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Faculteit Revalidatiewetenschappen

master in de revalidatiewetenschappen en de kinesitherapie

Masterthesis

Effects of direct access to physiotherapy for patients with low back pain

Hanne Corstjens
Demi Volz

Scriptie ingediend tot het behalen van de graad van master in de revalidatiewetenschappen en de kinesitherapie, afstudeerrichting revalidatiewetenschappen en kinesitherapie bij musculoskeletale aandoeningen

PROMOTOR :
Prof. dr. Lotte JANSSENS

BEGELEIDER :
dr. Pieter SEVERIJNS
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Inhoud

Positioning

Our master's thesis is situated in the 'clinical care paths & guidelines in rehabilitation' research domain, which is part of the REVAL Rehabilitation Research Centrum of UHasselt. Research plays a crucial role in determining the effectiveness and safety of direct access (DA) to physiotherapy. DA refers to the ability of patients to seek physiotherapy treatment without a referral from a general practitioner, physician, or specialist. The Federal council of Belgium advised that it seems appropriate to implement direct access to physical therapy for specific reasons and in specified circumstances. ("Advies Van Federale Raad Voor Kinésitherapie Over Directe Toegang Tot De Kinesitherapie (DTK)," 2016). Our research plays a role in a broader context, namely a pragmatic pilot trial, which investigated the added value of direct access for PT compared to usual care for patients with acute LBP lasting >24 hours and <6 weeks, called Direct-Physio (*Direct-Physio*, n.d.). This Trial is executed by different universities in Belgium in partnership, i.e., UHasselt, UCLouvain, KU Leuven and University Antwerp. The trial is commissioned by INAMI-RIZIV and supported by AXXON Belgium, Domus Medica and SSMG. Our review, which questioned what the effects of DA to physiotherapy was on clinical outcome, medical imaging, medication prescription, and cost-effectiveness in patients with LBP, serves as a comparator for the results of this trial. The relevance of this study lies in several areas. DA to physiotherapy means that patients can bypass unnecessary delays or referrals from other healthcare professionals. This can lead to earlier intervention and maybe faster relief of symptoms. Also, in terms of cost-effectiveness this is a very interesting study. Patients may avoid additional visits to primary care physicians, which in terms will lead to reduced healthcare costs. We wrote this master's thesis as a duo, where we mostly worked together, but sometimes we divided our work, especially in writing our individual parts. For our research question, we sat together and presented it to our co-promoters, and came to an agreement on the topic of our research and specific population. We both screened the studies and we also both performed a quality check on the included studies individually. Then we both extracted the data separately from the included studies and came to a complete data table. We split the writing part between the both of us. Hanne took care of the introduction, where Demi started to write the method. Later on, Demi started with the results where Hanne created the tables and appendices. After that Demi wrote the discussion, abstract and acknowledgement. Later we reviewed each other's work and made improvements.

Abstract

Background: low back pain (LBP) contributes to disability, decreased productivity, and high healthcare costs. Physiotherapy is recommended as a primary treatment, but access is often slowed down or denied by the need for referrals, other options (e.g., medical imaging, medication) have priority for some physicians. Access to physiotherapy without a referral is called, direct access (DA). There is research supporting DA for LBP, but the results are not yet synthesized. This systematic review aimed to evaluate the effectiveness of DA in the LBP population.

Methods: A literature search was conducted in PubMed, Web of Science, PEDro, EMBASE, and CINAHL, up until September 30, 2022. Studies comparing DA care with referral-based, usual care for patients with LBP, and examining healthcare use, costs, and clinical outcomes were included. There were no restrictions in the search strategy. The modified Downs and Black quality checklist was used.

Results: Seventeen studies were included, after screening 44 full-texts. Twelve out of 17 studies were of good quality. Patients who got physiotherapy through DA had lower medication prescriptions and imaging utilization compared to patients referred by a physician. The impact on specialist referral, costs, clinical outcomes, and patient satisfaction varied across studies, most results were significant and in favor of DA to physiotherapy, others had no significant differences.

Discussion and conclusion: Good quality studies indicated positive effects of DA to physiotherapy for LBP. This pathway offers benefits in healthcare use, clinical outcomes, patient satisfaction together with reduced costs. Further research could explain these effects better.

