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Chapter 1

General introduction
Many decisions are made in health care. For example when a patient is diagnosed with a certain disease, the patient and health care provider are facing multiple decisions. One of these decisions for some musculoskeletal non-acute conditions, is to choose between non-surgical and surgical treatments. Surgery is then often not the first treatment of choice. Initial treatment includes non-surgical treatments and surgery is only considered if the patient does not respond sufficiently to non-surgical treatment. In the ideal world, all recommended non-surgical treatments for these conditions would be used first and surgery is only performed when non-surgical treatments are not effective enough to reduce the patient’s complaints. However, decision making in daily practice is far more complex and the decision to continue non-surgical treatments or to perform surgery needs to be customized, such as in Mary’s case.

Mary (45) suffers from pain and loss of function due to clinical and radiological osteoarthritis (OA) in her right knee. She is divorced, lives with her two children (8 and 10 years old) in an apartment on the third floor without an elevator. She is not able to work as a cleaning lady anymore. Her supervisor prefers that she receives a total knee arthroplasty (TKA), so that she can go back to work earlier. She is obese (Body Mass Index 37) and her general practitioner (GP) advises her to visit a dietician and a physical therapist to lose weight and exercise, which may reduce her complaints. However, her health insurance company does not cover visits at the dietician or the physical therapist and she cannot afford to pay for these visits herself. She uses painkillers every day, but these do not relieve the pain sufficiently. Her neighbor had a TKA and told her that it relieves the pain and improved his function. Therefore, she asks her GP to refer her to an orthopaedic surgeon for a TKA. The orthopaedic surgeon listens to Mary’s story and finds it difficult to decide. She did not receive all recommended non-surgical treatments as described in guidelines (e.g. physical therapy, dietary advices) and he prefers to follow these guidelines. He also knows that the lifespan of a prosthesis is limited. Mary is only 45 years old and if she reach the average life expectancy it is certain that she needs a revision in the future with less successful outcomes. She tells him that she has no choice and needs a quick solution since she cannot work, climb the stairs to her apartment or take care of her children. If he does not perform the surgery, she will ask his colleague in another hospital to perform the surgery.

Mary’s case shows that there are multiple factors involved in the decision making regarding the choice between different treatments, in this case non-surgical versus surgical treatment. Due to all these different factors, variation in health care may exist, meaning that the provided care differs for patients with similar health problems [1]. Sometimes variation in health care is desirable [1] as a consequence of disease severity,
duration of complaints or preferences of the patient, such as in Mary’s case. In this case the decision to continue non-surgical treatments or to perform surgery care needs to be customized. However, unwarranted practice variation also exists. For example when receiving surgery depends on the patient’s geographical region. Research has shown that patients in regions with a relative high number of medical specialists receive more treatments [2]. Such practice variation is often a sign of suboptimal care [3]. National and international initiatives for reducing practice variation emphasize the importance to search for possible strategies to optimize health care and thereby reduce unwarranted practice variation.

Hip and knee OA and sciatica are both non-acute conditions in which the decision of non-surgical versus surgical treatment is complex. This is not only illustrated by the large practice variation in surgery rates for both conditions across regions in the Netherlands [3,4], but also across different countries. Reduction of practice variation may make health care more efficient, as non-surgical treatment is mostly less costly. This is needed since the demand for care is increasing, parallel with health care costs. Furthermore, both conditions also have a relatively heavy economic burden on the health care macro budget. However, the exact issues being faced regarding non-surgical treatment and surgery are also different between hip and knee OA on the one hand and sciatica on the other hand. These issues determine on their turn how care can be optimized and which strategies are the most suitable.

**Treatment of hip and knee osteoarthritis**

OA is a degenerative joint disease primarily characterized by loss of articular cartilage. It is diagnosed by clinical and radiological examination. However, not all patients with symptoms also have radiological hip or knee OA and not all patients with radiological hip or knee OA have symptoms [5]. In the Netherlands, the prevalence of knee OA was 3.6% (62% females) and 2.1% (63% females) for hip OA in 2011 [6]. Due to the ageing society and obesity, the prevalence of hip and knee OA is still increasing, in parallel with health care costs. This will make the magnitude of the existing issues even larger in the future.

