Physiotherapist-led orthopaedic triage

Assessment and management of musculoskeletal disorders in primary care

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To Agnes

There is freedom waiting for you,
On the breezes of the sky,
And you ask "what if I fall?"
Oh, but my darling,
What if you fly?

– Erin Hanson

Don't think you're on the right road
just because it's a well-beaten path
– *Unknown author*

ABSTRACT

Aims: The overall aim of this thesis was to evaluate physiotherapist-led orthopaedic triage in primary care in comparison to standard practice.

Methods: The thesis comprises two studies (A and B) reported in four papers. Study A was a randomised controlled trial, where patients who were referred from general practitioners for orthopaedic consultation (n=203) were randomised to either physiotherapist-led orthopaedic triage or standard practice (i.e. directly to orthopaedic surgeon consultation). The main aim of this study was to evaluate selection accuracy for orthopaedic intervention i.e. the accuracy for selecting patients appropriate for orthopaedic intervention (e.g. surgery) with orthopaedic triage or standard practice, which was reported in Paper I (n=203). Paper II (n=163) aimed to evaluate patients' perceived quality of care of the physiotherapist-led orthopaedic triage compared with standard practice. The aim of Paper III (n=203) was to report a long-term follow-up of the patient-reported outcomes health-related quality of life, pain-related disability, and sick leave after physiotherapist-led orthopaedic triage compared with standard practice. Study B (Paper IV) was an exploratory qualitative study, with the aim to explore patients' perceptions and expectations of an upcoming orthopaedic consultation, using data from semi-structured interviews with patients (n=13). A qualitative content analysis with an inductive approach was used.

Results: Study A showed that the selection accuracy was significantly higher with physiotherapist-led orthopaedic triage, i.e. a significantly larger proportion of patients selected by the physiotherapist for orthopaedic surgeon consultation was found appropriate for orthopaedic intervention, compared with standard practice. Participants perceived significantly higher quality of care with physiotherapist-led orthopaedic triage than with standard practice. The long-term follow-up showed that the participants rated a significantly better health state three months after the physiotherapist-led orthopaedic triage, compared with standard practice; however, there were no other statistically significant differences in perceived health-related quality of life, pain-related disability or sick leave between the groups at any of the follow-ups. In Study B, the participants' expressed perceptions and expectations of the upcoming orthopaedic surgeon consultation were classified into five categories: Hoping for action, Meeting an expert, Having a respectful meeting, Participating in the consultation, and A

belief that hard facts make evidence. Across the categories, an overarching theme was formulated: Take me seriously and do something!

Conclusions: The findings in Study A suggest that physiotherapist-led orthopaedic triage for patients with musculoskeletal disorders can provide timely access to assessment by an appropriately qualified healthcare professional who can direct patients to the most appropriate management pathway. In addition, physiotherapist-led orthopaedic triage can provide care of good perceived quality, without compromising long-term health-related quality of life, pain-related disability, or sick leave. The main finding from Study B, that patients expect to be taken seriously and for something to happen during, or as a consequence, of the orthopaedic consultation, can serve to improve patient–clinician relationships and to inform the development of new models of care such as physiotherapist-led orthopaedic triage.

Keywords: *Expectations, Orthopaedic surgeon consultation, Musculoskeletal disorders, Physical therapy, Physiotherapy, Perceptions, Primary care, Selection accuracy, Quality of care, Waiting time*

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SVENSK SAMMANFATTNING (SUMMARY IN SWEDISH)

Bakgrund: Muskuloskeletala sjukdomar är en av de vanligaste orsakerna till att människor söker hjälp i primärvården. Muskuloskeletala sjukdomar är ofta relaterade till smärta och orsakar i stor utsträckning både funktionsnedsättningar och sjukskrivning och har en negativ påverkan på livskvalitet. I många länder har man gjort förändringar i vården avseende olika vårdmodeller för att möta behovet av patienter med muskuloskeletala sjukdomar som remitterats för ortopedisk konsultation. En sådan modell är s.k. ortopedisk triage vilket innefattar en utökad roll för specialutbildade fysioterapeuter som gör bedömningar och undersöker vårdbehov, samt hänvisar patienter till de mest lämpliga åtgärderna. Denna modell behöver utvärderas ytterligare och därför var det övergripande syftet med avhandlingen att utvärdera fysioterapeut-ledd ortopedisk triage i primärvård, jämfört med sedvanlig vård.

Metod: Avhandlingen innefattar två studier (A och B) som är rapporterade i fyra artiklar. Studie A var en randomiserad kontrollerad studie, där patienter med muskuloskeletala sjukdomar som remitterats från allmänläkare för ortopedisk konsultation randomiserades till antingen fysioterapeut-ledd ortopedisk triage (mellansteg mellan remitterande allmänläkare och ortopedkirurg) eller sedvanlig vård (direkt till ortopedkirurg). Det primära syftet med Studie A som rapporteras i Artikel I (n=203), var att utvärdera urvalsprecision för ortopedisk åtgärd (exempelvis kirurgi), dvs. hur stor andel av patienterna som skickades vidare från fysioterapeuten till ortopedkirurgen som ansågs vara lämpliga för ortopedisk åtgärd jämfört med de som remitterats direkt från allmänläkare till ortopedisk konsultation. Dessutom utvärderades om det var någon skillnad mellan fysioterapeut-ledd ortopedisk triage och sedvanlig vård (konsultation med ortopedkirurg) avseende åtgärder såsom remiss för vidare utredning (såsom röntgen) eller till fysioterapeut för konservativ behandling. Artikel II (n=163) syftade till att utvärdera patienternas upplevda vårdkvalitet med fysioterapeut-ledd ortopedisk triage jämfört med sedvanlig vård. Syftet med Artikel III (n=203) var att jämföra långtidseffekter efter 3, 6 och 12 månader på de patientrapporterade utfallsmåtten hälsorelaterad livskvalitet, smärtrelaterad funktionsnedsättning och sjukskrivning mellan fysioterapeut-ledd ortopedisk triage och sedvanlig vård. Studie B var en utforskande kvalitativ studie med syftet att undersöka patienters uppfattningar och förväntningar inför en ortopedisk konsultation (n=13).

Semistrukturerade intervjuer genomfördes med alla deltagare och resultaten analyserades med en kvalitativ innehållsanalys med en induktiv ansats.

Resultat: Resultatet av Studie A visade att urvalsprecisionen var signifikant högre med fysioterapeut-ledd ortopedisk triage, dvs. en signifikant större andel av patienter som skickades från fysioterapeuten till ortopedkirurgen ansågs vara lämpliga för ortopedisk åtgärd, jämfört med sedvanlig vård. En signifikant mindre andel patienter skickades för vidare utredning och en signifikant större andel vidare till fysioterapeut för konservativ behandling efter fysioterapeut-ledd triage jämfört med sedvanlig vård. Deltagarna i studien upplevde en signifikant bättre vårdkvalitet med fysioterapeut-ledd ortopedisk triage än med sedvanlig vård, både avseende medicinsk-teknisk kompetens och identitets-orienterat förhållningssätt. Långtidsuppföljningen visade att deltagarna skattade ett signifikant bättre hälsotillstånd tre månader efter fysioterapeut-ledd ortopedisk triage jämfört med sedvanlig vård, men utöver det sågs inga signifikanta skillnader avseende hälsorelaterad livskvalitet, smärtrelaterad funktionsnedsättning eller sjukskriving. Resultatet från Studie B av deltagarnas uppfattningar och förväntningar inför en ortopedisk konsultation sammanställdes i fem kategorier: Hoppas på att något ska hända, Möta en expert, Ha ett respektfullt möte, Delta i konsultationen och Tro på att röntgen är bevis. Ett övergripande tema formulerades: Ta mig på allvar och gör något!

Slutsatser: Resultaten från Studie A visar att fysioterapeut-ledd ortopedisk triage kan fungera som en instans mellan allmänläkare och ortopedkirurg för patienter med muskuloskeletala sjukdomar, och kan medföra en snabb bedömning av en kvalificerad vårdgivare, och hänvisning till den lämpligaste åtgärden eller behandlingen. Dessutom påvisar resultaten att fysioterapeut-ledd ortopedisk triage möjliggör vård med god upplevd vårdkvalitet utan att negativt påverka hälsorelaterad livskvalitet, smärtrelaterad funktionsnedsättning och sjukskrivning. Resultaten från Studie B visar att patienter förväntar sig att bli tagna på allvar och att något ska hända under, eller som en konsekvens av en ortopedisk konsultation. Resultaten kan användas för att förbättra relationen mellan patient och vårdgivare, som grund för utvecklingen av nya vårdmodeller såsom fysioterapeut-ledd ortopedisk triage, och som grund för fortsatt forskning på området.

LIST OF PAPERS

The thesis is based on the following papers, which are referred to in the text by their Roman numerals:

I. **Samsson KS**, Larsson MEH. Physiotherapy screening of patients referred for orthopaedic consultation in primary healthcare – a randomised controlled trial. *Manual Therapy*, 19 (2014) 386-391.

II. **Samsson KS**, Bernhardsson S, Larsson MEH. Perceived quality of physiotherapist-led orthopaedic triage in primary care – a randomised controlled trial. *BMC Musculoskeletal Disorders*, 2016, 17:257.

III. **Samsson KS**, Larsson MEH. Physiotherapy triage assessment of patients referred for orthopaedic consultation – Long-term follow-up of health-related quality of life, pain-related disability and sick leave. *Manual Therapy* 20 (2015) 38-45.

IV. **Samsson KS**, Bernhardsson S, Larsson MEH. Take me seriously and do something! – A qualitative study exploring patients' perceptions and expectations of an orthopaedic consultation. *In manuscript.*

TABLE OF CONTENTS

ABBREVIATIONS

APP	Advanced Practice Physiotherapist
EQ-5D	European Quality of Life-5 Dimensions Questionnaire (3 levels)
EQ VAS	European Quality of Life Visual Analogue Scale
ESP	Extended Scope Physiotherapist
IASP	International Association for the Study of Pain
ICD-10	International Classifications of Diseases, Tenth revision
ICF	International Classification of Functioning, Disability and Health
MCIC	Minimal Clinically Important Change
PDI	Pain Disability Index
PREM	Patient-Reported Experience Measures
PROM	Patient-Reported Outcome Measures
QPP	Quality from the Patient's Perspective
RCT	Randomised Controlled Trial

TERMS AND CONCEPTS

Advanced scope of practice	A role that is within the currently recognised scope of practice for that profession, but that through custom and practice has been performed by other professions. The advanced role requires additional training, as well as significant professional experience and competency development [1].
Chronic or persistent pain	Pain for more than 3 months [2].
Direct access physiotherapy	Physiotherapists working as primary contact practitioners through direct access, i.e. patient self-referrals [3, 4].
Disability	An umbrella term for impairments, activity limitations and participation restrictions [5]
Expectations	Defined as a belief that an event will occur [6].
Extended scope of practice	A role that is outside the currently recognised scope of practice and one that requires some method of credentialing following additional training, competency development and significant professional experience, as well as legislative change [1].
Functioning	All body functions, activities and participation.
Health	A state of complete physical, mental and social well-being and not merely the absence of disease or infirmity [7].
Musculoskeletal disorders	A term for disorders of the muscles, nerves, tendons, ligaments, joints, cartilage and spinal disks; it may also encompass work-related injuries [8], including conditions such as back and neck pain, osteoarthritis, rheumatoid arthritis, osteoporosis, as well as other musculoskeletal conditions, and those related to injuries and trauma [9]. Throughout this thesis the term musculoskeletal disorder refers to pain, disease or conditions in the musculoskeletal system.

Musculoskeletal pain	A consequence of and closely associated with a musculoskeletal disorder [10, 11], but also a disorder itself, such as low back pain or neck pain [12].
Pain	An unpleasant sensory and emotional experience associated with actual or potential damage or described in terms of such damage [13].
Patient-reported experience measures	Self-reported questionnaires used to understand patients' views of the process of care, often measured through patient satisfaction or patient experience [14].
Patient-reported outcome measures	Standardised, validated questionnaires, self-reported by patients to measure their perceptions of their functional status and wellbeing [15].
Patient satisfaction	Considered as the patient-reported evaluation of an experience, process or outcome [16].
Physiotherapist-led orthopaedic triage	For this thesis considered as physiotherapist-led assessment with the main aims to diagnose and determine the most appropriate management pathway.
Quality of care	The degree to which health services for individuals and populations increase the likelihood of desired health outcomes and are consistent with current professional knowledge [17].
Standard practice	For this thesis considered as orthopaedic surgeon consultation.
Selection accuracy	In this thesis defined as the accuracy in selecting patients appropriate for orthopaedic intervention (e.g. surgery).
Self-rated health state	Results from the EQ VAS.

INTRODUCTION

Working as a physiotherapist in primary care, one understands how common musculoskeletal disorders are and what consequences they have for the individual in terms of pain and disability. Musculoskeletal disorders have been found to be one of the leading causes for disability globally, and the socio-economic impact and burden of these conditions are evident [18, 19]. The majority of patients with musculoskeletal disorders are managed in primary care, which creates demands for the delivery of fast and efficient services.

At the primary healthcare centre where I work, a visiting orthopaedic surgeon has, for several years, been taking consults a couple of times per month. This was working well for patients who were found appropriate for orthopaedic intervention (e.g. surgery), but a large proportion of patients were considered inappropriate for intervention, and was referred back to their general practitioner. Therefore, the question was raised; are patients with musculoskeletal disorders referred for orthopaedic consultation at the health care centre seeing the most appropriate healthcare professional? Could physiotherapists be appropriate for diagnosing and determining the most appropriate management pathway, and by doing that, shortening the waiting times and freeing up time for the orthopaedic surgeon? Could this also reduce the workload on the general practitioners? Could we change the management pathway while maintaining quality of care, and could this influence patient outcome in terms of health-related quality of life, disability and sick leave?

These questions led me out on a winding road, where this initial idea for a quality improvement project quickly evolved into a randomised controlled trial, and a hypothesis was formed: physiotherapist-led orthopaedic triage would provide good selection accuracy for orthopaedic intervention and maintain good quality of care without negatively affecting patient-related outcomes. We wanted to compare physiotherapist-led orthopaedic triage in primary care with standard practice (i.e. an orthopaedic surgeon consultation), aiming for the study protocol to stay as close to standard practice as possible, to facilitate future implementation. The outcomes measured in this randomised controlled trial are reported in Papers I-III.

Considering the learning curve during the work with this thesis, as well as the evolving body of literature in this field, the terms used in the papers and the thesis differ slightly. Initially the intervention was called physiotherapy screening for patients referred for orthopaedic consultation, then changed to physiotherapist

triage for patients referred for orthopaedic consultation, and finally modified to the term used in Paper II as well as throughout this thesis: physiotherapist-led orthopaedic triage.

Once the randomised controlled trial was up and running, I wanted to know more about what was going on in the patients' heads when waiting for an orthopaedic consultation. I wanted to explore which perceptions and expectations patients had of an orthopaedic consultation, which led to the design of the second study. The result of this study is reported in Paper IV.