Introduction

Millions of people throughout the world suffer from low back pain (LBP), with a one-year prevalence of 7.46% analyzed in the Global Burden of Disease study of 2019 (Washington, 2023). From these high prevalence numbers, only a small part of patients has a specific pathology and 90% are classified as patients with non-specific LBP (Finucane et al., 2020; Koes, van Tulder, & Thomas, 2006). From 1990 to 2019, the global incidence of LBP increased by 50% and the global disability-adjusted life years (DALY) increased by 47% (Wang et al., 2022). LBP causes a significant disability in daily living, therefore a decrease in productivity for the working population, and an increase in healthcare costs. Data from the United States estimated an annual, total cost of $100 billion and more, including direct costs for healthcare use, along with indirect costs due to less productivity and sick leaves (Katz, 2006).

Guidelines state physiotherapy is a first-line treatment for LBP. This suggests that physiotherapy can reduce pain, improve function, and prevent the transition to a chronic condition (Shipton, 2018). However, a referral from a physician is required in diverse countries, so access to physiotherapy is not always easy, partly due to a low referral rate of 9.1% according to an Australian study (Dennis, Watts, Pan, & Britt, 2018; Peurois et al., 2023). A solution for this obstacle can be DA to physiotherapy.

DA to physiotherapy is already implemented in countries like the Netherlands, Canada, New Zealand, the United Kingdom, and the United States (Maselli et al., 2022). Those countries create programs for DA in their healthcare systems that can differ between the countries, but mostly, care from a physiotherapist is allowed without a referral from a physician. The implementation of a physiotherapist in an emergency department is also a possible solution to reduce the burden on the physicians and the rather large waiting times (Alkhouri, Maka, Wong, & McCarthy, 2020).

Recent evidence suggests that DA to physiotherapy is a safe and efficient treatment option in primary care, mainly in musculoskeletal (MSK) pathologies without adverse events of harm detected (Maselli et al., 2022; Ojha, Snyder, & Davenport, 2014). Despite the growing evidence for DA in MSK pathologies, there is still a lack of evidence for the LBP population specifically. This may be of high importance because of the high prevalence and the high number of DALY's in the LBP population (Wang et al., 2022). Furthermore, early physiotherapy in LBP patients may lead to improvement in disability, lower utilization of healthcare, and

lower costs (Fritz et al., 2015; Liu et al., 2018). Nevertheless, many general practitioners do not refer patients with LBP to physiotherapy, only 9.1% do according to an Australian study (Dennis et al., 2018). The DA approach has several potential benefits for the patients, but also for the healthcare system, including the government and the healthcare practitioners. Potential benefits in the regular care are improved patient outcomes, such as pain and disability, less medical imaging, improved patient satisfaction, reduced specialist visits, and reduced costs (Harwood, Pines, Andrilla, & Frogner, 2022; Kiljańska, Soszyński, Motyl, & Walewska-Zielecka, 2021)

DA can also be applied in an emergency department (ED), mostly after triage and prior to physician assessment (Gagnon et al., 2021). Possible benefits for physiotherapists in the ED are reduced waiting times, reduced treatment times, improved patient satisfaction and reduced healthcare use, i.e., medical imaging and medication prescription (Sayer et al., 2018; Schulz et al., 2016).

An in-depth analysis of the research on individuals with LBP receiving DA to physiotherapy might shed light on this strategy and its possible advantages. This systematic review investigated the body of research and pinpointed the best plans for giving DA to physiotherapy for patients with LBP. The review also pointed out areas that need more research in the future. Further, we will give the model of DA more publicity and consequently support its worldwide implementation. The hypothesis was that there are in fact different advantages of DA, for instance, improved clinical outcomes (pain and disability), increased satisfaction of both patients and healthcare practitioners, reduced waiting times, decreased referral rates, and lower economic burden. In addition, minimal risk of adverse effects was expected compared to the regular care pathway.

Methods

1. Literature search

Systematic searches on multiple literature databases, i.e., Pubmed, Web of Science, PEDro, EMBASE, and CINAHL were carried out, with the latest search on 30 September 2022. The keywords were adapted following a preliminary literature research. Further records were searched on the reference list of the articles in the preliminary literature search. The research question formulated was: “What are the effects of DA to physiotherapy on clinical outcome, medical imaging, medication prescription, and cost-effectiveness in patients with LBP? ” .

