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Chapter 12
General Discussion
The aim of the present thesis was to extend the knowledge in the field of implementation science by examining how care delivery for patients with hip and knee OA or sciatica can be optimized. Part 1 focused on the optimization of care delivery for patients with hip and knee OA and sciatica, when evidence is available in existing guidelines on what optimal care is. It is then important to gain insight into reasons why guidelines are not always followed (i.e. barriers and facilitators) to improve implementation. However, sometimes evidence underlying the guideline is still lacking and more evidence needs to be generated. Guidelines for patients with hip and knee OA for example do not include specific information on when to perform a THA or TKA. Since this evidence about optimal timing of THA or TKA is still lacking, more evidence is needed on which determinants influence outcome after surgery so that the timing of surgery is optimal and will lead to the best possible outcomes. Therefore, part 2 focused on getting more evidence regarding determinants that will optimize surgical care in hip and knee OA.

Part 1 Implementation of evidence based guidelines

Part 1 aimed to contribute knowledge to improve guideline uptake regarding the use of non-surgical and surgical interventions in hip and knee OA and sciatica care. In hip and knee OA care, recommended non-surgical treatments are underused, while in sciatica care there is a lack of use of shared decision making (SDM) when to choose between non-surgical and surgical treatment. From the literature it is known that an inventory of barriers and facilitators is useful for the development of a tailor-made implementation strategy [1-3]. Such an inventory reduces the number of costly trials evaluating different implementation strategies [4-6]. Therefore, barriers and facilitators for the implementation of non-surgical interventions in hip and knee OA [7] and the use of SDM in sciatica care were determined [8]. By comparing two different implementation issues in different conditions, it is possible to determine whether generalized knowledge can be extracted from these different studies, or to conclude that it is necessary to perform a barriers and facilitators assessment for each implementation issue.

Barriers and facilitators for the implementation of guidelines: general findings

Although hip and knee OA and sciatica are two different conditions with different implementation issues, barriers and facilitators reported by health care providers showed similarities. For the implementation of evidence based guideline recommendations it appeared that knowledge and attitude of health care providers and organization of care played an important role whether guidelines were applied.

Knowledge and attitudes

First, barriers and facilitators related to knowledge and attitudes of health care providers appeared to influence the use of guidelines in hip and knee OA and sciatica. In hip and knee OA, an important barrier for the use of non-surgical care was lack of knowledge
on the effectiveness of non-surgical interventions among orthopaedic surgeons. In sciatica care, an important barrier was knowledge about the outcomes of surgical and non-surgical treatment options in primary and secondary care, resulting in lack of usage of SDM in sciatica care. Sciatica patients also indicated that knowledge, in the form of information provision about treatment options and potential harm and benefits played a role in the usage of SDM. The finding that knowledge is important in the uptake of guidelines is in line with the literature. A systematic review regarding barriers to apply evidence-based medicine (EBM) also found that the most common barrier in management and decision making was a lack of knowledge [9], which is consistent with the findings in this thesis.

Implicitly related to the lack of knowledge was the attitude of orthopaedic surgeons to the effectiveness of non-surgical treatments. An example of this is the attitude of orthopaedic surgeons towards physical therapy: they think physical therapy is not an effective treatment for patients with hip OA. This attitude towards the effectiveness was associated with lower use of non-surgical treatments. However, this attitude towards physical therapy was not found in a previous study among GP’s [10]. The discrepancy in views may be due to different health care professionals seeing patients with the same condition at different stages: GP’s often are the first health care provider in a care trajectory, whereas orthopaedic surgeons more often see the patients who have already used several non-surgical treatments but still have complaints with the overall benefit being less.

Organization of care
Other important overlapping barriers and facilitators perceived by health care providers in both conditions concerned the organization of care, such as communication and collaboration between health care providers from different disciplines. This is possibly due to the multidisciplinary character of care for hip and knee OA and sciatica patients. In both conditions, there are not only multiple disciplines involved (e.g. GP and physical therapist), but they are also working within different settings of care (primary, secondary and tertiary care). Moreover, some treatments concerned interventions which can only be delivered by a specific health care provider, such as a physical therapist or dietician, so that referral by a physician or advice for self-referral is needed. Both health care providers and patients found that a good collaboration between health care providers was important for the use of non-surgical treatments in both conditions. Another example of barriers and facilitators related to the organization of care was a good patient-health provider relationship for the use of guidelines in both sciatica and OA care. In sciatica care, the quality of professional-patient relationship was considered as most important for the use of SDM in sciatica care. In OA care good guidance by the physical therapist was associated with more use of physical therapy. Other studies did not mention the
organization of care frequently as a barrier or facilitator. This can possibly be explained by the fact that previous studies into barriers and facilitators only included one discipline or one setting, whereas the barriers and facilitators in this thesis were assessed for two conditions where care is provided by multiple disciplines and in multiple settings. Furthermore, previous research mainly focused on barriers and facilitators at the patient level [11,12], but the results of this thesis show that it is important to also focus on other levels, such as the organization.