BACKGROUND

Musculoskeletal disorders

The term musculoskeletal disorder is widely used for disorders of the muscles, nerves, tendons, ligaments, joints, cartilage and spinal disks; as well as work-related injuries [8], however, a generally accepted definition is still lacking. However, the term work-related musculoskeletal disorder has been defined as *"impairments of bodily structures such as muscles, joints, tendons, ligaments, nerves, bones or a localised blood circulation system that are caused or aggravated primarily by the performance of work…"* [20]. Musculoskeletal disorders include conditions such as back and neck pain, osteoarthritis, rheumatoid arthritis, and osteoporosis, as well as other musculoskeletal conditions and conditions related to injuries and trauma [9]. The term musculoskeletal disorder is frequently used interchangeably with other terms such as musculoskeletal conditions [12] and musculoskeletal disease [21]. Woolf et al [10, 22] use the term musculoskeletal conditions, which are considered a diverse group of disorders with various aetiology and pathophysiology, linked by their association with pain and impaired physical function. Some of these are of acute onset and short duration, but many are recurrent or lifelong disorders. In the World Health Organization International Classifications of Diseases, tenth revision (ICD-10) [23], health conditions such as diseases and disorders are classified, including the chapter Diseases of the musculoskeletal system and connective tissue (XIII), which includes dorsopathies such as low back pain, arthropaties such as gonartrosis, and soft tissue disorders. Throughout this thesis the term musculoskeletal disorder is used, and refers to pain, disease or conditions in the musculoskeletal system.

In addition, a frequently used term in this context is musculoskeletal pain [24]. The International Association for the Study of Pain (IASP) defined pain as *"an unpleasant sensory and emotional experience associated with actual or potential damage or described in terms of such damage"* [13]. Chronic, or persistent, pain has been defined as pain for more than 3 months [2], a definition also used in this thesis. For the purpose of this thesis, musculoskeletal is defined as *"of, relating to, or involving both musculature and skeleton"* [25]. Musculoskeletal pain is a known consequence of repetitive strain, overuse, and work-related musculoskeletal disorder, including a variety of disorders that cause pain in bones, joints, muscles or surrounding structures, and can be acute or chronic, focal or diffuse [11]. Musculoskeletal pain is in this thesis considered a consequence of and closely

associated with a musculoskeletal disorder [10, 11], but also as a disorder in itself, such as low back pain or neck pain [12].

Prevalence and impact on the individual

The consequences of musculoskeletal disorders on the individual needs to be considered in terms of the problems associated with them, i.e. the pain or physical disability related to the musculoskeletal system, as well as in relation to the cause such as joint or bone disease or trauma [26]. One way of addressing these consequences is by using the World Health Organization International Classification of Functioning, Disability and Health (ICF) [5]. The aim of the ICF is to provide a standard language and framework for the description of health and health-related states. Health has been defined as *"a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity"* [7]. In ICF the term functioning refers to all body functions, activities and participation, and disability is considered an umbrella term for impairments, activity limitations and participation restrictions [5].

There is recent evidence of musculoskeletal disorder being highly prevalent and the socio-economic impact and burden of these conditions is evident [18, 19]. The global point prevalence of musculoskeletal disorders has been reported for low back pain (9.4%), neck pain (4.9%), osteoarthritis (hip and knee) (3.8%) and for other musculoskeletal disorders (8.4%) [12]. In order to estimate the global burden of various conditions and diseases such as musculoskeletal disorders, the measurement years lived with disability (defined as any short-term or long-term health loss other than death) has been used [19]. A recent study including 188 countries presents that musculoskeletal disorders constitute some of the leading causes of years lived with disability [18]. Low back pain was found to be the leading cause, and neck pain and other musculoskeletal conditions amongst the top ten causes. These musculoskeletal disorders have been leading causes for disability for the last twenty years [18]; however, the global burden of years of living with disability due to a musculoskeletal disorder has increased by approximately 45% from 1990 to 2010, for both males and females. The reason for this increase has been suggested to be population growth and ageing [12]. Taking into account death and disability, musculoskeletal disorders are the fourth greatest burden on the health of the world's population, accounting for 6.7% of the total global disability-adjusted life years [18, 19].

Pain due to musculoskeletal disorders is very common in the population worldwide, with studies reporting point prevalence between 48-53% [2, 24, 27]. A systematic review showed that the 1-month prevalence of moderate-to-severe

non-cancer chronic pain in Europe was approximately 19% [28]. The natural history for many patients with musculoskeletal disorders such as low back pain and neck pain is believed to be spontaneous recovery; however, research has shown that in many cases recurrence is common, as well as the development of chronic pain [29-31], and can often become long-term conditions [32].

Pain due to musculoskeletal disorders has been found to be strongly associated with symptoms such as deficient energy and muscular discomfort [33] and often results in disability, which limits daily life [24, 33, 34]. Additionally, patients with chronic pain have been found to experience a high level of disability, often affecting work ability [2, 27, 35, 36] and increasing the probability for receiving disability pension or being unemployed [27]. Pain due to musculoskeletal disorder has also been found to negatively influence health-related quality of life [27, 37, 38]. Health-related quality of life has been defined in various ways. In this thesis, the following definition is used: *"Health-related quality of life is the value assigned to duration of life as modified by the impairments, functional states, perceptions, and social opportunities that are influenced by disease, injury, treatment, or policy"* [39, p. 22]. Chronic pain has also been shown to significantly impact personal relationships, to be associated with depressive symptoms [28] and with co-morbidities such as anxiety, depression, and decreased physical and mental functioning [40].

Pain due to musculoskeletal disorder in the general population is costly. Estimated total cost of patients with a diagnosis related to non-cancer chronic pain in Sweden has been estimated to approximately 30 billion EUR, almost 10% of the gross domestic product [36]. Most costs have been found to be associated with loss of production due to sick leave or early retirement, rather than direct health-care costs [12, 36].

Standard practice management of musculoskeletal disorders

Musculoskeletal disorders are one of the main reasons why individuals consult primary care, thereby placing a significant burden on the healthcare system [9]. It has been reported that 25% of the registered population consulted primary care with a musculoskeletal disorder at least once during the course of a year [41]. Research shows that between 14% and 30% of consultations in primary care are due to musculoskeletal disorders [9, 41-44] making this the second leading reason for consulting a general practitioner [44].

Patients with musculoskeletal disorders are managed by healthcare professionals from primary care as well as specialist care; however, there are difficulties in selecting the patients that are appropriate for interventions such as surgery, as well as selecting the appropriate specialist [45]. It has been reported that in Canada, one fifth of all patients with musculoskeletal disorder are referred to a specialist, the most common being orthopaedic surgeons [9]. In most countries, including Sweden, it is still standard practice for patients to be referred to an orthopaedic surgeon in a hospital for consultation, further management and, possibly, orthopaedic procedures, and waiting times for orthopaedic consultation are long [46]. Patients are referred for advice on non-surgical as well as surgical management [47]. However, only a small number of patients, 40% or less [47-52], are appropriate for orthopaedic intervention (e.g. surgery). When it comes to selecting patients that are appropriate for orthopaedic intervention, in this thesis and in the included papers, the term selection accuracy for orthopaedic intervention is used. Other papers have used the terms conversion rate [53], surgery rate [47], or appropriateness for orthopaedic intervention [54, 55]. A study of person visit rate to orthopaedic surgeons reports of 35 visits per 1,000 population, resulting in a surgery rate of 12 surgeries per 1,000 population, out of which half was for arthritis and related conditions [47]. In addition, a study of patients with osteoarthritis referred to orthopaedic specialist for consideration for total joint replacement reports that only 50% of patients had a total hip replacement and only 33% had a total knee replacement [52]. Many patients are instead in need of conservative management, such as self-care and knowledge about how to control their own symptoms [56]. However, in one study of patients with osteoarthritis referred to an orthopaedic specialist, only 42% received information about osteoarthritis, 35% about pain management, and 43% about exercise [57], indicating a problem in the management of patients with musculoskeletal disorders.

Physiotherapists have been working at the primary care level, for the last three decades [58, 59], and are managing a large proportion of patients with musculoskeletal disorders, and physiotherapy management such as exercise therapy or other conservative treatments are recommended for many musculoskeletal disorders such as osteoarthritis [60] and low back pain [61]. Additionally, physiotherapists in many countries have taken on a new role as primary contact practitioners, through direct access, i.e. patient self-referrals [3, 4], with physiotherapists being able to assess, diagnose, treat, and in some cases even to refer onward to other specialities (e.g., x-ray/ultrasound/specialists) [3]. A systematic review showed that physiotherapy by direct access compared with referred physiotherapy was associated with improved patient outcomes and decreased cost,

without any evidence of harm [62]. This was confirmed in a study by Ludvigsson and Enthoven [63], where it was reported that physiotherapists working as the primary assessor (i.e. direct access) identified all patients with a serious underlying medical problem at the initial consultation. Additionally, Childs et al [64] explored physiotherapists' knowledge in managing musculoskeletal disorders in corroboration with existing clinical studies, and reported that experienced physiotherapists had higher levels of knowledge in managing musculoskeletal disorders than medical students, physician interns and residents, and all physician specialists except orthopaedists.

The number of people suffering from musculoskeletal disorder throughout the world is expected to increase considerably over the coming decades, further increasing the burden on healthcare systems [12]. Consequently, there is a challenge to provide good quality care for the increasing group of patients in need of orthopaedic consultation and management [65]. One way to address this challenge is to develop new models of care for patients referred for orthopaedic consultation; models which must be accessible and efficient, and use the best level of care without compromising safety or quality of care [66].

Physiotherapist-led orthopaedic triage

It has been suggested that best practice can be achieved when the patient consults the most appropriate healthcare professional [67]. Efforts have been made to this end, for instance by extending existing roles of healthcare professionals [44] and creating primary care musculoskeletal interface services where healthcare professionals are allowed to work flexibly across traditional boundaries [68].

Medical triage has been defined as *"the process of deciding which patients should be treated first based on how sick or seriously injured they are"* [25]. Triage has primarily been used face-to-face in emergency medicine [69, 70]; however, triage has also been used in telephone triage to reduce inappropriate attendance at the emergency departments [71, 72]. In addition, the use of triage has been transferred to primary care, and is mostly performed as telephone triage by nurses, with the aim of directing patients to the appropriate healthcare professional [73-75].

One of the first papers reporting on physiotherapist-led triage of patients with various musculoskeletal disorders in an outpatient department in the United Kingdom was published by Weale and Bannister [50]. Since then, orthopaedic [76] or musculoskeletal triage [77, 78] conducted by physiotherapists has been

developed into a model of care, which has been explored predominantly in the United Kingdom, Australia and Canada [79-88]. When exploring triage in physiotherapy, Morris et al [87] have described that the word triage has a variety of meanings, descriptions and definitions, and is applied in different ways in different healthcare settings. Triage was found to take place in various settings such as outpatient clinics, in primary and secondary care. One model of triage, the triage model of interprofessional care, has been described by Aiken et al [89] as *"using other healthcare professionals to perform preliminary assessments of patients, to triage patients for physician assessment, and to perform conservative management of those patients who require it before they are seen by the physician"*. The aims of physiotherapist-led orthopaedic triage have been addressed to target areas of high demand such as long waiting times, and to enhance effectiveness and best care/practice, i.e. timely access to the right care from the appropriately qualified healthcare professional who can direct patients towards the optimal management pathway [46, 90].

However, there is a lack of consistency throughout the body of research concerning the definition and the process of the physiotherapist-led orthopaedic triage; such as activities included in the triage and the competence or knowledge of the physiotherapist who is performing the triage [90, 91]. In addition, there is a lack of models of physiotherapist-led orthopaedic triage in Sweden. Due to these aspects there has been a development of terms used in the research in this field, as well as the research in this thesis, during the last decade. The term initially used for the model of care, physiotherapy screening, has had to be adjusted according to the existing literature, and is therefore labelled differently in the papers included in this thesis, but is throughout this thesis called physiotherapist-led orthopaedic triage. The term screening was abandoned because it did not fully describe the intervention, and the term triage was found to be a better fit. Orthopaedic triage is throughout this thesis used synonymously with musculoskeletal triage.

Physiotherapists working in an advanced or extended role

The nomenclature for physiotherapists working with orthopaedic triage vary, such as advanced practice physiotherapist (APP) [66, 92], extended scope physiotherapist (ESP) [76, 78], experienced physiotherapists [93], or clinical specialist physiotherapists [94]. The following definitions have been proposed in a position statement by the Australian Physiotherapy Association (APA) [1]:

"Advanced scope of practice - A role that is within the currently recognised scope of practice for that profession, but that through custom and practice has been performed

by other professions. The advanced role requires additional training, as well as significant professional experience and competency development."

"Extended scope of practice - A role that is outside the currently recognised scope of practice and one that requires some method of credentialing following additional training, competency development and significant professional experience, as well as legislative change."

A theoretical framework for advanced practice or extended role development has been lacking for physiotherapists. In nursing, however, the advanced practice role has been developed and researched, and theoretical frameworks for the nursing roles, such as the Participatory Evidence-based Patient Focused Process [95], have been adapted and used also for the development of advanced practice physiotherapist roles, for example in a Canadian orthopaedic and arthritic center [84]. Robarts et al [84] have used this framework to create a model of care, where physiotherapists work in an advanced role in orthopaedic triage, and have a shared orthopaedic foundation with the orthopaedic surgeon, with independent roles as well as some overlapping roles as described in Figure 1.

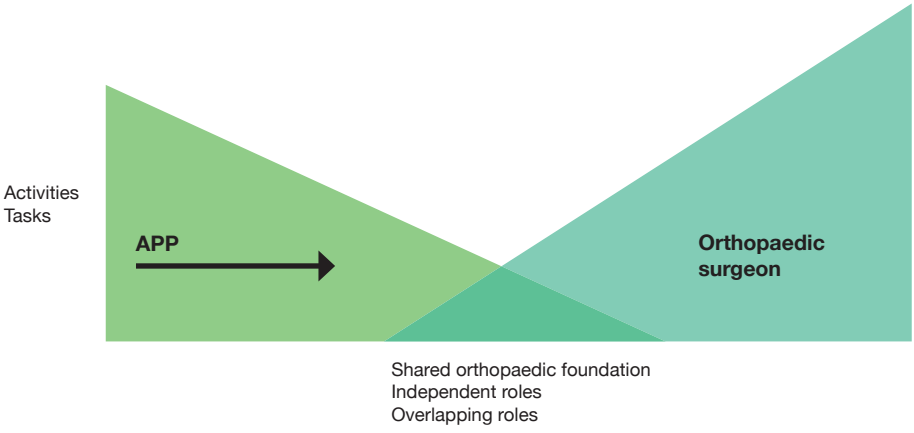

Figure 1. Roles of the advanced practice physiotherapist (APP) and the orthopaedic surgeon. From Robarts et. al. [p. 71, 84]. Reprinted with permission from the author.

The majority of posts where physiotherapists work in an advanced [66] or extended scope [91] have developed in an ad hoc fashion due to local demands, and therefore there are difficulties in defining this "new" role for the physiotherapists. The physiotherapist working in an advanced or extended scope of practice has primarily worked in secondary care (hospital-based) alongside orthopaedic surgeons, but has also moved into primary care, for example in primary care interface services [68].

Considering the lack of framework for this advanced or extended role for physiotherapists, internationally as well as in Sweden, the physiotherapist performing the orthopaedic triage in this thesis can be considered to be working in an advanced practice role.