Patients with symptomatic hip or knee OA suffer from pain and loss of function. In the Netherlands, first treatment of these patients is usually provided by the general practitioner (GP) (figure 1). According to the (inter)national evidence based guidelines, the GP will start with non-surgical treatment, including pharmacological options (e.g. the use of acetaminophen, non-steroidal anti-inflammatory drugs (NSAIDs), and corticosteroid injections) and non-pharmacological options (e.g. physical therapy, patient education, and weight loss intervention) [7-11]. These non-surgical treatments aim to prevent progression and reduce symptoms such as joint pain and impairment of functions [11]. As it was shown that non-surgical treatments in hip and knee OA care
are not optimally used in primary care, a stepped-care BART (Beating osteoARThritis) strategy was developed [12,13]. The first step consists of education, lifestyle advice, and acetaminophen. If the treatment options in the first step are not sufficient, treatment options in the second step can be considered (exercise therapy, dietary therapy, and non-steroidal anti-inflammatory drugs). Multidisciplinary care, intra-articular injections, and TENS are treatment options in the third step and could be considered if treatment options in step one or two are ineffective.

Patients are referred to an orthopedic surgeon if they do not respond sufficiently to non-surgical treatment options. Together with the orthopaedic surgeon, the decision will be made to start/continue non-surgical treatments or to perform a surgery depending on previously received treatments and disease severity.

Treatment of sciatica
Sciatica is a common disorder with a prevalence reported from 1.2% up to 43% depending on its definition [14]. Sciatica patients have pain radiating into the leg, but definitions vary widely in terms of pain distribution and/or pain duration. Sciatica is mostly caused by a herniated disc with compression of the nerve root, which gives
radiating leg pain. In the Netherlands, yearly 75,000 persons develop symptoms of sciatica (almost 6 on the 1000 persons) of whom approximately 10,000 are treated surgically [15].

In the Netherlands, sciatica patients are initially diagnosed by GPs and advised to continue daily activities with or without physical therapy (non-surgical treatment) (figure 2). Seventy percent of patients with sciatica spontaneously recover in the first 6–8 weeks or with non-surgical treatments [16]. Non-surgical treatment for sciatica is focused at pain reduction and consists of analgesics such as NSAIDs and physical therapy and the advice to stay active until spontaneous recovery from sciatica occurs. Other treatments that are not supported by high quality evidence or clinical guidelines but (widely) used are spinal manipulation, transcutaneous electrical nerve stimulation (TENS), acupuncture and epidural injections of glucorticoids. The Dutch sciatica guideline advises that in the first 6–8 weeks surgery is only an option when a patient suffers from severe neurologic symptoms. After these 6–8 weeks the Dutch multidisciplinary sciatica guideline recommends that the team of professionals involved in sciatica care and patients jointly decide about treatment, i.e., surgery or prolonged non-surgical treatment, based on the evidence regarding associated risks and benefits and preference of the patient (i.e. shared decision making (SDM)) [17].

Figure 2. Care trajectory and shared decision making (SDM) in sciatica
The neurologist evaluates the presence of a radicular pain syndrome and may order an MRI to visualize the affected spinal nerve(s) and to judge possible compression. If the MRI confirms a nerve compressing herniated disc, a surgical intervention can be considered. During surgery the disc herniation is removed. A large, randomized clinical trial showed no significant difference in clinical outcomes between non-surgical treatment and surgery after 1 and 2 years in patients with sciatica [18]. Other, low quality studies showed conflicting results [19]. However, surgery leads to more rapid relief from the pain, whereas non-surgical treatment is less invasive [18] but takes patients longer to recover. Furthermore, surgery is more costly but cost-effective because of the rapid relief from the pain [20]. It is unclear whether delaying surgery reduces the chance of full recovery or that this delay gives sciatica time to resolve spontaneously [21]. This leaves the decision up to the patient and health care providers.

Part 1: Implementation of evidence based guidelines

Even though guidelines are based on the best available evidence, it is known from the literature that health care providers do not always follow guidelines [22-24]. As the evidence regarding use of non-surgical treatment and when to perform surgery, is already specific and included in the guideline, efforts can be taken to implement these guidelines. To implement guidelines and thereby optimize the quality of care, it is important to gain insight into reasons why guidelines are not always followed (i.e. barriers and facilitators). This is the focus of part 1 of this thesis.