**Barriers and facilitators: condition specific findings**

Besides similarities in barriers and facilitators perceived by health care providers and patients, also condition specific barriers and facilitators were found regarding implementation of recommendations in guidelines. For OA care, the use of non-surgical treatment was hampered by the pressure that orthopaedic surgeons perceived from patients to perform a surgery and by the experience and advices from patients' environment, which was not mentioned as an important barrier or facilitator in sciatica care. In sciatica care on the other hand, SDM was hampered by the assumption of health care providers that patients want to recover quickly. As a consequence of this assumption they did not make a shared decision, but recommended surgery. It is important though to determine patients’ views on the importance of speed of recovery and this is part of the SDM process.

**Comparison of identified barriers and facilitators with the literature**

The results in this thesis showed that knowledge and attitude of health care providers and organization of care played an important role whether guidelines were applied, but is this also consistent with the literature? A recent systematic review on barriers for the implementation of guidelines included 106 studies [9]. In total, 155 barriers were identified. The most commonly reported barriers were: lack of resources (24/155 barriers) (e.g. inadequate facilities, lack of medical resources) and inadequate access (22/155 barriers) (e.g. guidelines are too complicated or difficulty to find the information). Other common barriers were lack of time and research (e.g. conflicting methods, literature not being compiled in one place), which is also related to knowledge. Another systematic review focused on barriers and facilitators to implement SDM in clinical practice [13]. In this review only 7 out of the 38 studies reported that lack of knowledge (familiarity) was a barrier for using SDM. The three most often reported barriers were: time constraints (22/38 studies) and lack of applicability due to patient characteristics (18/38 studies) and the clinical situation (16/38 studies). The three most often reported facilitators were: provider motivation (23/38 studies) and positive impact on the clinical process (16/38 studies) and patient outcomes (16/38 studies)[13].
The previously mentioned reviews found some barriers and facilitators consistent with the findings in this thesis, but also different barriers and facilitators were found between the literature and this thesis. Part of these differences may be explained by the multidisciplinary character of care for hip and knee OA and sciatica patients. This comes with different barriers and facilitators compared to monodisciplinary care, which is mostly described in the literature. Next to this explanation, the difference in barriers and facilitators may also be caused by the use of different methods. So far, the use of qualitative methods is most common. For example in a review about barriers and facilitators to implement SDM 21 of the 38 studies used qualitative methods exclusively, 11 used quantitative methods exclusively and only six studies used mixed methods [13]. With a qualitative study, the perspective of a respondent takes the center stage and the purpose is to gain some deeper understanding on the respondent’s perspective [14]. This is difficult, if not impossible, to reach with a quantitative design. Using only quantitative methods it is possible that the researchers’ personal hypothesis is tested instead of a rather complete set of possible barriers and facilitators since no ‘new’ perspectives will be explored [15]. On the other hand, information on the importance of each barrier or facilitator is also needed, warranting the need for a quantitative approach.

In this thesis, a combination of qualitative and quantitative studies was employed, with the aim to obtain a complete view on barriers and facilitators. The added value of this approach was demonstrated by the observation that barriers and facilitators most often mentioned in the qualitative part of the studies in this thesis [16], were not always consistent with the highest ranked barriers or facilitators [17]. For example during interviews about SDM in sciatica care, health care providers mentioned lack of knowledge about treatment options only a few times, whereas it was ranked as an important barrier in the subsequent survey [17]. Likewise, lack of time during a consultation was mentioned often during interviews, and is also the most mentioned barrier for SDM in other studies [18]. But in the quantitative part, time during a consultation only took a 33rd place, and did not occur in any of the health care providers top 5. This emphasizes the importance of a combination of methods to determine barriers and facilitators.