There are a number of systematic reviews of physiotherapists working in advanced or extended roles. Desmeules et al [66] reported in their systematic review of physiotherapists working in an advanced role in managing patients with musculoskeletal disorders that these physiotherapists could provide equal or better care in comparison to physicians in terms of diagnostic accuracy, treatment effectiveness, use of healthcare resources, costs and patient satisfaction. A systematic review by Stanhope et al [76] explored diagnostic accuracy, costs, waiting times and health outcomes of physiotherapists working in an extended role for orthopaedic outpatients, and reported similar positive findings for all reported outcomes. Oakley et al [78] recently published a systematic review of physiotherapists working in an extended role performing musculoskeletal triage. They concluded that research evidence is supportive of the clinical effectiveness of the physiotherapist role, in terms of diagnostic accuracy of the physiotherapist, and of patient and general practitioner satisfaction with the service provided. However, as all the reviews conclude, the generally low quality of evidence and outcome measures reported prevented firm conclusions to be drawn regarding the health, process and cost implications [66, 76, 78].

The quality limitations of published research notwithstanding, the majority of studies report favourable findings, and there are reports of physiotherapists working in an advanced or extended role, in various settings, having a high agreement or accuracy in diagnosis and treatment approach when compared with orthopaedic surgeons [79, 82, 86, 88, 93, 96-100]. There are also reports of high surgical conversion rates when using physiotherapists for triage: 81% in a spinal unit [101], 89% in a spinal and knee clinic [55], and an average of 74% in physiotherapists working in a primary care setting [102]. Reports of physiotherapists in the role of diagnosing and managing patients show decreased number of referrals for orthopaedic consultation [79, 83, 96, 97], and large proportions (69%–89%) of referrals for orthopaedic consultation were considered appropriate for orthopaedic intervention [54, 55]. Studies evaluating physiotherapists working in advanced or extended roles in the management of spinal patients, reports that the vast majority (up to 90%) of patients were managed independently by the physiotherapists [101, 103]. Furthermore, studies have shown that physiotherapists working in advanced or extended roles have a good ability to assess the need for further investigations [55, 100, 104, 105]. A recent study showed that

referrals for lumbar MRI from physiotherapists working in a spinal service were significantly more likely to have positive findings than referrals from general practitioners as well as spinal surgeons [105]. In another recent study on patients with shoulder pain, the physiotherapist working in an extended scope and the orthopaedic surgeon had a near perfect agreement regarding the need for further investigations for 220 patients [100].

In addition, patients seem to perceive good quality of care with physiotherapists working in advanced or extended roles [83, 88, 92], and studies have reported that patients are either equally [81, 84] or even more satisfied with physiotherapist in this role, than with standard practice [82, 86].

Models of care for physiotherapist-led orthopaedic triage

There is evidence suggesting that physiotherapist-led orthopaedic triage can improve access to care with equal or better outcomes compared with standard practice with regard to waiting times, treatment effectiveness, use of healthcare resources, economic costs, both patient and provider satisfaction, and patient outcomes such as pain and disability [46, 78].

The physiotherapist-led orthopaedic triage in this thesis was performed in a primary care setting. The interest in developing new models of care, such as transferring care from hospitals into community and primary settings has escalated internationally [44], as has the interest in developing the role of specialist practitioners as a way of meeting the demand for enhanced primary care services. Some models are still hospital-based such as the Orthopaedic Physiotherapy screening clinic and Multidisciplinary Service (Queensland) [106] and the Physiotherapy-led triage clinic [85] in Australia. Others function in a primary or interface setting, such as the Musculoskeletal Clinical Assessment and Treatment Services [107], the Target Early Access to Musculoskeletal Services [108], and the Clinical specialist physiotherapy-led musculoskeletal triage clinics [94], all in the United Kingdom.

Hussenbux et al [109] recently published a systematic review on management pathways for musculoskeletal disorders, especially pertaining to the Musculoskeletal Clinical Assessment Treatment Service model as well as physiotherapist-led triage. The authors reported that physiotherapists working in these models of care appropriately manage and suitably refer patients, with a reduction in waiting times and high patient satisfaction. In addition, the review indicated improved efficiency of secondary care management pathways for orthopaedic patients. Recent research has reported large proportions of patients being independently managed by physiotherapists in orthopaedic triage clinics [94],

and has suggested that they are likely to be highly cost-effective [106]. Another recent systematic review by McEvoy et al [46] provided an overview of various models of triage for patients with spinal complaints, and reported that despite the heterogeneous literature, triage undertaken by physiotherapists appears to be a viable pathway to reduce unnecessary waiting times, improve access to effective care options, and improve health and cost outcomes. However, both systematic reviews concluded that due to the scarcity of high-quality studies, the scientific evidence for the effectiveness of this model of care remains limited, [46, 109].

Quality of care

Patient perception of quality of care

Quality of care has various definition but one that has been widely accepted is the one proposed by the American Institute of Medicine [17]: *"The degree to which health services for individuals and populations increase the likelihood of desired health outcomes and are consistent with current professional knowledge."* The participation by patients in healthcare decisions has been promoted for a long time by the World Health Organization and many other organisations [110]. It has been suggested that patients' perceptions of what constitutes quality of care are formed by their encounters with an existing care structure, and by their norms, expectations, and experience [111]. Patients' reports of their experience are increasingly recognised as one of the pillars of quality in health care, along with clinical effectiveness and patient safety [17, 112, 113], and the importance of patients' views in evaluating their health care is recognised in quality assessment and improvement efforts [6, 114]. Patient experience has been found to be positively associated with patient safety and clinical effectiveness for a range of disease areas, settings, and health outcomes [115].

Patient satisfaction can be considered as the patient-reported evaluation of the experience, process or outcome [16]. Patient satisfaction is a multidimensional but often poorly defined concept, centred on the subjective experiences of patients [116]. Satisfaction can be influenced by a number of key components such as patient expectations, characteristics and psychosocial determinants [116], as well as the patients' biopsychosocial needs [117]. Additionally, it has been suggested that satisfaction should be addressed using various components, such as technical and interpersonal aspects of care as well as accessibility of care [116], later described as the "Three A's: Ability (technical competence of the healthcare professional), Affability (interpersonal manner of the healthcare professional)

and Accessibility (physical access) [118].

Expectation is defined in this thesis as a belief that an event will occur [6]. Expectation also involves the patient's beliefs about the potential benefit of the treatment, i.e. positive or negative outcome [119], is likely to vary according to knowledge and prior experience, and has been found to influence satisfaction [116]. Expectations have also been associated to patients' assessment of outcome of surgery in general [120] as well as postoperative satisfaction in orthopaedic surgery [121-126]. Considering that expectations can influence postoperative satisfaction it has been emphasised that patients should be extensively informed and to a higher extent participate in decision making [127].

Assessing quality of care

The most frequent indicator of the quality of medical care has been the outcome, in terms of recovery, restoration of function, and survival [128], i.e. addressing the domains of effectiveness and safety. However, Donabedian [129] has described a three-dimensional model for assessing the quality of care consisting of Structure, Process and Outcome. *Structure* refers to attributes of the setting in which care occurs and includes material, human resources and organisational structure. *Process* concerns what is done in giving and receiving care, such as the technical knowledge of the healthcare provider, as well as the interpersonal relationship between the provider and the patient (information, communication, involvement in decision-making). *Outcome* stands for the effects on patients' health status, including knowledge as well as behaviour and satisfaction.

Patient-reported outcomes are important to gain information about patients' views on the outcome of a treatment [130]. To systematically record these outcomes, patient-reported outcome measures (PROMs) are used. PROMs are standardised, validated questionnaires, self-reported by patients to measure their perceptions of their functional status and wellbeing [15]. The most common areas for PROMs are disease symptoms (occurrence and/or severity); functional ability; and health status/health-related quality or life, and PROMs can be either disease/site specific or generic (broad range) [15].

The concept of patient-reported experience measures (PREMs) is used to understand patients' views of the process of care, frequently measured through patient satisfaction or patient experience [14]. Patient-reported experience measures can be divided into experiences (reports of the health care received) and satisfaction (evaluations of their experience), both of the structure (e.g. access to services and convenience of localities) and/or the process (e.g. medical encounters and information) [131-133].

RATIONALE FOR THE THESIS

The number of people suffering from musculoskeletal disorders throughout the world is expected to increase considerably over the coming decades, further increasing the burden from musculoskeletal disorders on health care systems [12]. There is an increasing demand to provide health care that is safe, yet fast and efficient in terms of management, and to use the most appropriate healthcare provider. In most countries, including Sweden, it is still standard practice for patients with musculoskeletal disorder to be referred to an orthopaedic surgeon for consultation and management, and waiting times for orthopaedic consultation are long [46]. There is a need for a change in approach, and alternative models of care such as physiotherapist-led orthopaedic triage, have been explored predominantly in the United Kingdom, Australia and Canada [79-88]. All in all, there is a vast body of research on physiotherapist-led orthopaedic triage, with the majority of studies reporting favourable findings. However, the supporting evidence is generally of low methodological quality, and the concept remains difficult to study due to considerable variations internationally in the parameters of the roles, and of the model of care [76, 91]. In addition, patient-reported outcome measures are rarely used. Physiotherapist-led orthopaedic triage needs to be evaluated systematically, using standardised outcome measures, including both PROMs and PREMs [76]. Particularly, evaluating patients' perceptions is essential to any new role that involves a shift in traditional scope of practice [134]. Additionally, considering differences amongst national healthcare systems, studies need to be conducted in each respective country [76]. Therefore, there is a need to evaluate physiotherapist-led orthopaedic triage in a Swedish primary care context using a study design of high methodological quality, with outcome measures such as management pathways as well as patient-reported outcomes and experiences. Moreover, there is an increasing need for better definitions and improved understanding of patients' expectations of orthopaedic procedures [135]. Increased understanding of patient views is important so that orthopaedic assessments, regardless of who performs them, can be further developed to meet patient needs.

AIMS

The overall aim of this thesis was to evaluate physiotherapist-led orthopaedic triage in primary care in comparison to standard practice for patients with musculoskeletal disorders in Sweden.

Specific aims were:

- To evaluate a physiotherapist-led orthopaedic triage compared with standard practice in primary care, using the primary outcome selection accuracy for orthopaedic intervention, and the secondary outcomes other referrals, waiting time, and patient-perceived quality of care.
- To evaluate patients' perceived quality of care in a physiotherapist-led orthopaedic triage in primary care compared with standard practice. Additionally, to evaluate outcome-related aspects: whether patients' expectations were met, and patients' intentions to follow advice and instructions.
- To report a long-term follow-up of patient-reported health-related quality of life, pain-related disability, and sick leave after a physiotherapist-led orthopaedic triage in primary care compared with standard practice.
- To explore patients' perceptions and expectations of an upcoming orthopaedic consultation.

METHODS

Study design

An overview of the studies is presented in Table 1. In **Study A**, comprising papers I-III, a randomised controlled research design was used. The findings from this trial were reported according to the Consolidated standards of reporting trials (CONSORT) 2010 guidelines for reporting parallel group randomised trials [136]. The design used in **Study B**, presented in paper IV, was an explorative qualitative research design with an inductive approach. To strengthen rigour and comprehensiveness, the study was conducted and reported according to the Consolidated criteria for reporting qualitative research (COREQ) checklist [137].

Setting and participants

For **Study A** (Paper I-III) patients referred for orthopaedic surgeon consultation at a primary healthcare centre in Region Västra Götaland were consecutively recruited from August 2009 until January 2011. Region Västra Götaland is Sweden's second largest county council, providing healthcare services to approximately 1.6 million people in western Sweden. At the time of this study, a visiting orthopaedic surgeon was at the healthcare centre approximately two days per month. Patients were included using the following inclusion criteria: working age (between 18 and 67 years of age), sub acute (four weeks to three months) or chronic (> three months) pain due to musculoskeletal disorder, and the ability to understand written and spoken Swedish. Exclusion criteria were chosen in collaboration with the orthopaedic surgeon in the study. Patients were excluded if the stated diagnosis on the referral was hallux valgus, ganglion or trigger finger, where the general practitioners were assumed to have high accuracy in diagnosis. In total, 203 patients were included in **Study A**. A flow chart describing the inclusion process is presented in Figure 2. Participant characteristics are presented in Table 2. In Paper I and III there were no significant differences between the two groups with regard to demographic characteristics at baseline. In Paper II there were no significant baseline differences between the two groups at baseline with the exception of age; participants in the standard practice group were significantly older.

Table 1. Overview of the studies and papers included in the thesis

	Study A			**Study B**
	Paper I	Paper II	Paper III	Paper IV
Study design	Randomised controlled trial	Randomised controlled trial	Randomised controlled trial	Explorative qualitative study
Participants	Patients referred for orthopaedic consultation in primary health care (n=203).	Patients referred for orthopaedic consultation in primary health care (n=203) and who responded to the questionnaire Quality from the patient perspective (QPP) (n=163).	Patients referred for orthopaedic consultation in primary health care (n=203).	Patients referred for orthopaedic consultation in primary health care (n=13).
Aims	To evaluate a physiotherapist-led orthopaedic triage in primary care compared with standard practice.	To evaluate patients' perceived quality of care in a physiotherapist-led orthopaedic triage in primary care compared with standard practice. Additionally, to evaluate outcome-related aspects: whether patients' expectations were met, and patients' intention to follow advice and instructions.	To report a long-term follow-up of patient-reported health-related quality of life, pain-related disability, and sick leave after physiotherapist-led orthopaedic triage in primary care compared with standard practice.	To explore patients' perceptions and expectations of an upcoming orthopaedic consultation.
Methods	Patients were randomised to physiotherapist-led orthopedic triage or standard practice. Outcome measures: selection accuracy for orthopaedic intervention and other referrals, patients' perception of quality of care, waiting time.	Patients were randomised to physiotherapist-led orthopaedic triage or standard practice. Patient-reported experience measure: the QPP questionnaire; the dimensions medical-technical competence and identity-orientation of the caregiver, and fulfilling of expectations and intention to follow advice.	Patients were randomised to physiotherapist-led orthopedic triage or standard practice. Patient-reported outcome measures: Pain Disability Index (PDI), and EuroQol-5D (EQ-5D, including EQ VAS), and sick leave (days).	Individual semi-structured interview prior to consultation with an orthopaedic surgeon
Data collection (yr)	2009-2011	2009-2011	2009-2014	2016
Data analysis	Between group comparisons using proportion analysis for selection accuracy and other referrals, Mann- Whitney U test for quality of care and Independent t-test for waiting time.	Between group comparisons using Mann-Whitney U test for quality of care.	Between group comparisons using the marginal logistic regression model (i.e. the generalized estimating equations (GEE) model) of the EQ-5D and PDI (treated as ordinal variables). Linear longitudinal model for the EQ-VAS (treated as a continuous variable). Mann-Whitney U test for sick leave.	Qualitative content analysis according to Graneheim and Lundman, with an inductive approach