Implementation can be described as a planned process and systematic introduction of, in our case, guidelines. The aim being that these are given a structural place in professional practice, in the functioning of organizations or in health care structure [25]. From the literature it is known that implementation of guidelines is influenced by several barriers and facilitators on the levels of the innovation, the professional, the patient, the social context, organizational context and the external environment political and economic factors [26]. Mary’s case shows how multiple factors involved in the decision making act on different levels such as the micro level (i.e. the individual patient or the professional) and the macro level (i.e. the population, the insurance company and the environment). On a micro level, the decision making may depend on disease severity, working situation, family situation, financial situation, other health complaints or on the opinion or characteristics of the health care provider and their social context. On a macro level it may depend on organizational and economic factors such as the length of the waiting list, and insurance. All these factors may complicate the optimal use of non-surgical care and optimal timing of surgery with the best possible outcomes after surgical care. Therefore, we need to reveal barriers and facilitators that may hinder or facilitate the use of guidelines. Based on these barriers and facilitators an implementation strategy can be developed [27], which is likely to be more effective for
the uptake of guidelines [28-30]. The specific barriers and facilitators are likely to differ between conditions like hip and knee OA and sciatica, based on the evidence already available in the different guidelines.

**Implementation of the hip and knee osteoarthritis guideline**

A specific recommendation about timing of surgery and use of non-surgical treatment is not provided in the hip and knee OA guideline [31]. It is stated that patients should first receive non-surgical treatment and should only be referred to the orthopedic surgeon if they do not respond sufficiently to non-surgical treatment options. However, previous studies showed that non-surgical treatments are underused in primary care [32-36]. Therefore, orthopaedic surgeons have an important role in ensuring that all recommended non-surgical treatments have been used before considering a surgical intervention.

The issues faced here are the extent to which patients have received all recommended non-surgical treatments before undergoing surgery, and if not, to gain more insight into barriers and facilitators for the use of non-surgical treatments among both patients and orthopedic surgeons. Including solutions for these barriers and facilitators in the implementation strategy can thus optimize the non-surgical treatment given to hip and knee OA patients.

**Implementation of the sciatica guideline**

The sciatica guideline is far more specific than the hip and knee OA guideline on both the use of non-surgical treatment as well as on the timing of surgery [17]. The use of non-surgical treatment and the timing of surgical treatment are specifically described in the guidelines. Still, large practice variation remains in surgery rates ranging from 19 to 319 per 100,000 inhabitants in 2012 in the Netherlands [4], unlikely to be explained by differences in case mix and patient preferences. It is more likely that noncompliance with the evidence-based guidelines regarding SDM is responsible for the varying surgery rates, since SDM may diminish this variation.

The issue here seems to be more the extent to which SDM is used. The recommendation to use SDM is not as easy as it may sound. Figure 2 shows that SDM could take place at different moments in the care trajectory and with multiple health care providers, so one of the issues may be when SDM should take place and which health care provider is responsible for using SDM to choose between (prolonged) non-surgical treatment or surgery. This makes SDM in sciatica care complicated. Therefore, it is important to gain insight into specific barriers and facilitators for use of SDM to improve implementation of the sciatica guidelines.
Part 2: The optimization of surgical care in hip and knee osteoarthritis

Guidelines for patients with hip and knee OA do not include specific information on when to perform a THA or TKA. As evidence about optimal timing of THA or TKA is still lacking, more evidence is needed on which factors predict the outcome after surgery. Using non-surgical treatments first may delay or diminish the need for surgical intervention in hip and knee OA patients. This is important given the limited lifespan of a prosthesis and the fact that outcomes are usually worse after revision than after primary arthroplasty [37]. However, the question is how long the surgery can be delayed without causing worse outcomes. This depends on the indications to perform surgery and the determinants for having the best possible patient outcomes after surgery. Do these differ between patient groups so that surgery is performed earlier for some patients? This is currently unknown and needed as evidence to decide on optimal timing of surgery. Therefore, part 2 of this thesis focusses on studying criteria and determinants to reach the best possible outcomes after surgical care. These new pieces of evidence can then be included in future guidelines.