Databases were searched using a combination of free text words and also a list of Medical Subject Headings (MeSH in Pubmed) terms related to musculoskeletal (MSK) pathology, LBP, and direct physiotherapy access. The full search strategy and results for the different databases are listed in appendix 1. Further, there were no limitations in the search strategy for language, publication date, or article type.

2. Selection criteria

The results from all searches were imported into Rayyan (Rayyan Systems, 2023), after which all the duplicates were excluded. Two reviewers, D.V., H.C., were involved in the screening and were blinded from each other. They independently screened the titles and abstracts of the articles for relevance against eligibility criteria and excluded ineligible studies. Later, the same reviewers read the selected full-texts to include useful articles. Disagreements were noted and resolved between the two reviewers and if necessary, the opinion of a third and fourth reviewer, N.G. and P.S., was asked.

Inclusion criteria for the studies:

P: Included patients with LBP.

I/C: Compared outcomes between DA to physiotherapy with referral-based physiotherapy.

O: Investigated the effect of DA to physiotherapy in any form, e.g., after triage, in the ED, in the military.

Were published in the Dutch, English, or French language.

Exclusion criteria for the studies:

P: No sub-analyses were made with LBP population specifically.

I: Used no DA to physiotherapy.

C: /

O: Evaluated an intervention (e.g., new therapy form) in a DA setting, without evaluating the effects of DA.

Were non-original studies (e.g., reviews), case studies/-series, conferences abstracts, and symposiums.

Were published in other languages than Dutch, English, or French.

3. Quality assessment (appendix 2)

The Downs and Black checklist was used to assess the methodological quality of the studies, by two reviewers (D.V., H.C.) independently. This tool has been shown to be valid and reliable for assessing the methodological quality of both randomized and non-randomized studies. This quality appraisal tool rates 27 methodological items on a two-level scale, except for one question with a three-level scale. The tool is divided into four categories. The first ten items are about the reporting and the next three on external validity. The following 13 questions are about internal validity, where there is a distinction between bias and confounding. The last question represented the power of the article (Downs & Black, 1998).

Some questions were irrelevant for most of the studies, because of the type of study. Most studies did not include an intervention study where the researchers could decide which form of DA was implied. In this review non-randomized studies were used, where the effect of DA was investigated. Therefore, questions concerning the validity of the design were removed for those studies (questions 4, 8, 13-15, 19, 23, and 24). Questions related to loss of follow-up were only evaluated in longitudinal cohort studies (questions 9, 17, and 26). For observational studies with outcomes provided from a database, question 12 was removed, because the participants were not asked whether they were prepared to participate. Total scores were reported as percentages, because of the inequality of the maximum score for all study designs. There are different categories for the quality of each study, “excellent” (86-100%), “good” (68-85%), “fair” (50-67%), or “poor” (<50%) based on the total scores, suggested by O’Connor et al. (2015) and previously used by Goossens et al. (2022).

4. Data extraction

Data extraction was conducted by the same two reviewers. A data extraction Excel sheet was designed to record relevant information from each study: reference (title, author, publication year and country), quality of the study, study setting, population, groups/statistics and results. Outcomes measured in multiple studies were examined and taken into account for the review. Information was extracted regarding costs, healthcare use and clinical outcomes. Two tables were used, one about the studies regarding regular care and the other regarding ED. Regular care means an examination or treatment in a military academy, in healthcare clinics or with a

private practitioner, all in the absence of an emergency unit. Both physician-referred patients and DA to physiotherapy patients are included in regular care.

Results

1. Study selection

A comprehensive search using appropriate keywords and MeSH terms resulted in 16.312 articles: Pubmed (n=6.929), Embase (n=3.195), Cinahl (n=1.790), WOS (n=4.007) and Pedro (n=391). In Rayyan, a product of Rayyan Systems, Inc located in the USA (Ouzzani et al., 2016), 5.569 duplicates were removed. After reviewing the titles and abstracts of the retrieved studies, there were 44 studies left. No MSK/LBP, no physiotherapy and no DA were the reason why most of the studies were excluded (figure 1). After the full-text screening, only 17 articles were included, of which were 13 in regular care (Crowell et al., 2022; Harwood et al., 2022; Halfpap et al., 2022; Kiljanska et al., 2021; Garrity et al., 2020; Kazis et al., 2019; Denniger et al., 2018; Magel et al., 2018; Frogner et al., 2018; Bornhöft et al., 2015; Fritz et al., 2015; Pendergast et al., 2012; Overman et al., 1988) and 4 in ED (Pugh et al., 2020; Sayer et al., 2018; Schulz et al., 2016; De Grunchy et al., 2015;). The others were excluded, because there was no comparison of the effect of DA to physiotherapy compared to referral-based care in the other studies (Figure 1). The characteristics of the included studies are summarized in Table 1 regarding regular care and in Table 2 regarding ED care, including author, year of publication, sample size and outcome measures.