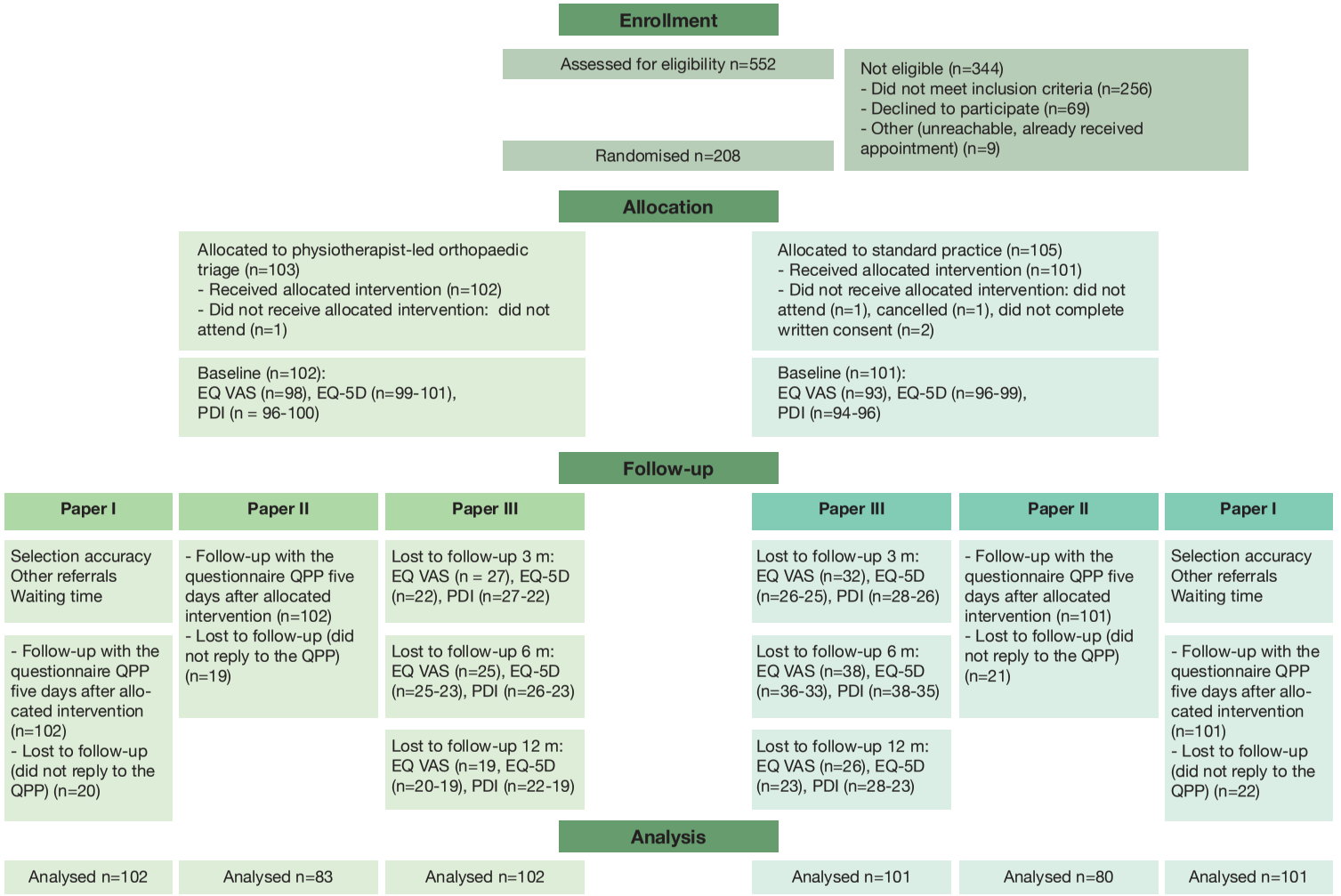

Figure 2. Flow chart describing participants' flow through Study A (Paper I-III). EQ VAS = EuroQol VAS, EQ-5D = EuroQol 5 Dimensions, PDI = Pain Disability Index, QPP = Quality from the Patient's Perspective

Table 2. Participant characteristics Study A (Paper I-III)

	Physiotherapist-led orthopaedic triage (n=102) n (%)			**Standard practice (n=101)** n (%)		
	Paper I (n=102)	Paper II (n=83)	Paper III (n=102)	Paper I (n=101)	Paper II (n=80)	Paper III (n=101)
*Age (years)**						
Mean	51	51	51	53	55	53
Range	18-67	18 - 67	18-67	21-67	21 - 67	21-67
SD	12.5	10.6	12.5	11.8	12.5	11.8
Sex						
Male	45 (44)	38 (46)	45 (44)	45	36 (45)	45 (45)
Female	57 (56)	45 (54)	57 (56)	56	44 (55)	56 (55)
Civil status						
Married/living together	82 (80)	69 (83)	82 (80)	86	73 (91)	86 (85)
Single/living alone	16 (16)	14 (17)	16 (16)	14	7 (9)	14 (14)
Country of birth						
Sweden	93 (91)	81 (98)	93 (91)	92 (91)	76 (95)	92 (91)
Other	5 (5)	2 (2)	5 (5)	8 (8)	4 (5)	8 (8)
Education						
Elementary school	11 (11)	10 (12)		23 (23)	19 (24)	
Upper secondary school	48 (47)	38 (46)		47 (47)	33 (41)	
University	39 (38)	35 (42)		30 (30)	28 (35)	
Occupation						
Working	71 (70)	61 (73)	11 (11)	70 (69)	53 (67)	23 (22)
Student	2 (2)	2 (2)	48 (47)	3 (3)	2 (2)	47 (47)
Other	25 (25)	20 (24)	39 (38)	27 (27)	25 (31)	30 (30)
Pain location on referral						
Cervical			7(7)			8 (8)
Thoracic			2 (2)			0
Lumbar			18 (17)			15 (15)
Shoulder			13 (13)			14(14)
Arm/Wrist/Hand			12 (12)			16 (16)
Hip			12 (12)			9 (9)
Knee			21 (20)			30 (30)
Leg/Ankle/Foot			15 (15)			6 (6)
Other			2 (2)			3 (3)
Duration of symptoms						
Subacute			18 (18)			14 (14)
Chronic			75 (73)			70 (69)
Missing			9 (9)			17 (17)

* indicates a statistically significant difference between groups for participants in paper II (p=0.036). Analyses were made with Independent t-tests or chi-squared tests. The level of statistical significance for all tests was set to p<0.05.

For **Study B** (Paper IV) patients referred for orthopaedic consultation (n=13) were recruited from two primary healthcare centres in Region Västra Götaland during February to July 2016. A purposeful sampling strategy was used [138], with the aim of obtaining a variation in gender, age and pain locations for referral. Inclusion criteria were the same as for Study A: patients of working age (18-67 years) with sub acute (four weeks to three months) or chronic (> three months) pain due to musculoskeletal disorder, who were referred for orthopaedic consultation, with the ability to understand and speak Swedish. Patients were excluded if the stated diagnosis on the referral was hallux valgus, ganglion or trigger finger. In total 23 patients were asked to participate out of which thirteen patients (10 women, 3 men) accepted participation. Participant characteristics are presented in Table 3. Their mean age was 51 years (range 33-62 years). Five patients were unreachable and four patients declined to participate, for unknown reasons. One patient accepted participation but was then not possible to reach, neither at the time for interview nor a few days later.

Table 3. Participant characteristics (sorted by age) Study B (paper IV)

Gender	Age	Profession	Education	Pain location on referral
Man	33	Electrician	High school	Knee
Woman	35	Assistant nurse	High school	Upper back
Woman	47	Baker	High school	Shoulder
Woman	49	Office worker	High school	Neck
Woman	50	Shop assistant	2 year high school	Arm/hand
Woman	50	Postman	2 year High school	Neck
Woman	51	Office worker	High school	Knee
Woman	52	Orderly	Elementary	Knee
Woman	55	Assistant nurse	High school	Knee
Woman	57	Nurse	University	Foot
Man	59	Truck driver	Elementary	Hip
Man	62	Oil platform worker	High school	Knee
Woman	63	Teacher	University	Knee

Procedures (Study A)

According to standard practice at the healthcare centre, patients with musculoskeletal disorders were referred by general practitioners for orthopaedic consultation. Patients could also be referred by physiotherapists at the centre, or could request a consultation at their own request. All paper referrals were screened for eligibility for inclusion by an administrator at the primary healthcare centre. Block randomisation with a 1:1 allocation and block sizes of 20 were used to ensure an equal allocation ratio [136]. The administrator mixed sealed, opaque envelopes containing details of the allocated group and put them in a box. After receiving verbal consent for participation, the administrator randomised the patient by drawing the next envelope from the box. Due to the nature of the intervention, it was not possible to blind therapists and participants to their group allocation. The participants were randomised to either physiotherapist-led orthopaedic triage or standard practice. The physiotherapist-led orthopaedic triage comprised an assessment and triage by a specialist physiotherapist, and can be considered an interface between the general practitioner and the orthopaedic surgeon. Standard practice comprised a consultation with an orthopaedic surgeon.

Physiotherapist-led orthopaedic triage

The physiotherapist did not receive any training specific for this trial. She had specialist training in the form of postgraduate education, including a master's degree in manipulative therapy, one year of mentored clinical practice within the scope of orthopaedic manual therapy (OMT) and eight years of clinical experience in primary care, four of which were within the scope of OMT. The duration of the physiotherapist consultation was up to 60 minutes with the main aims of diagnosing and determining the most appropriate management pathway. The participants received advice and/or exercises when needed. Management pathways consisted of one or more of the following: further investigation (i.e. x-rays, MRI) via the participant's general practitioner; orthopaedic surgeon consultation (i.e. appropriate candidate for orthopaedic intervention); back to the participant's general practitioner; or, if conservative management with on-going support was needed, referral to physiotherapy or occupational therapy. If patients were found to be appropriate candidates for orthopaedic intervention, the physiotherapist had the authority to make an appointment for the participant for an orthopaedic surgeon consultation at the primary healthcare centre, without consideration of the waiting list. This was done to avoid prolonged waiting time to orthopaedic surgeon consultation for participants considered appropriate for orthopaedic

intervention compared with standard practice. Referrals for further investigations were requested and sent via the participant's general practitioner, and the reports could be assessed together with the orthopaedic surgeon if needed. One or two optional follow-up visits were offered when needed, for example follow-up after treatment or investigations.

Standard practice

The orthopaedic surgeon had 26 years of experience in orthopaedic medicine, 21 of which were as an orthopaedic specialist. The duration of the orthopaedic surgeon consultation was 15 minutes, with the main aims of diagnosing and determining the most appropriate management pathway. The participants received advice, prescriptions or injections when needed. Management pathways consisted of one or more of the following: further investigation (i.e. x-rays, MRI), orthopaedic intervention (i.e. minor surgery at the present healthcare centre); referral to orthopaedic clinics for orthopaedic intervention (i.e. appropriate candidates for surgery); back to the participant's general practitioner; or, if conservative management with on-going support was needed, referral to physiotherapy or occupational therapy. One or two optional follow-up visits were offered when needed, for example follow-up after investigations.

Procedures (Study B)

Administrators at the two primary healthcare centres screened all paper referrals for orthopaedic surgeon consultation for eligibility for inclusion. Eligible patients were sent a letter with information about the study and were contacted by telephone approximately five days later, and invited to participate. If the patient accepted participation, an appointment for the interview was made. The participant chose the location for the interview. Nine of the interviews were held in a room at one of the healthcare centres, and four were conducted via telephone.

Data collection and outcomes measured

Participant demographics

For **Study A** demographic data (age, sex, nationality, education, family, work status, pain location on the referral, and duration of symptoms) were collected to describe the study population and to determine any differences between

the groups at inclusion. For **Study B** demographic data on age, sex, profession, education and pain location on referral were collected during the interviews to describe the study population.

Management pathways (Paper I)

Selection accuracy (described in Figure 3), i.e. the accuracy in selecting patients appropriate for orthopaedic intervention (e.g. surgery), was defined in the physiotherapist-led orthopaedic triage group as the ratio (a) between the number of patients considered appropriate for orthopaedic intervention by the orthopaedic surgeon (y_1) and the number of patients selected by the physiotherapist for orthopaedic surgeon consultation (x_1) ($a=y_1/x_1$). In the standard practice group, selection accuracy was defined as the ratio (b) between the number of patients considered appropriate for orthopaedic intervention by the orthopaedic surgeon (y_2) and the number of patients referred by the general practitioners for orthopaedic surgeon consultation (x_2) ($b=y_2/x_2$). To address the possibility of selection inaccuracy or patient dissatisfaction with the physiotherapist-led orthopaedic triage, data also were collected on the number of patients where the physiotherapist could not find any reason for orthopaedic surgeon consultation, but where the patient still requested a consultation. The number of referrals from the orthopaedic surgeon for further investigation or orthopaedic intervention for these patients was collected. The number of patients in either group who re-visited their general practitioner at the primary healthcare centre for the same problem within six months following the assessment also was collected.

Other referrals were defined as the number of patients who were referred onward from the physiotherapist-led orthopaedic triage or the orthopaedic surgeon consultation for further investigation (i.e. x-rays, MRI); back to the participant's general practitioner; or, to physiotherapy or occupational therapy.

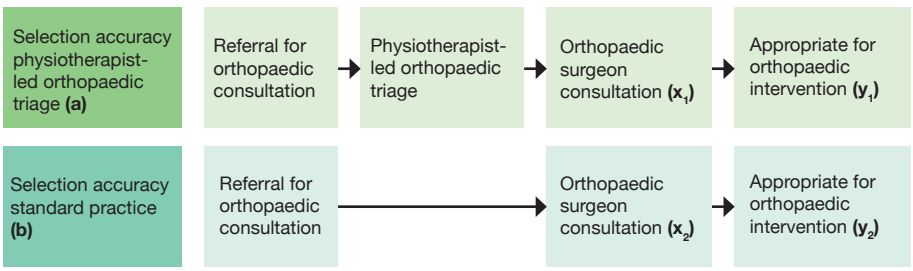

Figure 3. Description of the primary outcome measure; selection accuracy for orthopaedic intervention, for the physiotherapist-led orthopaedic triage and the standard practice group, respectively.

Waiting time (Paper I)

Waiting time was measured from the day of the referral until the day of consultation with either the physiotherapist or the orthopaedic surgeon. There was an administrative delay of approximately five to seven days for each participant.

Sick leave (Paper III)

Sick leave was measured as the total number of net days off work (number of days multiplied by the percentage off work) registered at the Swedish Social Insurance Agency. This was measured for the 12 months following the day of consultation and only sick leave due to the musculoskeletal disorder or diagnosis that originated the referral for orthopaedic consultation was registered. Data was collected in collaboration with the Swedish Social Insurance Agency.

Patient-reported experience measure (Paper I, II)

The patient-reported experience measure Quality from the Patient's Perspective (QPP) was used to assess patients' perception of quality of care. The QPP was, as per the choice of the participant, sent either by mail or as an online survey approximately five days after the consultation. Up to two reminders were sent. To reduce risk of bias, an independent administrative company, ImproveIT (Halmstad, Sweden), managed distribution and administration of the questionnaires.

The QPP is a self-administered Swedish questionnaire, developed using a grounded theory approach and consisting of items formulated in words used by patients [111]. The QPP is based on the assumption that patients' perception of quality of care may be considered in four dimensions: caregivers' medical-technical competence; care organisations' physical-technical conditions; degree of identity-orientation in the caregivers' attitudes and actions; and the care organisations' socio-cultural atmosphere [139]. Each item is evaluated in two ways using a 4-point Likert scale; first the patients rate how they perceive the quality of care (PR; perceived reality); "This is what I experienced…", ranging from 1 (do not agree at all) to 4 (completely agree). The patients then rate how important that aspect of care is (SI; subjective importance); "This is how important it was to me…", ranging from 1 (little or no importance) to 4 (of the very highest importance). Each item also has a "Not applicable" response option. The dimensions care organisations' physical-technical conditions and socio-cultural atmosphere were considered to be outside the scope of this thesis since they were the same for both groups (same healthcare centre).