**Implementation strategies**

The identification of barriers and facilitators is just the first step for the implementation of guidelines. If barriers and facilitators are identified, an effective implementation strategy needs to be developed. Different methods can be used to develop an implementation strategy. One of these methods is the intervention mapping approach of Bartholomew et al.[19]. This method begins with the creation of matrices in which the specific recommendations of guidelines are set against the most important barriers and facilitators. Subsequently, a project team can brainstorm about the interventions needed to achieve the performance objective in the presence of the barrier or facilitator.
mentioned in the matrix. During this process a theoretical model can be identified to change the barriers and facilitators. The theoretical model proposed by Woolf [20] was used in this thesis that links the intensity of enforcement to the scientific and clinical quality of guidelines, called the “mechanism of action” of practice guidelines. This model says that guideline recommended outcomes can be reached through the steps of changing practitioner’s knowledge, attitudes, and behavior [20]. Eventually, the cells of the matrices are gradually filled with interventions [21] and the formulated strategy components are translated into interventions.

In this thesis two specific implementation strategies for the management of the two conditions using the intervention mapping approach were developed. Figure 1 shows the identified overlapping and condition specific barriers and facilitators related to each level of the mechanism of action (knowledge, attitude and behavior), the theory-based model that was used [20] and the different interventions geared at these barriers and facilitators to improve the implementation of the use of non-surgical treatments in hip and knee OA care and the use of SDM in sciatica care. The proposed interventions were interactive education, feedback about the use of SDM (specific for sciatica), tools for patients and health care providers such as an information booklet, obesity clinics (specific for OA) and agreements between disciplines. Figure 1 also shows at which barriers and facilitators these interventions are geared and with which level of the mechanism of action the barriers and facilitators are associated. The results of the inventory of barriers and facilitators indicated that both implementation strategies should be geared at improving the knowledge and attitude of health care providers and the organization of care.

Figure 1. The mechanism of action [20] with identified barriers and facilitators at each level and different interventions to improve the implementation of the guidelines of hip and knee OA and sciatica
Knowledge and attitude

Both implementation strategies should be geared at improving knowledge and attitude of health care providers by providing interactive education [4] on specific topics (e.g. about evidence underpinning the effectiveness of different treatments and SDM). For example a barrier for not using physical therapy was that orthopaedic surgeons did not believe in the effectiveness of this treatment for OA. This could be due to not making a clear distinction between the effectiveness of physical therapy in the non-surgical management of hip and knee OA and physical therapy in end stage OA where the indication for surgery is already set. The first physical therapy intervention aims to reduce patients’ symptoms in early stage OA and may thereby delay or diminish the need of surgery. This treatment is proven to be effective and recommended in multiple guidelines [22-26]. The second intervention concerns specific preoperative physical therapy programs aiming to improve postoperative recovery, which is not proven to be effective [27-30]. Interactive education about this and other topics can be provided to extend their knowledge for example by using e-learnings. The duration of interactive education in trainings may be less than 10 hours since research has shown that short-term training (less than 10 hours) is as successful as longer training for promoting patient-centered care (e.g. using SDM) within clinical consultations [31].

The interactive education only focusses on health care providers while it is also important to involve patients. Research has shown that interventions targeting patients and healthcare professionals together show more promise than those targeting only one or the other [32]. Therefore, in addition to interactive education, specific tools for both patients and health care providers may improve the information provision and thereby improve knowledge and facilitate the decision making. An example of such a tool is the BART (Beating osteoARThritis) stepped care strategy for hip and knee OA, which is already available and introduced in primary care [33,34]. Part of this strategy is a booklet for patients, containing information about the disease and different treatments. However, this strategy should be updated, since treatments like glucosamine, hyaluronic acid and TENS are not proven effective treatments but still included in the stepped care strategy. Therefore health care providers may question this strategy rather than using it. For sciatica, a decision tool is also already available [35]. This tool may be useful to facilitate the SDM process. Research has shown that offering decision aids increases the number of patients who prefer non-surgical treatments, improve patient knowledge and reduce decisional conflict. It helps surgeons and patients to achieve well-considered and shared treatment decisions [36].

Organization of care

Even when health care providers have sufficient knowledge and their attitude towards recommendations is positive, the organization of care remains a problem. Therefore,
another part of the implementation strategies for both conditions is geared at improving the organization of care. An example concerns the relative underuse of the dietician in obese patients. Making referrals to a dietician in primary care, whom they may not know personally, was a barrier. During the interviews with orthopaedic surgeons some mentioned a successful collaboration with obesity clinics in their hospital. Dietary therapy becomes even more important due to the increasing number of obese people and an obesity clinic may facilitate this dietary therapy. However, additional research is necessary to assess the feasibility and cost-effectiveness of obesity clinics.