2. Quality assessment

Scores on the Downs and Black checklist ranged from 42% to 100%. There were seven out of 17 studies of good quality (68-85%) (Bornhöft, Larsson, & Thorn, 2015; Crowell, Mason, & McGinniss, 2022; de Gruchy, Granger, & Gorelik, 2015; Harwood et al., 2022; Kazis et al., 2019; Pugh et al., 2020; Sayer et al., 2018), this turned out to be the largest group. There were five studies of excellent quality (86-100%) (Fritz et al., 2015; Frogner, Harwood, Andrilla, Schwartz, & Pines, 2018; Garrity et al., 2020; Pendergast, Kliethermes, Freburger, & Duffy, 2012; Schulz et al., 2016), only 4 studies had a fair quality score (50-67%) (Denninger, Cook, Chapman, McHenry, & Thigpen, 2018; Kiljańska et al., 2021; Magel et al., 2018; Overman, Larson, Dickstein, & Rockey, 1988) and one study was of poor quality (<50%) (Halfpap et al., 2022). Especially the items about blinding and randomization, together with the selection bias, scored poorly overall. All studies had a clear objective beforehand and did not use additional

analysis. Further details about the checklist can be consulted in appendix 2. An overview of the scoring of the assessment can be found in appendix 3.

Figure 1.

