consult with the general practitioner. If the blood pressure remains elevated despite medication: avoid high intensity strength training.</li> </ul>	
<b>Obesity</b>	
<b>Restrictions</b>	<b>Modifications</b>
<ul style="list-style-type: none"> <li>• Increased stress, pressure and pain in the weight-bearing joint</li> <li>• Poor thermoregulation during exertion</li> <li>• Shortness of breath</li> <li>• Fear of movement</li> <li>• Lack of motivation for weight loss</li> </ul>	<ul style="list-style-type: none"> <li>• Reduce weight-bearing exercises if pain in the knee increases. Consider temporary hydrotherapy.</li> <li>• Reduce the training intensity in warm weather.</li> <li>• Reduce the training intensity, consider interval training.</li> <li>• Coach the patient about gaining confidence; i.e. consider starting at a lower training intensity and provide positive feedback.</li> <li>• Provide education about weight loss and pain relief. Encourage and coach the patient in making behavioural changes.</li> </ul>
<b>General modifications</b>	
<ul style="list-style-type: none"> <li>• Provide education about weight loss and pain relief.</li> <li>• Encourage the patient to lose weight and/or refer the patient to a dietician.</li> </ul>	

**Note 20. Modifications of exercise therapy in the case of inadequate pain coping****Clinical question**

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

This clinical question was answered by means of a systematic literature study. The conclusion is based on two RCTs.[1,2]

**Conclusion from the literature study**

Measure of outcome 'physical functioning' (patient-reported outcomes). The literature shows positive effects of exercise therapy in combination with pain education and training of pain coping in patients with knee osteoarthritis, compared to exercise therapy alone or pain education and training of pain coping alone. The quality of the evidence is moderate.

**Other considerations**

- Some patients with osteoarthritis of the hip and/or knee exhibit an inadequate pain coping style, which can have an adverse effect on the expected results of active exercise therapy. It is therefore important for an optimum treatment result that these patients – in addition to regular exercise therapy – also receive guidance about how to cope with the pain.
- The included studies have demonstrated the added value of pain education and training of pain coping, in addition to exercise therapy, in a general patient population with osteoarthritis of the knee, in other words not specifically in patients with inadequate pain coping. However, partly due to the demonstrated added value on psychological measures of outcome such as pain coping, catastrophizing, self-efficacy, depression and anxiety, it can be considered plausible that these additional interventions should be considered particularly for patients with inadequate pain coping.
- If a patient has inadequate pain coping, then – in addition to knowledge and skills relating to osteoarthritis – the treating therapist must also have sufficient knowledge and skills to determine how the treatment of hip and/or knee osteoarthritis can be combined with offering pain education and training of pain coping skills. If the treating therapist does not have the required knowledge and skills to a sufficient extent, then the therapist should refer the patient to a therapist who does have this knowledge and skills.

**Recommendation**

For patients with osteoarthritis of the hip and/or knee and inadequate pain coping (e.g. fear of movement, passive coping style, pain catastrophizing, low self-efficacy, anxiety, depression), consider applying the exercise therapy according to a time contingent approach (*graded activity*) and combining it with pain education and training of pain coping skills.

**Note 21. General considerations for recommendations regarding non-exercise therapy 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 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****Clinical question**

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

This clinical question was answered by means of a systematic literature study. The conclusion is based on two RCTs.[2,3]

**Conclusion from the literature study**

Measure of outcome 'physical functioning' (patient-reported outcomes). Massage therapy (30-60 minutes weekly or fortnightly) – in addition to exercise therapy intervention – does have a small effect on the physical functioning of people with knee osteoarthritis, compared to exercise therapy in which no massage therapy is offered. The quality of the evidence is very low. In addition, there also appears to be an effect on pain. The effect of massage therapy on people with hip osteoarthritis is not known.

**From evidence to recommendation**

There is evidence of a very low quality that suggests that massage – in addition to exercise therapy – may be effective in improving physical functioning (small effect) and reducing pain. Based on the large uncertainty concerning the effect, the duration of the intervention that was examined (30-60 minutes) and the expected negligible added value of the intervention over standard care (i.e. exercise therapy and education/advice) on the one hand and the value that some patients may attach to this intervention and the potential effect on pain (thereby possibly supporting the exercise therapy) on the other hand, the working group is of the opinion that the intervention should be conditionally discouraged for both hip and knee osteoarthritis ("preferably do not offer").

**Recommendation**

Preferably do not offer massage therapy to patients with hip or knee osteoarthritis.