The questionnaire has been psychometrically tested [140, 141] and validated in different settings and for various diagnosis and found both reliable and valid

[139, 142, 143]. The short version of the questionnaire vas tested and found to be reliable (modest yet acceptable), as well as valid compared with the original QPP [144]. The short version was used for this study, with minor modifications to include the physiotherapist and the orthopaedic surgeon.

In Paper I the primary outcome was management pathways, and therefore only one item from the QPP was presented: ”Do you feel any hesitation about attending this healthcare centre for future care?”, (with the response options ”yes, a lot of hesitation”, ”yes, quite a lot of hesitation”, “yes, some hesitation”, “no, no hesitation”, “don’t know”). This item was chosen since the patients’ self-reported hesitation to re-visit the same healthcare provider has previously been found to co-vary with the patients’ quality experience as a whole [139].

The outcomes in Paper II were the following two dimensions of the QPP: *medical-technical competence* (one item) and *identity-orientated approach* (seven items). Additional outcomes were two items from the QPP measuring outcome-related aspects: “Will you follow the advice and instructions that you have now received from the physiotherapist/orthopaedic surgeon?” (response options rated on a 3-point Likert scale ranging from 1 (No) to 3 (Yes, completely), or Not applicable (Don’t know or I have not received any advice or instructions)), and “To what extent were your expectations of the treatment met?” (response options rated on a 5-point Likert scale ranging from 1 (Not at all) to 5 (To a very large extent)).

Patient-reported outcome measures (Paper III)

Patient-reported outcome measures were distributed to the patients at the reception desk prior to the consultation at the primary healthcare centre, and by post at 3, 6 and 12 months after consultation; up to two reminders were sent.

The European Quality of Life - 5 Dimensions Questionnaire (EQ-5D) was used to assess perceived health-related quality of life [145, 146]. It is a generic, preference-based, self-reported questionnaire consisting of two parts: the descriptive system and the Euroqol visual analogue scale (EQ VAS). The descriptive system comprises five dimensions: mobility, self-care, usual activities, pain, and anxiety/depression with three severity levels: 1 (no problems), 2 (some problems) and 3 (extreme problems). In the second part of the questionnaire, EQ VAS, self-rated health is recorded on a vertical scale with the endpoints 0 (worst imaginable health state) and 100 (best imaginable health state) [147]. Psychometric testing of the EQ-5D has shown the questionnaire to be reliable [148], valid and responsive [149-151], and practical [152] for patients with various musculoskeletal disorders. In addition EQ-VAS has been found to be responsive for patients

with musculoskeletal disorders [153]. The Swedish version of the EQ-5D was used for this study. This version has been translated using forward-backward translation [147].

The Pain Disability Index (PDI) was used to evaluate pain-related disability. The questionnaire is a seven-item inventory, designed to measure self-reported disability on a participation level, due to pain in any pain location (pain-associated disability), suitable for patients with musculoskeletal disorders [154, 155]. Respondents are asked to rate disability on a numeric rating scale ranging from 0 (no disability) to 10 (maximum disability) in the areas family and home responsibilities, recreation, social activity, occupation, sexual behaviour, self-care, and life-support activity. The instrument has been shown to be valid and reliable for patients with musculoskeletal pain [155-157]. The Swedish version of the PDI was used for this study.

The patient-reported outcomes or experiences measured in this thesis could be viewed in terms of Donabedian's three-dimension model [128], as presented in Figure 4.

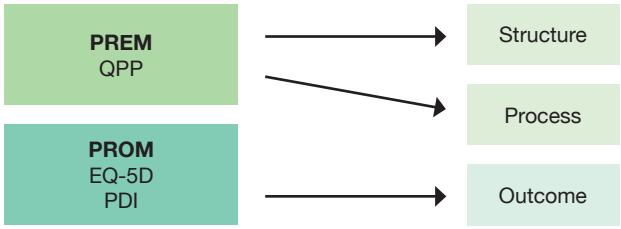

Figure 4. Illustration of the patient-reported outcome measures (PROMs) and patient-reported experience measures (PREMs) used in this study in relation to Donabedian's three quality measures (structure, process and outcome) [128]. QPP = Quality from the Patient's Perspective, EQ-5D = EuroQol 5 dimensions, PDI = Pain Disability Index.

Patients' perceptions and expectations of an orthopaedic consultation (Paper IV)

Semi-structured interviews were conducted during March – July 2016 prior to an orthopaedic consultation. To ensure consistency and reliability of data collection, the same interviewer conducted all interviews. She had postgraduate training in qualitative research methods, previous experience of qualitative research, and clinical experience from treating patients with musculoskeletal disorders. She had no prior relationship with the participants. Her profession as physiotherapist was not disclosed before or during the interviews, unless specifically asked for. Only the interviewer and the participant were present during the interview.

Field notes were made during the interview if needed. Interviews lasted between 19 and 41 minutes (average 27 minutes), were audio-recorded and transcribed verbatim by the researcher performing the interviews, or an administrator.

An interview guide was used to ensure that the topics of interest were covered. The interview guide was developed and discussed until agreed by all authors. The focus of the interview was four domains (presented in Table 4), explored by open questions to understand the participants' perceptions and expectations about the upcoming consultation. When necessary, the open questions were followed by clarifying or exploratory prompts. The interview guide was tested in two pilot interviews, not included in the study, and reviewed and modified thereafter.

Table 4. The interview guide (study IV)

Domains
- Previous experiences of orthopedic consultation (if any); thoughts on participation, outcomes
- Expectations for the upcoming consultation; thoughts on possible interventions, outcomes, fears or hopes
- Perception of their own role; thoughts about participation, decision making
- Perception of the role of the orthopaedic surgeon; thoughts on decision-making, knowledge.
Prompts
- Can you describe/explain further?
- When you said__how did you mean?
- What did you think about that?

Data analysis

Sample size

Sample size for **Study A** was originally calculated based on the trial's main outcome variable management pathway. Calculations for power were made using PROC POWER with a two-tailed test in SAS/STAT® software (SAS Institute Inc. Cary, USA). Sample size was calculated for the variable management pathway where the patients in physiotherapist-led orthopaedic triage or standard practice could be referred to seven different pathways. The calculation was based on the proportion of patients referred to one pathway, where we assumed that the proportion of referrals from the physiotherapist-led orthopaedic triage would be between 20% and 70%. We wanted to know if the proportion of referrals from

the standard practice group was significantly larger or smaller (with a difference of 20%). If the proportion of referrals from the physiotherapist-led orthopaedic triage were to be 40%, and we wanted power of 80%, a total of 194 patients would be required (97 in each group) to detect differences at the $p<0.05$ level. Allowing for dropouts (10%) it was decided to include at least 200 patients, 100 in each group.

To verify that Paper II and III had sufficient power to detect a difference in the outcomes QPP and the EQ-VAS, retrospective power calculations were made. For Paper II, a retrospective power calculation was made based on mean scores for the item "I received the best possible examination and treatment (as far as I can tell)" (range 1-4) from the QPP. A relevant mean difference between groups for items from the QPP has been suggested to be 0.35 [158]. An online calculator from the University of British Columbia, Canada [159] was used. The mean difference for the item was 0.60 units (physiotherapist-led orthopaedic triage mean 3.51 vs. standard practice mean 2.91, SD 0.94). With a sample size of 73 participants in each group (respondents to this particular item) we reached sufficient power (0.97) to detect differences at the $p<0.05$ level.

For Paper III, a retrospective sample size calculation was made based on the mean scores for the EQ VAS at three months. A minimal clinically important change (MCIC) for the EQ VAS has been suggested to be 10.5 units [150]. The same online calculator was used. The mean difference for the EQ VAS at three months was 7.6 (physiotherapist-led orthopaedic triage mean 75.5 vs. standard practice mean 67.9, SD 18.1) and with a sample size of 69 participants in each group (the number of responders to EQ VAS) we reached a power of 69% to detect differences at the $p<0.05$ level.

Statistical analyses

An overview of statistical tests used in this thesis is presented in Table 5. All collected data were analysed using IBM SPSS, version 18.0 (IBM Corp, Armonk, NY, USA) unless otherwise stated. The randomised cohort was analysed on an intention-to-treat (ITT) basis. For data on interval level, parametric tests were used, and for data on ordinal level, or data not normally distributed, non-parametric tests were used. The significance level for all tests was set to $p<0.05$.

Descriptive statistics were used for demographic characteristics, and mean and standard deviations were used to describe the groups. To determine any baseline differences between the groups, data were analysed with the independent samples t-test or the Pearson's chi-square test.

Table 5. Overview of statistical tests used in this thesis

Statistical test	Study I	Study II	Study III
Analysis of Variance (ANOVA)			x
Pearson´s chi-square test	x	x	x
Descriptive statistics	x	x	x
Fisher´s exact test	x		
Independent samples t-test	x	x	x
Linear longitudinal model			x
Mann-Whitney U test	x	x	
Marginal logistic regression model			x
Normal approximation	x		

Between-group comparisons of management pathways were made using proportion analyses with estimated difference (%) and 95% confidence intervals (CI) for the difference. A normal approximation was used when the number of participants exceeded five; otherwise, the Fisher's exact test was used. Minitab® Statistical Software 15 (SAS Institute Inc.) was used for proportion analyses of management outcome. Between-group comparison of sick leave was performed with a Mann-Whitney U test due to the data being skewed.

Between-group comparisons for the QPP data were made using the Mann-Whitney U test, and medians, quartile 1 and 3, and means are reported. The QPP data were collected and registered by Improve IT staff with the KUPPIT[1] software (ImproveIT, Halmstad, Sweden, 2003). Prior to the analysis, the five items of the EQ-5D were dichotomised according to the Euro-Qol User guide [147], where level 1 was dichotomised into 'no problems', and level 2 and 3 were dichotomised into 'problems'. The PDI was dichotomised using the median score at baseline for each item (median=x): Family/home responsibility (3), Recreational (5), Social activity (0), Occupation (2), Sexual behaviour (0), Self-care (1) and Life-support activity (0). The scores were dichotomised into 'median or below', and 'above median'. Data from the EQ VAS were treated as a continuous quantitative variable and analysed with a linear longitudinal model by using PROC MIXED, which yielded beta (regression coefficients) estimates of least square means, which subsequently were analysed for between-group differences with a repeated measure ANOVA. Outcomes of the EQ-5D and the

[1] KUPP is the Swedish name for QPP

PDI were treated as ordinal variables, and were analysed using a marginal logistic regression model (i.e. the generalised estimating equations, GEE, model) and estimated population average odds ratio in SAS for Windows, version 9.3 (SAS Institute Inc.). Odds ratios for binary outcomes were estimated using repeated logistic regression with PROC GENMOD [160, 161].

Missing data analysis (Paper II, III)

Due to the level of missing data being higher than 20% for various items, at various times, missing data analyses were performed.

In Paper II, a between-group dropout analysis was performed using demographic data for those who responded to the QPP vs. those who did not respond after physiotherapist-led orthopaedic triage and after standard practice, respectively. If any differences were found, a within-group analysis was performed for this demographic item. The analysis was performed using an independent t-test or the Pearson's chi-square test.

In Paper III, due to baseline missing data, a dropout analysis was not possible, and therefore a between-group analysis of the respondents was performed. The self-reported health state (EQ VAS) at baseline was chosen as the main outcome variable for this analysis, which was performed using an independent t-test.

Qualitative content analysis (Paper IV)

Qualitative content analysis with an inductive approach was used for analysis of the data, according to the procedure described by Graneheim and Lundman [162].

The unit of analysis was the transcribed text of the entire interview. The audio files were listened to and the interviews were thoroughly read several times in order to obtain a sense of the whole and to get an overview of the content. A systematic data analysis directed by the study aims was then performed, where meaning units were extracted, condensed and coded, while preserving the core. The codes were compared and sorted into sub-categories and categories, which were as internally homogeneous and externally heterogeneous as possible. This part of the analysis was still close to the data and on a descriptive level (manifest content). In the last step of the analysis the underlying meaning (latent content) was interpreted, expanding over all the categories, and an overarching theme was formulated. The computer software NVivo 10 (QSR International Pty Ltd.) was used to support the analysis.

Three researchers performed the analysis in order to provide analyst triangulation and to increase the credibility of the analysis [162]. The lead researcher was

responsible for coding and categorising all interviews, as well as the preliminary formulation of a theme. To verify the coding, three of the interviews were also independently coded by the other two researchers, and discussed to reach consensus on coding strategy. Two researchers discussed the codes, sub-categories and categories until consensus was reached. The third researcher verified content conformity of the categories. Organisation and labelling of the categories were continuously checked and modified throughout the analytical process.

Ethical considerations

The studies in this thesis were conducted according to the ethical principles of the Helsinki Declaration [163]. Oral and written information were provided to all participants in the studies, including information that all data were kept so that no unauthorised person would have access to the material, and that participation was voluntary. Participants gave oral consent upon inclusion, and completed informed written consent prior to consultations or interviews. The participants who were interviewed by telephone stated informed consent orally and were then sent a written consent to sign and return in a prepaid envelope. All data were coded and kept separate from the code key in locked cabinets. Data are stored according to the guidelines of Region Västra Götaland. The Swedish Social Insurance Agency collected participant data on sick leave, and data were collected and stored according to their regulations until data analysis was completed, after which they were destroyed.

Study A was approved by the Regional Ethical Review Board in Gothenburg, Sweden (09.09.09, Reference no: 382-09). Upon enrolling, participants were informed that they could withdraw from the study at any time without any consequences. We were curious to know whether participants would decline participation due to their wanting to consult an orthopaedic surgeon only, and therefore a request to collect reasons for refusal was made to the Ethical Review Board; however it was not approved. Patient fees for consultations with the orthopaedic surgeon were set according to standard procedure. The physiotherapist-led orthopaedic triage was free of charge since this was considered the study intervention, and could potentially mean one additional consultation for the participant. In those cases where the physiotherapist in the study could not find reasons for orthopaedic surgeon assessment, but the participant requested consultation, this was provided for. All results are presented on a group level with no possibility to identify individuals.

Study B was approved by the Regional Ethical Review Board in Gothenburg, Sweden (14.08.13, Reference no: 628-14). Contact information to the patients was destroyed after completion of the interview, and the interviews and transcripts did not include any patient details. Therefore, it was not possible to link transcripts to any individuals, which limited the possibility for participants to request any information, nor withdraw from the study after completion of the interview. This was addressed prior to signing the informed consent, and participants had the opportunity to ask questions. There was little perceived risk of harm. The topic was not considered particularly sensitive; however, the encounter with healthcare personnel can be a vulnerable situation, and some participants told stories about how they felt ignored and uncomfortable in some encounters. Results were presented on a group level and quotes are anonymous to avoid identification of any individual participant.

RESULTS

In this chapter, the main findings from **Study A** (Paper I-III), and **Study B** (Paper IV) are presented. Detailed results are reported in the respective paper. The main findings of **Study A** are presented in Table 6.