PRISMA flow-chart of search results

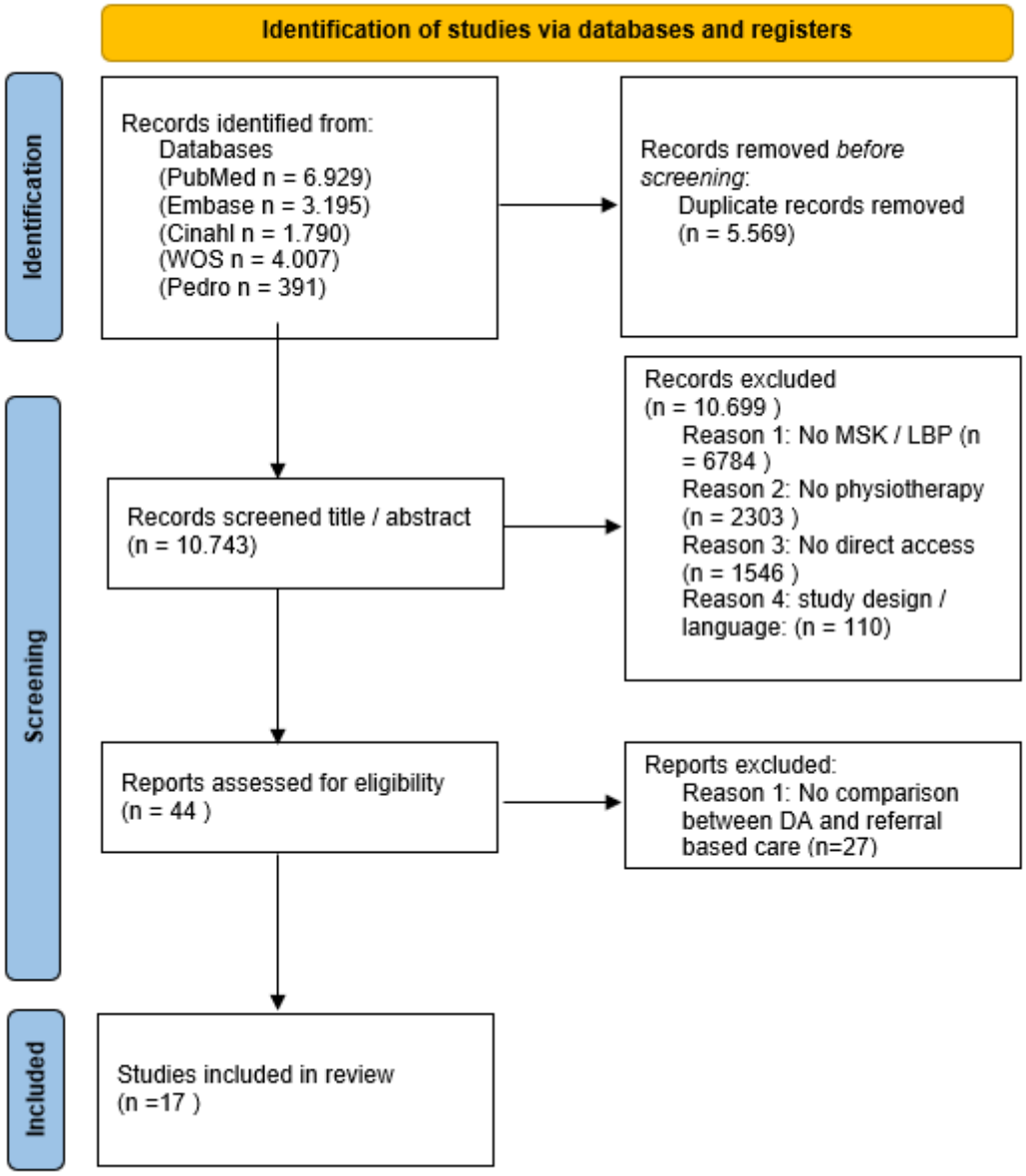

Table 1

Data-extraction (regular care)

Reference	Quality	Setting & Population	Groups, Statistics	Medication	Imaging	Clinical outcomes	Costs	specialist referral / injections	other outcomes
"Musculoskeletal Imaging for Low Back Pain in Direct Access Physical Therapy Compared to Primary Care: An Observational Study" Crowell, Mason, and McGinniss, 2022, USA	Good	US Military Academy at West point; young athletic patients (18-24 years) with low back pain	PT, N=1845		No imaging: 96.7%				
			PCC, N=467		No imaging: 82%				
			Statistics		P**<0.001**				
		US Military Academy at West point; young athletic patients (18-24 years) with LBP and imaging ordered	PT, N=92	NSAIDS: 19%	Clinically Sig. findings: 31%			specialist referral: 31%	
			PCC, N=50	NSAIDS: 50%	Clinically Sig. findings: 20%			specialist referral: 16%	
			Statistics	**P<0.001**	P=0.180			P=0.059	
"The Influence of Patient Choice of First Provider on Costs and Outcomes: Analysis From a Physical Therapy Patient Registry" Denniger et al., 2018, USA	Fair	8 clinics collocated within GHS-Steadman Howkins clinics; back and neck pain patients, mean age 45.9, 72% female.	DA, N=171			Pain (mean): 2.0/10 disability (mean): 5.6/50	Total costs (mean): $1542		
			Referral, N=276			Pain (mean): 2.0/10 disability (mean): 6.1/50	Total costs (mean): $3085		
			Statistics			Pain: p=0.92 disability: p=0.40	**P=0.04**		
"Unrestricted Direct Access to Physical Therapist Services Is Associated With Lower Health Care Utilization and Costs in Patients With New-Onset Low Back Pain" Garrity et al., 2020, USA	Excellent	59670 patients, 18+ years with new-onset LBP with insurance through a private health plan.	PT, N= 2238 (N=1397, PA; N=841, UA)				30 days cost-ratio: PA: 1.19 UA: 0.96 90 days: PA: 1.28 UA: 1.14		
			PCC, N=57273 (N= 38872, PA; N=18401, UA)				Reference: 1.00		
			Statistics				30 days:		