**Note 23. TENS****Clinical question**

**Is treatment with transcutaneous electrical nerve stimulation (TENS) recommended for patients with osteoarthritis of the hip and/or knee in order to improve their physical functioning?**

This clinical question was answered by means of a systematic literature study. The conclusion is based on two RCTs.[2,3]

**Conclusion from the literature study**

Measure of outcome 'physical functioning' (patient-reported outcomes). There is no effect of treatment with TENS on the physical functioning of people with knee osteoarthritis compared to no treatment with TENS. The quality of the evidence is very low. There is also no effect of treatment with TENS in addition to the exercise therapy intervention on the physical functioning of people with knee osteoarthritis compared to exercise therapy where no treatment with TENS is offered. The quality of the evidence is very low. However, there does appear to be an effect of TENS on pain in people with knee osteoarthritis. The effect of TENS on people with hip osteoarthritis is not known.

**From evidence to recommendation**

There is evidence of a very low quality that suggests that TENS may not be effective in improving physical functioning, but may be effective in reducing pain. Based on the large uncertainty concerning the effect and the expected negligible added value of the intervention over standard care (i.e. exercise therapy and education/advice) on the one hand and the potential effect on pain (thereby possibly supporting the exercise therapy) on the other hand, the working group is of the opinion that the intervention should be conditionally discouraged for both hip and knee osteoarthritis ("preferably do not offer"). In addition, the working group is of the opinion that the intervention should only be considered as a brief intervention to support the exercise therapy, if the exercise therapy is being hampered by severe pain symptoms.

**Recommendation**

Preferably do not offer treatment with TENS to patients with hip and/or knee osteoarthritis. Consider the use of TENS only as a brief intervention for pain reduction to support the exercise therapy, if the exercise therapy is being hampered by severe pain symptoms.



**Note 24. Continuous passive motion****Clinical 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?**

This clinical question was answered by means of a systematic literature study. The conclusion is based on two RCTs.[2,3]

*Conclusion from the literature study*

Measure of outcome 'physical functioning' (patient-reported outcomes). CPM therapy possibly has a small effect after joint replacement surgery for knee osteoarthritis, compared to physiotherapeutic care in which no CPM therapy is offered. The quality of the evidence is very low. The effect of CPM therapy on people following joint replacement surgery for hip osteoarthritis is not known.

*From evidence to recommendation*

There is evidence of a very low quality that suggests that CPM after joint replacement surgery may be effective in improving physical functioning (small effect). Based on the large uncertainty concerning the effect and the expected negligible added value of the intervention over standard care (i.e. exercise therapy and education/advice), the working group is of the opinion that the intervention should be strongly discouraged after joint replacement surgery for both hip and knee osteoarthritis ("do not offer the intervention").

*Recommendation*

Do not offer continuous passive motion (CPM) therapy to patients following joint replacement surgery for hip and/or knee osteoarthritis.

**Note 25. Electromagnetic field****Clinical 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?**

This clinical question was answered by means of a systematic literature study. The conclusion is based on two RCTs.[2,3]

*Conclusion from the literature study*

Measure of outcome 'physical functioning' (patient-reported outcomes). An electromagnetic field possibly has a small effect on the physical functioning of people with knee osteoarthritis, compared to no treatment with an electromagnetic field. The quality of the evidence is very low. The effect of treatment with an electromagnetic field on people with hip osteoarthritis is not known.

*From evidence to recommendation*

There is evidence of a very low quality that suggests that treatment with an electromagnetic field may be effective in improving physical functioning (small effect). Based on the large uncertainty concerning the effect and the expected negligible added value of the intervention over standard care (i.e. exercise therapy and education/advice), the working group is of the opinion that the intervention should be strongly discouraged for both hip and knee osteoarthritis ("do not offer the intervention").

*Recommendation*

Do not offer treatment with an electromagnetic field to patients with osteoarthritis of the hip or knee.

**Note 26. Low level laser therapy****Clinical 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?**

This clinical question was answered by means of a systematic literature study. The conclusion is based on three RCTs.[2-4]

**Conclusion from the literature study**

Measure of outcome 'physical functioning' (patient-reported outcomes): There is no effect of treatment with LLLT on the physical functioning of people with knee osteoarthritis compared to no treatment with LLLT. The quality of the evidence is very low. LLLT in addition to exercise therapy intervention possibly has a small effect on the physical functioning of people with knee osteoarthritis, compared to exercise therapy offered without LLLT. The quality of the evidence is very low. The effect of treatment with LLLT on people with hip osteoarthritis is not known.

**From evidence to recommendation**

There is evidence of a very low quality that suggests that treatment with LLLT may not be effective in improving physical functioning. There is evidence of a very low quality that suggests that treatment with LLLT as an addition to exercise therapy may be effective in improving physical functioning (small effect). Based on the large uncertainty concerning the effect and the expected negligible added value of the intervention over standard care (i.e. exercise therapy and education/advice), the working group is of the opinion that the intervention should be strongly discouraged for both hip and knee osteoarthritis ("do not offer the intervention").

**Recommendation**

Do not offer treatment with low level laser therapy to patients with osteoarthritis of the hip or knee.