Another improvement that can be made regarding the organization is that the care trajectory should become clearer by making agreements between disciplines about the moment of information provision in both OA and sciatica care. For example who is responsible for which part of the information provision or guidance in which step of the care trajectory? This is especially important in multidisciplinary settings such as in OA and sciatica care.

**Generalized knowledge of implementation strategies**

The previously mentioned elements on knowledge, attitude and organization of care are not restricted to one specific disease or health care system. Therefore, interventions geared at these topics may also be used for implementation of guidelines in other patients groups or other implementation problems with multiple disciplines involved. However, the condition specific barriers and facilitators that were also identified suggests that that there is no “one size fits all” solution for the implementation of guidelines, and implementation strategies should be partly tailored to a specific implementation problem. An inventory of disease specific barriers and facilitators remains necessary and may lead to more disease specific interventions. Therefore, in addition to interactive education and optimizing the organization of care, a strategy for OA should also focus on involving patient’s environment (partner, family members) for example during a consultation and if possible also provide the decision tools to these persons. Whereas the implementation strategy for SDM in sciatica care should also be targeted at feedback about the use of SDM. This can be done for example by examining the use of SDM from patients and professionals perspective, using the SDM-9 [37], the Dyadic OPTION scale [38,39], and the Control Preference Scale [40] and report the numbers to the health care provider. Since many health care providers already perceived they used SDM in sciatica care even when they in fact did not, feedback can provide them more insights into their actual use of SDM.

**Comparison of implementation strategies with the literature**

Other studies developed implementation strategies, but used different methods. Although a structured approach including barrier assessment for the development of
guideline implementation strategies is advocated, it is not yet commonly used. A scoping review on trends in guideline implementation found that only one out of the 32 studies mentioned the identification of barriers [41]. Another systematic review including 39 studies that examined the effect of interventions to improve adoption of SDM in different conditions showed that only three of the 39 studies based their interventions on barriers assessments [32]. These three studies used multifaceted interventions and were all effective [42-44], while overall the authors of the review concluded that it was uncertain whether interventions to improve adoption of SDM are effective given the low quality of the evidence [32].

Besides that the implementation strategies in this thesis are based on identified barriers and facilitators, they also target both patients and health care providers. Gagliardi et al. [41] found that most studies focused on health care providers only. Legaré et al. [32] included 39 in a review, only three targeted more than one type of health care providers, but all these three studies had favorable outcomes. The authors also concluded that interventions targeting patients and healthcare professionals together show more promise than those targeting only one or the other [32].

Where to go next?

Most studies known in literature examined the effect of interventions without barriers assessment, in a monodisciplinary setting (only one type of health care provider) or among health care providers only (no patients included). This led to a low quality of evidence regarding effectiveness of interventions to improve adoption of SDM [32]. In the studies in this thesis, barriers assessments were performed, in a multidisciplinary setting and among both health care providers and patients. Since the literature shows that such strategies are more effective [4-6] than interventions without barriers assessment, in a monodisciplinary setting (only one type of health care provider) or among health care providers only (no patients included), the proposed implementation strategies are likely to improve the use of non-surgical care in OA and SDM in sciatica. Future studies should assess whether the developed implementation strategies are indeed effective. This could be done for example by a cluster RCT or a controlled before-after study among health care providers including an effect-, process- and economic evaluation in intervention and control hospitals and primary health care providers in the same region. The control group should receive usual care (passive dissemination of evidence) and the intervention group should receive the strategies as described above. No such interventions have been performed so far regarding improvement of the use of non-surgical care in OA and SDM in sciatica.

Part 2 The optimization of surgical care in hip and knee osteoarthritis

Care delivery cannot always be optimized by implementing existing guidelines, for
example when evidence underlying the guideline is lacking. The hip and knee OA guidelines are for example not specific about when to perform a THA or TKA, partly because evidence is lacking about what the optimal timing of surgery is. If evidence is lacking, more knowledge needs to be generated to develop evidence based recommendations in guidelines and thereby optimize care. Specific issues about this topic that were addressed in part 2 of this thesis were: what are the evidence based indications to perform surgery and what are criteria and determinants to achieve the best possible patient outcomes after surgery? And does the type of prosthesis matter?