Table 6. Summary of the main findings in Study A (Paper I-III)

Paper I	There was a significantly higher selection accuracy for orthopaedic intervention after physiotherapist-led orthopaedic triage compared with standard practice. A significantly smaller proportion of patients were referred for further investigations, a larger proportion for physiotherapy, and a smaller proportion of patients back to their general practitioner after physiotherapist-led orthopaedic triage compared with standard practice. Waiting time to physiotherapist-led orthopaedic triage was significantly shorter compared with standard practice. A large proportion of the patients reported no hesitation to attend the clinic for future care, no difference between the physiotherapist-led orthopaedic triage and standard practice.
Paper II	Participants perceived significantly higher quality of care with the physiotherapist-led orthopaedic triage than with the standard practice in regards to medical-technical competence of the caregiver, i.e. receiving best possible examination and treatment. This was also found for the identity-oriented approach of the caregiver (receiving information about examination and treatment, results, and self-care, the caregiver's understanding, respect and commitment, as well as the opportunity to participate in decision-making). Participants reported to a significantly higher extent that their expectations of the treatment were met as well as the intent to follow the advice and instructions received after physiotherapist-led orthopaedic triage compared with standard practice.
Paper III	The participants rated a significant better health-state at 3 months after physiotherapist-led orthopaedic triage compared with standard practice; however, this was probably not clinically relevant. There were no other significant differences in perceived health-related quality of life or in pain related disability between physiotherapist-led orthopaedic triage compared with standard practice at any of the follow-ups at 3, 6 and 12 months, nor in sick leave the following 12 months after the appointment.

Management pathways

Management pathways are presented in Table 7. In total, 21% of the patients were found appropriate for orthopaedic intervention. The selection accuracy for orthopaedic intervention was significantly higher with the physiotherapist-led orthopaedic triage, i.e. a significantly larger proportion (55%) of patients selected by the physiotherapist for orthopaedic surgeon consultation was found appropriate for orthopaedic intervention, compared with the proportion of patients

referred by the general practitioners for orthopaedic surgeon consultation (25%). Six patients (5.8%) wished to consult the orthopaedic surgeon after the physiotherapist-led orthopaedic triage, none of which were considered suitable by the orthopaedic surgeon for orthopaedic intervention. A very small proportion of patients re-visited their general practitioner for the same problem within six months after the assessment, no statistical difference between the groups. The proportion of follow-up visits after physiotherapist-led orthopaedic triage and standard practice were 40% and 18%, respectively.

Management pathways in terms of other referrals are also presented in Table 7. The proportion of patients referred for further investigations or referred back to their general practitioner was significantly lower with the physiotherapist-led orthopaedic triage. A significantly larger proportion of patients were referred to physiotherapy for conservative management with on-going support with the physiotherapist-led orthopaedic triage than with standard practice. There was no statistically significant difference between physiotherapist-led orthopaedic triage and standard practice with regard to patients being referred for occupational therapy.

Table 7. Management pathways; selection accuracy for orthopaedic intervention and other referrals.

	Physiotherapist-led orthopaedic triage (n=102), n (%)	Standard practice (n=101), n (%)	Difference, % (95% CI)	*p*-value
Selection accuracy				
Referral for orthopaedic consultation	33/102 (33)	101/101 (100)	-68 (-77; -59)	**<0.001**
Appropriate for orthopaedic intervention	18/33 (55)	25/101 (25)	30 (11; 49)	**0.002**
Re-visits to the general practitioner	2/102 (2)	3/101 (3)	-1 (-5; -3)	0.682
Other referrals				
Referral for further investigation	17 (17)	29 (29)	-12 (-23; -0.6)	**0.039**
Referral for physiotherapy	63 (62)	36 (36)	26 (13; 39)	**<0.001**
Referral for occupational therapy	3 (3)	2 (3)	-0.03 (-5; 5)	1.000
Referral back to the general practitioner	9 (9)	28 (27)	-19 (-23; -9)	**<0.001**

Proportion analyses of management pathways were made using a normal approximation when the number of patients exceeded five; otherwise, the Fisher's exact test was used. Patients could be referred more than once; therefore, the total number could exceed 100%. The level for statistical significance for all tests was set to $p < 0.05$, with statistically significant *p*-values presented in bold font.

Waiting time

Waiting time was significantly shorter to physiotherapist-led orthopaedic triage (p<0.001) with a mean of 19 days (SD=2), compared with 28 days (SD=14) for standard practice.

Sick leave

In total, a small number of participants were on sick leave during the 12 months following consultation, with seven participants [mean days 146 (SD 128)] versus 15 participants [mean days 72 (SD 81)] after physiotherapist-led orthopaedic triage and standard practice, respectively. The difference was not statistically significant (p=0.113).

Patient-reported experience measure

In total, 163 participants (80%) responded to the QPP questionnaire (physiotherapist-led orthopaedic triage, n=83; standard practice, n=80). In Paper I, 161 participants responded to the question about hesitation (physiotherapist-led orthopaedic triage, n=82; standard practice, n=79), and a large proportion reported a low grade of hesitation about attending the clinic for future care; no significant difference between the groups (p=0.095).

All participants perceived a very high quality of care. The participants in the physiotherapist-led orthopaedic triage perceived significantly higher quality of care compared with standard practice with regard to receiving the best possible examination and treatment (medical-technical competence), receiving information, the opportunity to participate in decision making, and the caregiver's understanding, respect and commitment (identity-orientated approach) (Table 8). Perceived importance of the different items was rated higher by participants in physiotherapist-led orthopaedic triage for the item in the medical-technical competence dimension and for two of the items in the identity-orientated approach dimension, compared with standard practice.

Table 8. Participants' perceptions of the quality of care in the dimensions of medical-technical competence and identity-oriented approach.

Dimension/factor		Physiotherapist-led triage n = 83					Standard practice n = 80					
		n	NA	Median	Q1;Q3	Mean	n	NA	Median	Q1;Q3	Mean	*p*-value
Medical-technical competence												
Care received												
I received the best possible examination and treatment.	PR	73	2	4	3; 4	3.5	74	4	3	2; 4	2.9	**<0.001**
	SI	73	2	4	3; 4	3.5	72	5	3	3; 4	3.3	**0.022**
Identity-oriented approach												
Receiving information about												
How examinations and treatments would take place.	PR	79	1	4	3; 4	3.6	69	5	3	2; 4	3.0	**<0.001**
	SI	79	1	3	3; 4	3.1	67	6	3	3; 4	3.0	0.559
The results of examinations and treatments.	PR	70	5	4	3; 4	3.4	68	1	3	2; 4	2.9	**<0.001**
	SI	71	4	3	3; 4	3.3	65	3	3	3; 4	3.1	0.166
Self-care: "how I should take care of myself".	PR	69	4	4	3; 4	3.4	61	7	3	2; 4	2.7	**<0.001**
	SI	68	5	3.5	3; 4	3.3	59	8	3	3; 4	3.1	0.159
Participation in decision making												
I had opportunity to participate in decisions.	PR	74	4	4	3; 4	3.6	68	8	3.5	3; 4	3.2	**0.010**
	SI	74	4	4	3; 4	3.5	67	8	4	3; 4	3.3	0.227
Caregiver's understanding, respect, and commitment												
Seemed to understand how I experienced my situation.	PR	77	0	4	4; 4	3.8	73	1	3	2.5; 4	3.1	**<0.001**
	SI	77	0	4	3; 4	3.6	71	2	4	3; 4	3.4	**0.046**
Was respectful towards me.	PR	74	0	4	4; 4	3.9	72	1	4	3; 4	3.4	**<0.001**
	SI	74	0	4	3; 4	3.7	70	2	4	3; 4	3.5	0.090
Showed commitment: cared about me.	PR	76	0	4	4; 4	3.9	69	1	3	2; 4	3.0	**<0.001**
	SI	76	0	4	3.25; 4	3.7	67	2	4	3; 4	3.5	**0.039**

Results from the questionnaire Quality from the Patient's Perspective (QPP). Response options for PR (perceived reality) ranged from 1 (do not agree at all) to 4 (completely agree), and for SI (subjective importance) from 1 (little or no importance) to 4 (of the very highest importance). NA: Not applicable. Q1; Q3: First quartile; third quartile. Analysis was performed using the Mann-Whitney U test and statistically significant differences between groups (two-tailed *p*-value) are presented in bold font.

Participants in the physiotherapist-led orthopaedic triage reported to a significantly higher extent that their expectations of the treatment were met, and that they intended to follow the advice and instructions received, when compared with standard practice (Table 9).

Table 9. Outcome-related aspects of quality of care; meeting of expectations and intentions to follow advice and instructions.

	Physiotherapist-led orthopaedic triage n = 83					Standard practice n = 80					
	n	NA	Median	Q1;Q3	Mean	n	NA	Median	Q1;Q3	Mean	*p*-value
Meeting of expectations	78	0	4	4; 5	4.3	74	0	4	3; 4	3.7	**< 0.001**
Intention to follow advice and instructions	76	6	3	3; 3	2.8	59	19	3	2; 3	2.6	**0.019**

Results from the questionnaire Quality from the Patient's Perspective (QPP). Response options ranged from 1 (not at all) to 5 (to a very large extent) for the item regarding expectations and from 1 (no) to 3 (yes, completely) for the item regarding intentions. Q1; Q3: First quartile; third quartile, NA: Not applicable. Analysis was performed using the Mann-Whitney U test; statistically significant differences between groups (two-tailed p-value) are presented in bold font.

Patient-reported outcome measures

The participants in the physiotherapist-led orthopaedic triage rated a significantly better health state (EQ VAS) at 3 months following consultation compared with standard practice [mean difference -5.7 (95% CI -11.1; -0.2); p=0.04] (Figure 5). No statistically significant differences were found between the groups at baseline (p=0.11) or after 6 (p=0.06) or 12 months (p=0.14). There were no statistically significant differences between the groups in odds ratios for reporting 'no problems' in the EQ-5D at baseline or after 3, 6 or 12 months (Table 10). Additionally, there were no statistically significant differences between the groups in odds ratios for reporting "baseline or below" in the PDI at baseline or after 3, 6 or 12 months.

Table 10. Odds ratios (OR) and confidence intervals (95% CI) for patients rating "no problems" for health-related quality of life, and for rating "median or below" on pain-related disability after physiotherapist-led orthopaedic triage or standard practice.

	Group	Baseline			3 months			6 months			12 months		
		n	OR	95% CI	*n*	OR	95% CI	*n*	OR	95% CI	*n*	OR	95% CI
EQ-5D													
Activity	PT	101	1.4	0.8; 2.4	80	1.1	0.3; 4.0	78	1.1	0.3; 3.8	82	1.8	0.5; 6.3
	SP	99	Ref		75	ref		68	Ref		79	Ref	
Anxiety	PT	101	1.4	0.8; 2.4	80	0.9	0.3; 3.1	79	1.9	0.5; 8.1	83	1.6	0.5; 5.2
	SP	97	Ref		76	Ref		67	Ref		79	Ref	
Mobility	PT	99	1.2	0.7; 2.0	80	1.8	0.5; 5.8	79	1.2	0.3; 4.2	83	1.0	0.3; 3.9
	SP	96	Ref		75	Ref		68	Ref		78	Ref	
Pain	PT	101	0.7	0.2; 3.3	80	0.8	0.0; 21.1	77	0.9	0.0; 2.1	84	0.7	0.0; 16.5
	SP	97	Ref		75	Ref		65	Ref		78	Ref	
Self-care	PT	101	4.1	0.8; 19.9	80	1.5	0.1; 36.4	78	4.6	0.2; 1215.3	83	1.6	0.0; 59.0
	SP	96	Ref		76	Ref		68	Ref		79	Ref	
PDI													
Family/home responsibility	PT	98	1.5	0.8; 2.6	80	1.0	0.3; 3.8	77	1.5	0.4; 5.8	82	1.3	0.3; 5.0
	SP	94	Ref		75	Ref		66	Ref		76	Ref	
Recreational	PT	99	1.2	0.7; 2.1	80	1.4	0.4; 5.1	77	1.5	0.4; 5.3	82	1.2	0.3; 4.4
	SP	96	Ref		74	Ref		64	Ref		75	Ref	
Social activity	PT	100	1.3	0.7; 2.3	80	1.4	0.4; 4.4	78	1.7	0.5; 4.7	82	1.4	0.4; 4.6
	SP	97	Ref		75	Ref		65	Ref		78	Ref	
Occupation	PT	99	1.4	0.8; 2.5	78	1.8	0.5; 6.5	78	1.8	0.5; 5.2	83	1.1	0.3; 3.8
	SP	94	Ref		75	Ref		65	Ref		75	Ref	
Sexual behaviour	PT	96	1.6	0.9; 2.8	75	1.4	0.5; 3.9	76	2.0	0.6; 5.5	80	1.3	0.4; 4.3
	SP	94	Ref		73	Ref		63	Ref		73	Ref	
Self-Care	PT	100	1.1	0.6; 1.9	79	1.4	0.4; 4.7	78	3.1	0.8; 14.6	81	1.5	0.4; 5.3
	SP	98	Ref		74	Ref		66	Ref		75	Ref	
Life-support activity	PT	100	1.1	0.6; 1.8	79	1.0	0.3; 3.5	79	1.4	0.4; 5.2	81	1.2	0.3; 4.0
	SP	96	Ref		75	Ref		65	Ref		76	Ref	

The number of respondents in each group varied (65-101) because of incomplete data. Analysis was made using a marginal logistic regression model. EQ-5D = EuroQol 5D, PDI = Pain Disability Index, PT = Physiotherapist-led orthopaedic triage, SP = Standard practice, Ref = reference group for analysis.

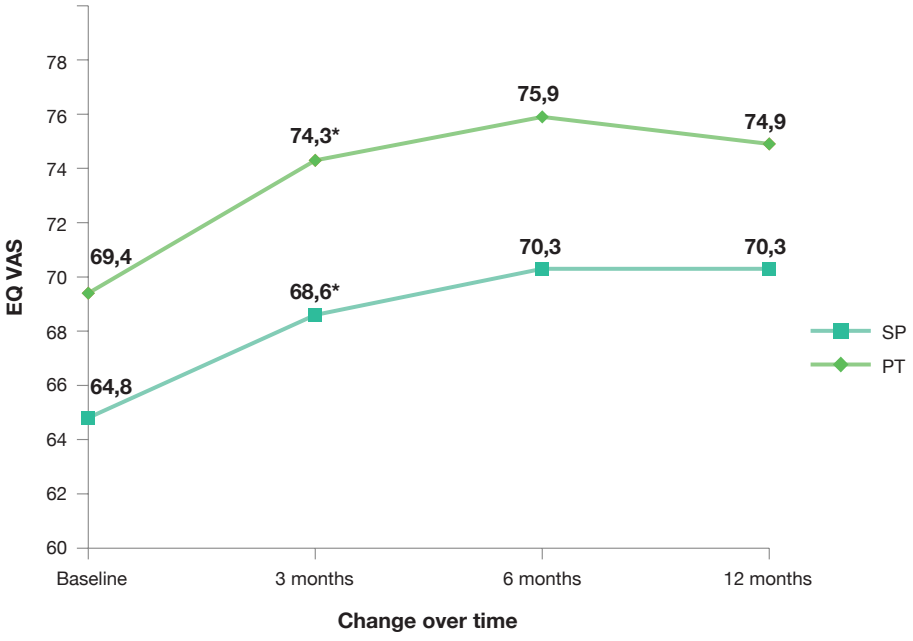

Figure 5. Long-term follow up for self-rated health state (EQ VAS) (predicted means, standard errors); physiotherapist-led orthopaedic triage (PT) versus standard practice (SP). Analysis was performed using an ANOVA. *= A statistically significant difference between the groups [mean difference -5.7 (95% CI -11.1; -0.2); p=0.04].