Reference	Quality	Setting & Population	Groups, Statistics	Medication	Imaging	Clinical outcomes	Costs	specialist referral / injections	other outcomes
							PA: p**<0.0001** UA: p=0.30 90days: PA: p**<0.0001** UA: p**=0.002**		
"Where to start? A two stage residual inclusion approach to estimating influence of the initial provider on health care utilization and costs for low back pain in the US" Harwood et al., 2022, USA	Good	Eligible insurance claims for LBP from Health Care Cost Institute (private).	PT, N=109480	Early opioid: 3.2% long opioid: 1.4%	Radiography 11% MRI/CT: 16.1%		Total costs: $7413		
			PCP, N=957619	Early opioid: 9.9% long opioid: 3.6%	Radiography 17.6% MRI/CT: 16.4%		Total costs: $5660		
			Statistics	/	/		/		
"Observational retrospective study of the association of initial healthcare provider for new-onset low back pain with early and long-term opioid use" Kazis et al., 2019, USA	Good	adults aged 18 years or older with a new outpatient diagnosis of LBP who had commercial or MA insurance.	PT, N=3499	Early use: OR 0.15 (0.13-0.17) long opioid: OR 0.27 (0.15-0.48)					
			PC, N=114782	Reference: 1.00					
			Statistics	**Sig. difference**					
"Physical Therapy Care for Low Back Pain Monitored Program of First-Contact	Fair	Patients who came to the walk-in clinic with a complaint of LBP, +16 years .	PT, N=107	Narcotic: 3% non-narcotic: 22%		Function: 26% limited; pain: 32%			PAT SF overall: 42%
			Physician, N=67	Narcotic: 18% non-narcotic: 57%		Function: 17% limited; pain: 32%			PAT SF Overall: 32%

Reference	Quality	Setting & Population	Groups, Statistics	Medication	Imaging	Clinical outcomes	Costs	specialist referral / injections	other outcomes
Nonphysician Care" Overman et al., 1988, USA			statistics	Narcotic, **p<0.01** non-narcotic, **p<0.001**		NS for both			overall NS, but Sig. difference for single items
"Impacts of a Re-designed Care Path for Back Pain Directing Patients to Physiotherapists A Pre–Post Intervention Study" Kiljańska et al., 2021, Poland	Fair	Patients with back pain, but no red flag symptoms, were booked in the Back Pain Unit (BPU), if they refused, they could still choose to book a visit to a doctor.	BPU cohort, N=11997 (N=3104)		Imaging services (mean): 0.17 visits				<u>Sick leaves:</u> -Number 0.08 -Duration 0.642 days <u>PAT SF</u>: NPS for BPU 83.0
			Post-intervention usual care cohort, N= 31107		Imaging services (mean): 0.53 visits				<u>Sick leaves</u> -Numbers 0.38 -Duration 3.30 days <u>PAT SF:</u> NPS for Primary care 73.9
			Statistics		**P<0.001**				**P<0.001** **P<0.001**
"Physiotherapy in Primary Care Triage – the effects on utilization of medical services at primary health care clinics by patients and sub-groups of patients with musculoskeletal disorders: a case-control study" Bornhöft, Larsson, and Thorn, 2015, Sweden	Good	2 primary health care clinics in Gothenburg, patients with musculoskeletal diseases, between 16-64 years. A: triaged to PT B: referral to PT	Clinic A: N=249 at 6m, N= 196 at 12m	Analgesics prescriptions at 6 m: 24.5%, OR = 0.11 at 12m: 28.6%, OR = 0.13				specialist referral: At 6m: 15.7%, OR 0.41; at 12m: 17.9%, OR 0.45	Sick leaves numbers at 6m: 17.7%, OR 0.52; at 12m: 19.9%, OR 0.58
			Clinic B: N=456 at 6m, N=401 at 12m	Analgesics prescriptions at 6 m: 77%, at 12m: 76.8%				specialist referral: At 6m 33.3%; at 12m 34.2%	sick leaves number: at 6m: 29.4% at 12m: 30.4%
			Statistics	**P<0.001**				**p<0.001**	At 6m **p=0.001** At 12m **p=0.009**
"A Comparison of Health Care Use	Excellent	Health insurance claims of healthcare use of physician-referred end self-	Self-referred, N=7497				PT claims only		Total PT visits (mean): 5.90