**Criteria and determinants to reach the best outcomes after surgery**

Guidelines are based on the best available evidence, but it is important to realize that sometimes the evidence is limited, and thus recommendations in guidelines are more expert based than evidence based. A review in this thesis showed that currently evidence-based indication criteria for THA or TKA are lacking, so that it is more important to generate more evidence about this topic. To strengthen the evidence base for indication criteria, knowledge is needed on which patients reach the best outcomes after surgery. A literature search on the determinants suggested that future research should focus on preoperative function to decide when THA will be most effective. However, most results were contradictory both with respect to the association and direction of age, gender and BMI with postoperative outcomes. These conflicting results can possibly be due to the high risk of bias in many included studies or estimates based on studies with a lack of power. Thus regardless of the amount of existing studies, when all included studies are of low quality, more original research of high quality is needed.

To gather more evidence about which determinants influence outcomes after THA or TKA, a pooled analysis of 19 prospective observational cohort studies with OA patients (2400 THA and 1783 TKA) was performed from hospitals throughout the Netherlands so that lack of power could not be an issue. This pooled analysis showed that patients with better preoperative quality of life functioning and less pain had better postoperative outcomes.

**Timing of surgery**

OA is often described as a progressive disease, meaning a (slowly) worsening condition over time. Optimal timing suggests that surgery can be delayed, but to what extent if the disease is worsening over time and given the above described results, that patients who received a joint replacement earlier in their clinical course (and thus with a better preoperative status) have a better outcome? There are two aspects that need to be considered. First, the natural course of the disease i.e. the prognosis of OA should be examined to assess whether worsening occurs in all patients. The second question that needs to be answered is whether the same outcomes can be reached when surgery is
delayed and only non-surgical treatment is given rather than THA or TKA.

**Natural course of OA**

Given the results in this thesis that patients with a better preoperative status have better postoperative results, it is important to examine whether functioning or pain in hip or knee OA patients become worse over time, so if a worsening of functioning or pain in hip or knee OA patients is followed by further worsening or whether this fluctuates randomly over time. Indications for such fluctuations were found in a study of De Rooij et al.[45]. The authors performed a meta-analysis on prognosis of pain and physical functioning in patients with knee OA in studies with a follow-up up to 8 years. They could not draw any conclusions with regard to the course of pain and physical functioning, due to the high heterogeneity across studies.

Other studies that examined progression of OA also found inconclusive results. Van Dijk et al.[46] described the limitations in activities in hip or knee OA patients in a three-year cohort study and found that at group level, limitations in activities of patients with hip or knee OA seemed fairly stable during the first three years of follow-up. However, at the level of individual patients, considerable variation occurred from deterioration to improvement. The same results were found after a follow-up of five years [47]. In another systematic review it was found that pain and functional status in hip or knee OA patients deteriorate slowly with limited evidence for worsening after three years. In specific subgroups, prognosis in the first three years of follow-up was either worse or better [48]. Bastick et al.[49] tried to identify these subgroups of patients who deteriorate. The authors examined prognostic factors for radiographic progression of knee OA in a meta-analysis and concluded that baseline knee pain, presence of Heberden nodes, varus alignment, and high levels of serum markers hyaluronic acid and tumor necrosis factor-α predicted knee OA progression. However, they also concluded that evidence for the majority of determined associations, was limited, conflicting, or inconclusive. The above mentioned studies showed heterogeneous findings regarding to progression of OA and thus it is important to gain more insights into subgroups of patients. Which patients deteriorate during time, which patients remain stable and which patients improve after a couple of years? Based on the previously described literature, there is no conclusive evidence whether there is continuous worsening or random fluctuation in pain and functioning over time for all patients or only for some subgroups.

**Non-surgical versus surgical treatment**

In addition to uncertainties about the natural course of the disease, the second question is whether the same outcomes can be reached if surgery is delayed with non-surgical treatment. The recommended non-surgical treatments in guidelines are proven to be effective, but are outcomes comparable with outcomes after THA or TKA? Recently,
Skou et al. [50] performed a randomized controlled trial (RCT) in which patients were randomly assigned in two groups. Patients in one group received a TKA followed by 12 weeks of nonsurgical treatment, patients in the other group received only 12 weeks of non-surgical treatment. The authors concluded that patients with a TKA followed by non-surgical treatment resulted in greater pain relief and functional improvement after 12 months than did non-surgical treatment alone, but that both groups had clinically relevant improvements. In addition, TKA was associated with a higher number of serious adverse events. Thus a TKA resulted in greater pain relief and functional improvement, but also in a higher number of serious adverse events. Furthermore, the lifespan of a prosthesis is limited and outcomes are usually worse after revision than after primary arthroplasty [51]. Non-surgical treatments also resulted in clinically relevant improvements. Thus the best treatment option remains unclear. Furthermore, long term results are unknown and need to be examined. In addition, no such a study was conducted for THA. It is important to assess whether a comparable study for THA should have the same results. Future studies are needed to examine whether a delay in surgery achieves the same outcomes for patients.