Missing data analyses

The between-group missing data analyses in Paper II showed significant demographic differences between those who responded to the QPP and those who did not in respective group. There was a statistically significant difference within both groups: those who did not respond were born outside of Sweden to a higher extent (physiotherapist-led orthopaedic triage p=0.004, standard practice p=0.02). Furthermore, there were significant differences in the standard practice: those who did not respond were younger (p=0.001), lived alone (p=0.007), and had a lower education level (p=0.04) than those who responded.

In Paper III, the missing data analysis showed that the patients in the physiotherapist-led orthopaedic triage who responded to EQ VAS at 3 months, reported a significantly better health state at baseline, compared with the patients in standard practice (difference in mean score = -7.2, 95% CI -13.6; -0.8). This means that the statistically significant finding in the main analysis for EQ VAS should be interpreted with caution. There were similar findings of significant differences for self-care (difference in mean score = -6.2, 95% CI -12.2; -0.1),

anxiety (difference in mean score = -6.2, 95% CI -12.2; -0.1) and mobility (difference in mean score = -6.5, 95% CI -12.6; -0.5) at 3 months. However, the findings in the main analysis for these items were not statistically significant.

Patients' perceptions and expectations of an orthopaedic consultation

The analysis in the qualitative study showed that the participants' expressed perceptions and expectations of the upcoming orthopaedic consultation could be classified into five categories; (1) Hoping for action, (2) Meeting an expert, (3) Having a respectful meeting, (4) Participating in the consultation, and (5) A belief that hard facts make evidence. Across the categories, an overarching theme was formulated as: *Take me seriously and do something!*. Patients with musculoskeletal disorders referred for orthopaedic consultation expressed a strong desire to be taken seriously during the consultation, and for something to happen during or as a result of the consultation. The participants perceived the orthopaedic surgeon to be an expert and were willing to place their trust in her or his decisions. Although a willingness to leave the orthopaedic surgeon in charge of the management of the problem was described, participants also viewed themselves as participating in the consultation and described that they wanted the orthopaedic surgeon to provide them with information and options, so that they could be part of the decision-making process. The participants also described the importance of having a good, respectful meeting with the orthopaedic surgeon.

DISCUSSION OF RESULTS

The main findings in this thesis are that physiotherapist-led orthopaedic triage is effective for selecting patients appropriate for orthopaedic intervention, and that patients' perceived good quality of care with this model. Additionally, a long-term follow-up showed that patient-reported outcomes did not differ between physiotherapist-led orthopaedic triage and standard practice. The qualitative study showed that patients referred for orthopaedic consultation expected to be taken seriously and for something to happen during, or as a consequence of, the consultation. The main findings are discussed in this chapter, in relation to other research. A more detailed discussion of the findings is provided in the respective paper.

Management pathways

The findings in **Study A** suggest that physiotherapist-led orthopaedic triage for patients with musculoskeletal disorders in primary care can be effective for diagnosing and directing to the appropriate management pathways. The primary outcome of the study, selection accuracy for orthopaedic intervention, was 55% after physiotherapist-led orthopaedic triage, which was significantly higher compared with standard practice. This can be compared with previous studies reporting selection accuracy ranging from 40% to almost 90% [55, 94, 101, 102]. It could be argued that the selection accuracy in our study was at the low end of this range; however, it still means a large reduction in referrals compared with standard practice as well as a higher proportion of appropriate patients referred onward to the orthopaedic surgeon. In addition, almost two thirds of the patients randomised to physiotherapist-led orthopaedic triage in this study could be managed independently by the physiotherapist, i.e. without any input from the orthopaedic surgeon. Previous studies show that between 69% and 92% of patients with spinal disorders were managed independently by physiotherapists working in triage [94, 101, 103]. The reduced proportion of patients referred for orthopaedic surgeon consultation after the physiotherapist-led orthopaedic triage, as well as the physiotherapist managing a large part of referred patients, could result in fewer patients waiting for orthopaedic surgeon consultation, and thereby also decreased waiting time. In addition, the shorter waiting time to physiotherapist-led orthopaedic triage could speed up patients' rehabilitation

process. Shorter waiting times to physiotherapist-led triage have been previously reported [46, 109]; however, by increasing the intake of patients to physiotherapist-led orthopaedic triage, there is a risk for a higher demand and which in the long run could lead to a longer waiting time.

In this thesis, the findings of low proportions of referrals for further investigation after physiotherapist-led orthopaedic triage confirm the findings in previous studies [55, 83, 100, 101], and suggest that physiotherapists working in an advanced or extended role send appropriate proportions of referrals for further investigations. In most countries, physiotherapists are restricted in terms of referral for further investigations. However, there are published reports of physiotherapists working in direct-access in the United States military who are able to refer patients for further investigations such as x-rays and MRI, showing a reduction in the number of extraneous images ordered while maintaining high levels of diagnostic accuracy [97]. The findings in this study, together with previous research, suggest that physiotherapists working in an advanced roles could be suitable for referring to further investigations; however, the healthcare setting has to be considered, as well as legislative issues in each country.

Quality of care

As previously described, the measurement of how patients perceive their care is an important aspect when evaluating the quality of health care [17, 112, 113], and should be addressed when implementing new care models that involve task shifting or advancing or extending professional roles. The finding reported in this thesis that patients perceived higher quality of care with the physiotherapist-led triage than with standard practice is supported by previous studies, which have found either equivalent [82, 86, 134] or higher [83] patient satisfaction with physiotherapist-led triage compared with care delivered by orthopaedic surgeons. As presented earlier, it is also of value to address other aspects of the care, such as ability (technical competence of the healthcare professional) and affability (interpersonal manner of the healthcare professional) [118]. The QPP measures both these aspects, and our findings showed that the patients reported a significantly higher perceived medical-technical competence (ability) after physiotherapist-led triage, and that the physiotherapist seemed to understand, respect, commit and care about them (affability).

The concept of patient-centred care involves components such as patient participation and involvement, and the relationship between the patient and the

healthcare professional [164, 165]. It can be argued that while all healthcare professionals provide care based on these elements, the degree to which this is done depends on the interest and priority given to these elements by the professional group [165]. As presented in Paper II, the patients reported that they had the opportunity to participate in the clinical decision-making to a higher extent after the physiotherapist-led triage than after standard practice. One could argue that in the context of orthopaedic consultation, where appropriateness for surgery is the main outcome, there is little room for participation. However, recent literature has suggested that in the management of 'preference-sensitive conditions' such as many musculoskeletal disorders where no single treatment option clearly stands out, shared medical decision making may be especially relevant [166]. As previously shown, physiotherapists are more likely to suggest more than one intervention [81, 82, 100, 167], and this could be one reason why patients perceived that they were participating to a higher extent in the physiotherapist-led orthopaedic triage.

The aspect of patients being involved in their care depends on different factors, of which information is one [164, 165]. The patients in Paper II reported receiving adequate information about the whole care process to a higher extent as well as receiving useful advice on treatment and self-care after physiotherapist-led orthopaedic triage, which is in concordance with previous research [81, 86]. Previous research has shown that information, exercise and pain relief are part of the physiotherapist assessment and management to a larger extent than assessments by other medical staff [82, 83, 168, 169]. Additionally, it has been reported that patients expect and wish for training programmes and advice about self-management, when seeking health care for back and neck pain [170, 171]. Considering that a large number of patients referred for orthopaedic consultation are managed non-surgically, this could be important for the patients' wellbeing as well as for the rehabilitation process and further care seeking.

Long-term follow-up of patient-reported outcomes

Only a few studies of physiotherapist-led orthopaedic triage have reported patient-reported outcomes. Therefore, the findings reported in Paper III add an important aspect to the body of literature regarding the possible effects of physiotherapist-led orthopaedic triage. No differences between the groups were reported in health-related quality of life or pain-related disability at any of the follow-ups, indicating that the management pathway outcome did not affect

long-term patient-reported outcomes negatively. The findings are comparable to previous findings of physiotherapist-led triage in orthopaedic outpatient departments [83]. In addition, patients in our study perceived a better self-rated health state three months after physiotherapist-led triage compared with standard practice. This result could have been influenced by other positive findings with the triage, such as the shorter waiting time and patients having received advice on self-care management to a higher extent, and indicates that the triage had a positive short-term effect on health state. There are studies of patients reporting short-term improvements in health-related quality of life after a physiotherapist-led spinal triage [172] as well as after attending a primary care musculoskeletal clinic, where the improvements were maintained at 12 months [107]. Although statistically significant, the finding of perceived better self-rated health state at three months might not be clinically relevant, considering that the MCIC has been suggested to be 10.5 units for patients with low back pain [150].

A very low number of patients were on sick leave during the 12 months following the physiotherapist-led orthopaedic triage. This finding is somewhat surprising, considering the referral to orthopaedic consultation. The patients reported a relatively low disability due to pain at baseline, which could be one of the reasons for the low rate of sick leave, considering that correlations between pain and occupational activity have been reported previously [2].

Patients' perceptions and expectations of an orthopaedic consultation

Because Paper IV has not yet been published, the discussion is kept short in the thesis. A more complete discussion is available in the manuscript.

To our knowledge there are no reports of patients' perceptions and expectations of an orthopaedic consultation, and therefore the findings presented in Paper IV can bring novel insights in the management of, as well as in developing the care for, these patients.

Expectations have been proposed to have two distinct meanings: beliefs about what should occur or what people want of care (normative) and beliefs about what will actually happen, irrespective of whether this is wanted (predicted) [6]. The main categories presented in Paper IV can be translated into these two types of expectation; Hoping for action (the wish for something to happen), Having a respectful meeting (the wish to be taken seriously and being listened to), and Participating in the consultation (the expectation to be part of the decision making)

can be viewed as normative expectations. On the other hand, Meeting an expert could be viewed as an expectation of a more predictive meaning.

The findings in Paper IV were that patients with musculoskeletal disorders referred for orthopaedic consultation expressed a strong desire to be taken seriously during the consultation, and for something to happen during or as a consequence of the consultation. The wish for something to happen has previously been reported in a study on patients' expectations of general practitioner management of back pain, where patients wished for more than just education and reassurance [173]. Verbeek et al [171] showed in their systematic review of patients' expectations of treatment for low back pain, that the patients expect more diagnostic tests as well as other therapy or referrals to specialists. Furthermore, participants perceived the orthopaedic surgeon to be an expert and were willing to place their trust in her or his decisions. These findings are supported by Bernhardsson et al [174], who reported a similar trust placed by patients with musculoskeletal disorders in the physiotherapist's professional competence in choosing and guiding treatment. Nevertheless, the participants in our study expressed a desire for participation both in the consultation and in the decision-making process, and for this to happen through the provision of information and having the orthopaedic-surgeon as a sounding board. Similar findings have previously been reported in patients prior to a physiotherapist-led triage [175] and confirm the previously discussed recommendation for the use of shared decision making in orthopaedics.

The importance of having a good, respectful meeting with the orthopaedic surgeon was also described. Findings from recent research suggest that patients perceive clinician empathy as important [176], and that the perception of surgeon empathy was primarily linked to patient satisfaction; more so than to visit duration or pre-visit expectations of visit duration, during a consultation with a hand surgeon [177].

METHODOLOGICAL CONSIDERATIONS

Strengths and limitations (Study A)

Paper I-III (**Study A**) are based on the same protocol and therefore share some strengths and limitations. The main strengths of this randomised controlled trial are its originality, the relatively large sample size, and sufficient power. Furthermore, a validated satisfaction questionnaire that addressed patients' perceptions of different aspects of qualify of care was used, and a long-term follow-up was performed using standardised, validated patient-reported outcome measures. In addition, analyses were made on an intention-to-treat basis, including all randomised patients who signed consent. However, the study has several potential limitations that could have affected the outcomes of the thesis. The strengths and potential limitations of the study are further discussed below.

Study design and study population

The choice of the randomised controlled trial design was based on this design being considered the highest level of evidence. The aim to stay close to standard practice at the healthcare centre in which the study was performed, led to a number of limitations. The study was a single-centre trial, mainly due to the scarcity of physiotherapists in primary care with a comparable level of experience and education, which limits the generalisability of the findings.

The age range of 18-67 years was chosen because it reflects the age span of the working population in Sweden and sick leave was one of the outcomes of interest. Age over 67 years was the main reason for not meeting inclusion criterion for the study. However, considering the similar findings in previous studies of physiotherapist-led orthopaedic triage for various musculoskeletal disorders using a wider age range [94, 96, 167, 178, 179], it is possible to assume that the findings could be generalised to patients of different ages.

Procedure

The physiotherapist who performed the physiotherapy-led orthopaedic triage in this study is also responsible for the data analysis and writing of this thesis, which causes a potential risk of performance bias in the analysis and interpretation of the data. To minimise this potential bias, she was not involved in the eligibility assessment, randomisation or data collection.

Block randomisation was used to enable a balanced distribution of patients

between the groups. Each block consisted of 20 envelopes, and although this is a large block size, which makes it more difficult to detect allocation sequence, this strategy may entail a risk of selection bias.

Preferably, the protocol should consist of several physiotherapists and orthopaedic surgeons and by both healthcare professionals assessing the same patients; however, due to the clinical reality at the present healthcare centre, such a protocol was not feasible. On a national level in Sweden, many primary healthcare centres are small, and very few have consulting orthopaedic surgeons on site or physiotherapists with an appropriate level of experience and education. Neither participants nor the healthcare professionals were blinded to group allocation, or to whether the participants had been through physiotherapist-led orthopaedic triage prior to the orthopaedic consultation.

To mirror clinical practice and avoid disruptions, and to facilitate future implementation, the duration of the assessments was set according to standard practice at many healthcare centres at the time of the study, and therefore differed between the groups (15 versus 60 minutes). This could have had an impact on the outcome of perceived quality of care, considering assessment time has previously been described as an important factor for satisfaction [180, 181].

Participants in our study who requested additional consultations with their general practitioner for the same disorder within six months following the consultation was registered. This was done in order to track any possible misdiagnosed or dissatisfied participants. It has been suggested that actions such as premature termination of care or seeking care outside the management plan can be signs of patient dissatisfaction [129]. Considering the very low number of participants who requested a new general practitioner consultation (5 in total), this could indicate that the majority of patients were accurately diagnosed, referred onwards appropriately, and were satisfied with the care received.

Outcomes measured

All patient-reported questionnaires (the QPP, as well as the EQ-5D and the PDI at all follow-ups) were posted to the participants and were therefore unlikely to be susceptible to observer bias. Since the QPP was administered by an external party, the risk for detection bias was low.

Management pathways

There is a possibility that the two healthcare professionals made extra efforts to perform at their very best knowing they were participating in a study, entailing a risk for performance bias. For example, they could be referring too many or

too few patients for further investigations. However, the findings are in line with the results presented in previous studies. The very low proportion of patients who requested an orthopaedic consultation after the physiotherapist-led triage, suggests that the patients were satisfied with the triage. Previous research also has found low proportions of patients requesting orthopaedic consultation after physiotherapist-led orthopaedic triage [182].

Quality of care

A validated satisfaction questionnaire was used to measure quality of care; however, the decision to use only selected dimensions and items may have affected the reliability and validity of the instrument. The total response rate for the QPP (80%) can be considered high, as a review of studies on patient satisfaction with health care reported a mean response rate of 67% for postal questionnaires [183].