Issues on when to perform surgery
The preoperative status of patients with hip or knee OA who have had THA or TKA may vary [3,38-40], suggesting that it is unclear when to perform a surgery. Therefore, insight is needed into the evidence base of indication criteria for primary THA and TKA in OA patients to determine whether it is possible for the orthopaedic surgeon to make an evidence-based decision about surgery. In addition, it is important to know which patients reach the best postoperative outcomes. Preoperative variables that predict the best outcomes were assessed before in a number of studies, but an overview is lacking. Furthermore, identified prognostic variables differed, and also gave contradictory results regarding the direction of the association. This may be due to the fact that some studies suffered from a lack of power, while other studies did not take independent effects (e.g. no correction for confounders) of prognostic variables into account. It is important to generate more understanding of these variables and their role on the outcome of a THA and TKA. For example should a patient first lose weight like the GP advised Mary? Or optimize preoperative status (e.g. health related quality of life, function or pain)? Having more reliable evidence on which variables predict the outcome after THA/TKA, may contribute to discussions on optimal timing of THA/TKA to achieve the best possible postoperative outcome in specific patient groups. This is important especially because still 10-20% of the patients is not satisfied after primary THA/TKA [41-44], possibly caused by not achieving the expected outcome.

Type of prosthesis
If the decision is made to replace a joint, the orthopaedic surgeon has to decide which implant should be used to reach the best possible outcomes. In recent decennia
an expansion of technological developments in prostheses have seen, usually introduced into clinical practice without appropriate assessment [45]. One of these new developments is the mobile (meniscal or rotating) bearing TKA. The mobile bearing TKA with a polyethylene insert has some freedom of movement. Compared with the more traditional fixed bearing TKA, the mobile bearing has a rotating platform that allows the knee to flex and extend (like the fixed bearing TKA) and to twist and turn. Contradictory views exist as to whether the mobile bearing prosthesis will improve functionality as compared with the fixed bearing prosthesis for cruciate retaining TKA and it is therefore important to compare these two types of knee prostheses to determine which one leads to the best postoperative outcomes in patients.

**Brief outline of this thesis**

This thesis aims to contribute to the optimal use of non-surgical treatment and timing of surgery among hip and knee OA and sciatica patients. In the first part we search for strategies to improve guideline uptake in hip and knee OA and sciatica care. For hip and knee OA this includes the implementation of non-surgical treatment, as recommended in guidelines. The study design of this problem analysis study regarding the use of non-surgical treatments in hip and knee OA is described in Chapter 2. In Chapter 3 the extent of non-surgical treatment use in hip and knee OA in orthopaedic practice is examined, to determine the magnitude of the problem. In Chapter 4, barriers and facilitators to use non-surgical treatments in hip and knee OA are assessed.

In sciatica care, the optimization of care is addressed by studying the extent to which SDM is used in the consideration of prolonged non-surgical care or surgery. The design of this study is described in Chapter 5. Chapter 6 describes barriers and facilitators to implement shared decision making in multidisciplinary sciatica care, based on qualitative interviews. These barriers and facilitators are ranked in Chapter 7, to assess which barriers and facilitators found in the qualitative interviews are most important to be included in an implementation strategy that will improve the use of shared decision making in sciatica care.

In the second part of this thesis, a search for new evidence related to the question of optimal timing of THA/TKA in hip and knee OA patients is done, as this is currently not described specifically in the guidelines. First, the availability and evidence base of indication criteria for primary THA and TKA is assessed in hip and knee OA in Chapter 8 to see if it is possible to make an evidence-based decision about surgery. Chapter 9 gives an overview of the available evidence from previous studies on which factors predict outcomes after THA, to guide decisions on when surgery is most effective in specific patient groups. Subsequently, Chapter 10 contributes to the availability of more evidence by pooling data from existing cohorts in the Netherlands to determine prognostic factors for outcomes after a THA and TKA. When the final decision is made
for surgery Chapter 11 describes which type of prosthesis should be used in terms of achieving the best outcomes for patients by performing a meta-analysis of mobile versus fixed bearing TKA. In Chapter 12 a discussion is given on the overall findings and its implications.
REFERENCES