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. Therefore, another question in this thesis was: does the type of prosthesis matter? In recent decades a large variety of types of prostheses have become available. An example of a new development is the mobile (meniscal or rotating) bearing TKA with a polyethylene insert that has some freedom of movement. New types of prostheses are often introduced in clinical practice without appropriate assessment [52]. Therefore, in this thesis the mobile bearing prosthesis with a fixed bearing prosthesis were compared using a meta-analysis of RCTs. Existing RCTs were included comparing mobile bearing with fixed bearing prostheses in cruciate retaining TKA among patients with OA or rheumatoid arthritis, using functional or clinical outcome measures and follow-up of at least six months. Moderate-to low-quality evidence suggests that mobile bearing prostheses may have similar effects on knee pain, clinical and functional scores, health-related quality of life, revision surgery, mortality, reoperation rate and other serious adverse events compared with fixed bearing prostheses in posterior cruciate retaining TKA. However, the meta-analysis was underpowered to detect differences in revision rate, specific reasons for revision and mortality. Because of the low numbers of revisions and mortality it is difficult to show differences using RCTs that on average have a follow-up period of a few years.

To show possible differences regarding these outcomes and after a longer follow-up period, the scope may be widened to observational studies and include studies that
report outcomes in greater detail, with sufficient follow-up time to allow gathering of high-quality evidence and to inform clinical practice. Large registry-based studies may have added value, but they are subject to confounding by indication. More complex analyses are needed to control for this type of confounding and thereby improve the quality of evidence, for example by using an instrumental variable.

Where to go next?

In part 2, knowledge is generated to develop evidence based recommendations in the hip and knee OA guideline. However, a number of issues remain that need to be resolved before a clear guideline recommendation about the optimal timing of THA/TKA can be formulated. This thesis showed that a better preoperative status leads to better postoperative outcomes, however if a patient’s status remain stable during the course of OA, postponing a surgery does not lead to a worse preoperative status with worse postoperative outcomes. In addition, previous studies searching for predictors or determinants for the best outcome and the studies in this thesis showed that evidence is often contradictory. Furthermore, research has shown that 10-20% of the patients are not satisfied after primary THA/TKA [53-56] while nothing seems to be clinically wrong with their prosthesis. Maybe there is not just one solution for all patients and researchers should stop quantifying all OA patients with their predefined assumptions and focus on patients’ perspectives. For example why are patients not satisfied? What were their expectations? And were these expectations met? These are questions that cannot be answered with a prediction model or other quantitative methods, although researchers tried to do so [57-59]. These questions can be answered using qualitative methods. Qualitative methods shift the balance between the researcher and the researched and remains open to concepts that emerge may be completely different. It can be used to get detailed findings on people’s views and experiences, which cannot be examined using quantitative methods only.

Conclusion

Part 1 of this thesis showed that there are general topics that need be focused on when evidence based guideline recommendations need to be implemented in a multidisciplinary setting, regardless of the condition. These topics are knowledge and attitude of health care providers and organization of care. Future implementation studies can start focusing on these topics if it is not feasible to perform a barrier assessment. However, also different barriers and facilitators for each different condition were found. This shows that each different condition needs a barrier assessment to be able to gear an implementation strategy at all existing barriers and facilitators. This will most likely result in improved implementation of evidence based guidelines.

If information in the literature is lacking, more knowledge needs to be generated to
develop evidence based recommendations in guidelines. Part 2 of this thesis showed that evidence based recommendations for indication criteria for THA or TKA are lacking in the literature. Pooling multiple cohort studies in the Netherlands showed that preoperative status is the most important variable for outcome after both THA and TKA, i.e. patients with better preoperative quality of life, functioning and less pain had better postoperative outcomes. This does not mean that patients who received a joint replacement earlier in their clinical course have a better outcome. To determine whether this is true, more knowledge is needed about the progression of OA in different subgroups and whether the same outcomes can be reached with non-surgical treatment as with THA and TKA since literature about these topics is inconclusive.
REFERENCES


General discussion


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