The missing data analysis revealed a potential risk of attrition bias due to significant demographic differences between those who responded to the questionnaire and those who did not. This risk for selective dropout means that caution is required when interpreting the study results. Reasons for non-response are unknown, but it cannot be ruled out that the interest in responding was low due to dissatisfaction [184]. Analysis of demographics of the respondents of the QPP showed that the respondents in the standard practice were significantly older at baseline, which could have affected the outcome. However, previous studies have showed that patients of older age usually report higher satisfaction scores [142, 143, 185] and therefore this factor might not entirely explain the differences in perceived care found in our study.

The outcomes of the management pathways, such as re-visit rates, could have influenced the perceived quality of care. Also, the patients received advice on self-management to a higher extent in the physiotherapist-led orthopaedic triage; an intervention that previously has been suggested to affect the perception of quality of care [81, 82, 167].

Health-related quality of life and pain-related disability

In Paper III, the total response rates for the questionnaires for the various follow-ups could be considered high (ranging from 71% to 80%); however, since the analysis was made on an item-level, the level of missing data varied up to as much as 38%. The missing data analysis showed that attrition bias might have been present, since those patients who responded to EQ VAS at the 3 month follow-up after the physiotherapist-led triage had a higher self-reported health

state at baseline.

The outcome measures were chosen based on them being generic, brief, reliable, and valid for a wide range of musculoskeletal disorders. The patients in this study generally perceived high health-related quality of life as well as low levels of pain-related disability at baseline and there were floor effects (>15%) for a large number of patients for both EQ-5D and PDI (more than 20% of respondents reported lowest possible score). Considering that it has been suggested that the more specific and sensitive the outcome measure is, the more sensitive the response becomes [186], using other more specific outcome measures might have changed the outcome. However, this was considered difficult due to the wide variety of diagnoses in this study.

Statistical analysis

Analyses were made on an intention-to-treat basis according to the CONSORT Statement [136], where participants were analysed in the groups to which they were randomised. There was a need for post-randomisation exclusions due to patients either not attending the consultation and therefore not signing informed consent for participation in the study, or attending but not having signed informed consent. In Paper II, the QPP was measured only at one single point of time and therefore, if participants did not respond, there were no data at all for these participants. Consequently there were no data to analyse, which is why an available case analysis was performed [187]. Missing item data analyses were performed to explore whether demographic characteristics differed between those who responded and those who did not.

A prospective sample size calculation was made for the study's main outcome (selection accuracy). To verify that we had sufficient power for the secondary outcomes reported in Paper II and III, retrospective power calculations were made for these outcomes. The use of retrospective power calculation is debated considering that a pre-study calculation of sample size is an estimation of which sample size that will allow a reasonable chance of detecting a difference in the outcome variable, at the given level of statistical significance [188]. Hence, a retrospective power calculation using actual sample sizes may not be relevant; nevertheless, it provided an indication of whether the study was adequately powered to detect differences also in the secondary outcomes.

The multiple statistical tests performed on the same sample entails a risk of mass significance. It could be argued that a reduction of the level of significance to $p<0.001$ would have been appropriate. Nevertheless, the majority of findings are statistically significant even with a lower level of significance, implying that

no such adjustment was called for.

In order to extract as much information as possible on an item level from the repetitive measures of the EQ-5D and the PDI, the choice was made to treat the outcome as ordinal data and to keep the item data instead of using the index. This could have affected the reliability and validity of the instruments. The choice to dichotomise the response categories might have further influenced the results considering that this means a loss of data.

The GEE model and estimated population average odds ratio for the outcomes from the EQ-5D and the PDI were used, since the GEE model considers multiple time points simultaneously and allows for testing the overall significance of the effects [160, 161]. The GEE model works well with missing data, assuming that they are missing completely at random (MCAR). The analysis of odds ratios resulted in wide confidence intervals, suggesting considerable imprecision in these estimates, thus reducing the confidence in our results.

Strengths and limitations (Study B)

The findings of the qualitative study bring novel insights into patients' perceptions and expectations of an orthopaedic consultation considering the scarcity of research in this area.

Trustworthiness of findings

In the tradition of qualitative research, trustworthiness of findings should be discussed in terms of credibility, dependability and transferability [162].

Credibility concerns the confidence in how well data and the process of analysis address the intended focus [162]. By using a purposeful sample strategy, the aim was to include participants of varied gender, age and pain location on referral. However, the included participants were quite homogeneous considering these aspects, which might affect credibility. Selection bias was minimised by recruiting participants via the clinic administrators. The interviewer's profession and experience of being a physiotherapist working in the area of research of orthopaedic triage may represent a potential bias in data collection and interpretation. However, this was not disclosed to the participants unless asked for. The relatively small sample might be a limitation of the study. After the first twelve interviews the number of new codes emerging were low and no new information seemed to be forthcoming (the so called redundancy criterion) [138], and the amount of data collected was therefore judged as sufficient to answer the research

question in a credible way. A semi-structured interview guide was used in this study in order to capture a variety of individual perceptions and expectations. To ensure transparency, the data collection and analysis was described in detail in Paper IV. Several types of triangulation were used in the analytical process. To enhance the different steps of the analysis as well as the reader's ability to value the results, the analysis process was presented in a table in the manuscript, and a rich description of the findings, including quotations, was provided.

Dependability is another aspect of trustworthiness, which addresses the degree to which data change over time and how the analysis process affects the data [162]. Dependability was addressed by using only one interviewer, an interview guide and by following the same procedure with all participants. Also, the interviews were carried out during a relatively short period of time. A continuous dialogue amongst the co-authors was strived for throughout the data collection as well as the analytic process. Dependability and credibility are closely linked and therefore, by reporting the study process in detail as done in the manuscript, dependability is further strengthened [162].

To facilitate the reader's judging of transferability, the setting and the participants as well as the process were described thoroughly. Since the results of qualitative research are context-dependent [162] and considering that this was a small study, with a relatively small sample, from a single geographical area in Sweden, transferability of the study findings might be limited. All participants were Swedish speaking and of Swedish origin.

GENERAL DISCUSSION

The findings presented in this thesis suggest that physiotherapist-led orthopaedic triage provides an opportunity to shape care with improve access and with maintained good quality. Implementation of this model of care could therefore benefit both patients and the healthcare system. However, before the model can be implemented, the level of certainty in the research evidence for a physiotherapist-led orthopaedic triage model needs to be evaluated. This could be done using the GRADE approach [189]. The existing body of evidence for physiotherapist-led orthopaedic triage consists primarily of reports of lesser quality, such as clinical audits and observational studies, and, to our knowledge, only one randomised controlled trial (RCT) evaluating physiotherapist-led triage as such [83] and one recent RCT investigating a specific procedure with physiotherapist-led triage (injections) for shoulder patients [184], besides the RCT presented in this thesis. Due to the methodological limitations of the RCT performed in this thesis the study can be classified as having a moderate risk of bias, while the other two RCTs can be considered as having low [184] and high risk of bias [83], respectively. Applying the GRADE approach to the three RCTs would yield the following result: the randomised study design used in three different trials means that the quality of evidence would be assessed as high by default. However, quality must be downgraded as a result of limitations in study designs (risks of bias of different kinds), and imprecision of estimates (small effect sizes and/or wide confidence intervals). In conclusion, the overall certainty in the evidence for a physiotherapist-led triage model remains low to moderate, depending on outcome. Therefore further research is warrented before a large-scale implementation can be recommended.

This thesis report on findings in perceived quality of care in favour of the physiotherapist-led orthopaedic triage model compared with standard practice. Previous studies has addressed other aspects of patient perception of physiotherapist-led triage, and report that patients attending a physiotherapist-led spinal service expects that the physiotherapist working in an extended role to be appropriately qualified and skilled [175]. In a recent British study, 99% of patients expressed satisfaction with seeing an extended scope physiotherapist rather than an orthopaedic surgeon [101]. A recent Canadian study showed that a majority of patients (89%) were willing to be assessed by a non-physician for their low back pain, when referred for surgical assessment [190], however, most patients (70%) also wished for a consultation with the surgeon if they were assessed as

non-surgical candidates. Nevertheless, it has been suggested that the experience and knowledge of physiotherapists working in advanced or extended roles make them amongst the most appropriate healthcare professionals for triage of patients with musculoskeletal order, in the opinion of both patients and other healthcare professionals [191]. When shifting or extending roles of healthcare professionals it is important to address the opinion and perception of other healthcare professionals affected by the change. When it comes to physiotherapist-led orthopaedic triage it is consequently important to address the satisfaction, perceptions and expectations of the professionals referring patients, the general practitioners, as well as the professionals who normally are responsible for assessing the patients, the orthopaedic surgeons. It has been reported that general practitioners perceive high satisfaction with physiotherapist-led triage; however, due to low response rate the results should be interpreted with caution [81]. In a study of Canadian spine surgeons [192] the majority of the surgeons in the study reported that they would be comfortable not assessing a patient with spinal pain if a specially trained non-physician clinician such as a physiotherapist, ruled out clear indications for surgery, however, if a probable surgical candidate was identified, a clear majority of surgeons wanted to confirm an indication for surgery themselves.

Working in an advanced or extended role with orthopaedic triage would be a new role for physiotherapists in Sweden and with this new role comes also a new responsibility. A few studies have investigated the perceptions of the physiotherapists working in these advanced or extended roles and report that physiotherapists in this role perceive the work as being stressful and have a concern or worry about missing a diagnosis or performing certain procedures [193, 194]. Moreover, the physiotherapists expressed a wish for formal, specific training, and expressed that the relationship with the orthopaedic surgeon and the medical team was very important for success in this role [194]. The perceptions of the physiotherapists in the study needs to be addressed in the future development and implementation of the triage model to ensure success with the model of care and safety for patients. The key finding in the study by Dawson et al [194] of a desired close relationship with the orthopaedic surgeon emphasises the need for teamwork regarding the triage model. Further understanding of the competence of the involved professions would be desirable, and working closely together as a team, collaborating around patients, could improve the care for patients with musculoskeletal disorders.

One way to standardise and to improve the efficiency and consistency of the triage process could be to use a screening/triage tool. In a study by Busse et al

[192] spinal surgeons identified a list of items that could be used to facilitate triage of patients with spinal pain by other healthcare professionals such as physiotherapists. Such tools or lists of items could be developed for various musculoskeletal problems in collaboration with orthopaedic surgeons.

For the physiotherapist-led orthopaedic triage model to be implemented, there is a need for a competency and curriculum framework for the physiotherapists working in this role. This could lead to a more standardised approach to practice across different organisations and geographical boundaries. In Sweden, there are no formal advanced or extended roles for physiotherapists, only a board certification of physiotherapists with specialist competence in various areas, such as general physiotherapy or orthopaedic manipulative therapy. There is a need for further evaluating this role and for the consideration of a formal recognition. Furthermore, there are issues concerning a regulatory framework on a policy maker level if physiotherapists working in this role are to be able to send referrals for further investigations, or sign up patients for orthopaedic intervention. There has recently been a development of frameworks for physiotherapists working in an advanced role in the United Kingdom [195] and Australia [196] and further research using these frameworks could greatly improve the quality of research, as well as facilitate implementation of a triage model.

Overall generalisability of findings

The study population of patients with musculoskeletal disorders in **Study A** is likely similar to other such patient populations in commuting communities nationally. The findings could therefore be applicable in similar settings in primary health care in Sweden, and might also be applicable to similar settings in other countries with comparable healthcare systems. The limitations of the study affect the generalisability of the findings, and the results should be interpreted with caution. It should be taken into consideration that the outcome of this study is based on two clinicians' individual assessments, and therefore the results are transferable to similar protocols only.

The findings in **Study B** of patients referred for orthopaedic consultation might be transferable to similar settings in primary as well as in secondary care/hospital settings in Sweden and internationally, although the homogenous group of participants may limit the transferability.

CONCLUSIONS AND IMPLICATIONS

Conclusions

This thesis comprises the results of a randomised controlled trial comparing physiotherapist-led orthopaedic triage in primary care with standard practice for patients with musculoskeletal disorders in Sweden. The findings from this study are supplemented with findings from a qualitative study illuminating patients' perceptions and expectations of an upcoming orthopaedic consultation.

Main conclusions of the studies are that:

- Physiotherapist-led orthopaedic triage for patients with musculoskeletal disorders can provide timely access to assessment by an appropriately qualified healthcare professional who can direct patients to the most appropriate management pathway.
- Physiotherapist-led orthopaedic triage can provide care of good perceived quality without compromising long-term health-related quality of life, pain-related disability, or sick leave.
- Patients expect to be taken seriously and for something to happen during, or as a consequence of, an orthopaedic consultation, while at the same time expecting to participate in decision making and viewing the orthopaedic surgeon as an expert and a sounding board.

Implications for practice

The findings in this thesis have several possible implications for primary healthcare practice.

- The findings of the physiotherapist-led orthopaedic triage providing timely care with good perceived quality, and without compromising long-term effects on patient-reported outcomes, suggest that physiotherapist-led orthopaedic triage could be a feasible model for the selection of patients appropriate for orthopaedic intervention. Physiotherapist-led orthopaedic triage can be useful in view of the challenge of the increasing burden of musculoskeletal disorders in primary health care.

- Considering that only one third of the patients were selected for orthopaedic surgeon consultation after physiotherapist-led orthopaedic triage, this model of care can reduce the waiting list and waiting time for orthopaedic consultation.
- Physiotherapists working in orthopaedic triage can diagnose and direct patients with musculoskeletal disorders to the most appropriate management pathway, and refer an appropriate proportion of patients for further investigations, which suggests that physiotherapists could potentially take an advanced role in the management of musculoskeletal disorders.
- The findings might also be relevant for secondary care, i.e. management of patients referred to hospital-based care, where physiotherapists could work in an advanced role with triaging patients on waiting lists for surgery.
- The results can inspire further collaboration between primary and secondary care in managing patients with musculoskeletal disorders, such as joint planning of how and where such triage models should be designed and performed.
- Patients' perceptions of the orthopaedic surgeon as the expert, and how that competence can influence both trust and participation, should be considered in clinical practice, and can be important factors for enhancing patient participation in the consultation, as well as in clinical decision-making. Additionally, patients' expectations for a respectful meeting that include listening, respecting and viewing the patient as a whole person, is in line with core components in patient-centred care, and should be considered in clinical practice. The findings should be used to inform the development of new models of care such as physiotherapist-led orthopaedic triage.

Future perspectives

For physiotherapist-led orthopaedic triage to be implemented, nationally as well as internationally, further high-quality studies are needed. The findings in this thesis can inspire future research since several new questions have arisen during this process as pointed out below. Furthermore some issues, which could benefit from further development and investigation, are addressed.

Future research on physiotherapist-led orthopaedic triage should preferably focus on multicentre randomised controlled trials with several different physiotherapists and orthopaedic surgeons. Moreover, cost-effectiveness of this model should be further investigated and standardised patient-reported outcomes as

well as experience measures should be used.

The issue of physiotherapist-led orthopaedic triage being based in primary or secondary care needs to be addressed and researched, based on the healthcare system in individual countries.

There is a need for a standardised approach to advanced or extended role practice across different organisations as well as geographical boundaries. Moreover, there is a need for a consistent approach in developing a standardised, evidence-based and safe triage model; which components it should involve, possible management pathways (such as referral to other specialists, or to further investigations) as well as the potential use of assessment tools.

The findings of this thesis combined with the existing body of research emphasises the need for a debate addressing the possibilities of physiotherapists working in an advanced role such as physiotherapist-led orthopaedic triage in Sweden. In addition, frameworks for such roles as well as education should be developed.

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