**Note 27. Passive mobilisations****Clinical question**

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

This clinical question was answered by means of a systematic literature study. The conclusion is based on one RCT.[2]

**Conclusion from the literature study**

Measure of outcome 'physical functioning' (patient-reported outcomes). There is no effect of treatment with passive mobilisations in addition to the exercise therapy intervention on the physical functioning of people with hip osteoarthritis compared to exercise therapy where no passive mobilisations are offered. The quality of the evidence is low. The effect of passive mobilisations on people with knee osteoarthritis is not known.

**From evidence to recommendation**

There is evidence of a low quality that suggests that passive mobilisations as an addition to exercise therapy may not be effective in improving physical functioning. Based on the large uncertainty concerning the effect and the expected negligible added value of the intervention over standard care (i.e. exercise therapy and education/advice), the working group is of the opinion that the intervention should be strongly discouraged for both hip and knee osteoarthritis ("do not offer the intervention").

**Recommendation**

Do not offer treatment with passive mobilisations to patients with osteoarthritis of the hip and/or knee.

\* The working group specifically 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.

**Note 28. Shock wave****Clinical question**

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

This clinical question was answered by means of a systematic literature study. The conclusion is based on three RCTs.[1-3]

**Conclusion from the literature study**

Measure of outcome 'physical functioning' (patient-reported outcomes). The effect of treatment with shock wave, compared to no shock wave, on the physical functioning of people with knee osteoarthritis is uncertain. The quality of the evidence is very low. The effectiveness of shock wave therapy on people with hip osteoarthritis is not known.

*From evidence to recommendation*

There is contradicting evidence of very low quality to support the effect of shock wave on improvements in physical functioning. Based on the large uncertainty concerning the effect and the expected negligible added value of the intervention over standard care (i.e. exercise therapy and education/advice), the working group is of the opinion that the intervention should be strongly discouraged for both hip and knee osteoarthritis ("do not offer the intervention").

*Recommendation*

Do not offer treatment with shock wave to patients with osteoarthritis of the hip or knee.

**Note 29. Taping***Clinical question*

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

This clinical question was answered by means of a systematic literature study. The conclusion is based on three RCTs.[1-3]

*Conclusion from the literature study*

Measure of outcome 'physical functioning' (patient-reported outcomes). There is potentially no effect of treatment using taping on the physical functioning of people with knee osteoarthritis, compared to no treatment with taping. The quality of the evidence is low. In addition, there also appears to be no effect of taping on pain. The effect of taping on people with hip osteoarthritis is not known.

*From evidence to recommendation*

There is evidence of low quality to suggest that taping may not be effective in improving physical functioning. Based on the large uncertainty concerning the effect and the expected negligible added value of the intervention over standard care (i.e. exercise therapy and education/advice), the working group is of the opinion that the intervention should be strongly discouraged for both hip and knee osteoarthritis ("do not offer the intervention").

*Recommendation*

Do not offer treatment with taping to patients with osteoarthritis of the hip and/or knee.

**Note 30. Thermotherapy***Clinical 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?**

This clinical question was answered by means of a systematic literature study. No relevant RCTs could be included.

*Conclusion from the literature study*

Measure of outcome 'physical functioning' (patient-reported outcomes): The effect of thermotherapy (hot or cold therapy) on the physical functioning of people with osteoarthritis of the hip and/or knee is not known.

*From evidence to recommendation*

There is no evidence to support an effect of thermotherapy on the improvement of physical functioning. Based on the lack of literature and the expected negligible added value of the intervention over standard care (i.e. exercise therapy and education/advice), the working group is of the opinion that the intervention should be strongly discouraged for both hip and knee osteoarthritis ("do not offer the intervention").

*Recommendation*

Do not offer thermotherapy to patients with osteoarthritis of the hip and/or knee to improve their physical functioning.

**Note 31. Ultrasound****Clinical question**

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

This clinical question was answered by means of a systematic literature study. The conclusion is based on three RCTs.[1-3]

**Conclusion from the literature study**

Measure of outcome 'physical functioning' (patient-reported outcomes): There is no effect of treatment with ultrasound on the physical functioning of people with knee osteoarthritis compared to no treatment with ultrasound. The quality of the evidence is low. The effect of treatment with ultrasound on people with hip osteoarthritis is not known.

**From evidence to recommendation**

There is evidence of low quality to suggest that ultrasound may not be effective in improving physical functioning. Based on the large uncertainty concerning the effect and the expected negligible added value of the intervention over standard care (i.e. exercise therapy and education/advice), the working group is of the opinion that the intervention should be strongly discouraged for both hip and knee osteoarthritis ("do not offer the intervention").

**Recommendation**

Do not offer treatment with ultrasound to patients with osteoarthritis of the hip or knee.

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