Reference	Quality	Setting & Population	Groups, Statistics	Medication	Imaging	Clinical outcomes	Costs	specialist referral / injections	other outcomes
for Physician-Referred and Self-Referred Episodes of Outpatient Physical Therapy" Pendergast et al., 2012, USA		referred ambulatory PT episodes of care, 18-64 years old.					(mean): $347.23 Other related claims (mean): $104.58		
			Physician-referred, N=45210				PT claims only (mean): $419.89 Other related claims (mean): $126.47		Total PT visits (mean): 7.00
			Statistics				**P<0.001**		**P<0.001**
"Implementation of an Alternative Pathway for Patients Seeking Care for Low Back Pain: A Prospective Observational Cohort Study" Magel et al., 2018, USA	Fair	University of Utah Health is an integrated academic health care system based in Salt lake city. Patients with a chief complaint of LBP, mean age is 45.5 years.	Rapid access, N=124		Radiographs: 25.8% advanced imaging: 8.9%	Change in PFCAT score (mean): 5.1 (N=85)		Spine surgeon: 2.4% Epidural steroid injection: 8.1%	
			Non-participants, N=276		Radiographs: 65.9% advanced imaging: 27.2%	Change in PFCAT score (mean): 2.6 (N=56)		Spine surgeon: 8.0% Epidural steroid injection: 29.0%	
			Statistics		**P<0.05**	**P=0.002** (for complete data)		**P<0.05** **P<0.05**	
"Improving Access and Decreasing Healthcare Utilization for Patients With	Poor	Active Duty Service Members receiving healthcare services in a novel acute spine pain clinic from a PT.	ASPC, N=1215 (Subsample, N= 100)	Medications 26%	Radiographs 7% Complex imaging 1%				

Reference	Quality	Setting & Population	Groups, Statistics	Medication	Imaging	Clinical outcomes	Costs	specialist referral / injections	other outcomes
Acute Spine Pain: Five-Year Results of a Direct Access Clinic" Halfpap et al., 2022, USA			Non-PT, N=100	Medications 20%	Radiographs 28% complex imaging 12%				
			Statistics	**/**	/				
"Physical Therapy as the First Point of Care to Treat Low Back Pain: An Instrumental Variables Approach to Estimate Impact on Opioid Prescription, Health Care Utilization, and Costs" Frogner et al., 2018, USA	Excellent	Commercial health insurance claims for patients aged 18-64 with a new primary diagnosis of LBP in the northwest US.	PT first, N=12906	Opioid prescription: 20.4%	Radiographs: 11.0% advanced imaging: 9.4%		Total costs: $6562		
			PT later, N=17135	Opioid prescription: 31.5%	Radiographs: 37.0% advanced imaging: 35.0%		Total costs: $9883		
			Statistics	**P<0.001**	**P<0.001**		**P<0.001**		
"Importance of the type of provider seen to begin health care for a new episode low back pain: associations with future utilization and costs" Fritz, Kim, and Dorius, 2015, USA	Excellent	Data claims from University of Utah Health Plans, age 18-60 with a LBP consultation.	PT, N=48		Radiographs 16.7%, OR 0.39; advanced imaging 6.2%, OR 0.40	Duration of LBP care: 44 days (median); coefficient: -0.036	Total LBP costs (mean): $904; coefficient: -0.21	Spine surgeon 6.2%, OR 1.35 Spinal injection 2.1%, OR 0.27	
			PC, N=409		Radiographs 30.1%; Advanced imaging 14.2%	Duration of LBP care: 20 days (median); coefficient reference	Total LBP costs (mean): $1167; coefficient: reference	Spine surgeon: 5.4% Spinal injection: 8.6%	

Reference	Quality	Setting & Population	Groups, Statistics	Medication	Imaging	Clinical outcomes	Costs	specialist referral / injections	other outcomes
			Statistics		Radiographs **p=0.017;** Advanced imaging, NS	P=0.87	P=0.34	NS	

Note. Abbreviations: Physiotherapist= PT, Primary care clinic= PCC, Primary care provider= PCP, Acute spine pain clinic= ASPC, Significant= Sig., Not significant= NS, Patient satisfaction= PAT SF, Musculoskeletal disease= MSD, Net Promotor Score= NPS, Provisional Access= PA, Unrestricted Access= UA. **Significant results (p< 0.05) in bold**.

Table 2

Data-extraction (Emergency department)

Reference	Quality	Setting & Population	Groups, Statistics	Treatment time	Stay at hospital	Medication	Clinical outcomes	Imaging	Patients-satisfaction
"Advanced musculoskeletal physiotherapists are effective and safe in managing patients with acute low back pain presenting to emergency departments" Sayer et al., 2018, Australia	Good	ED at three metropolitan public hospitals, all adults aged 18-65 with LBP.	AMP, N=360	119 min (wait time 13 min)	LOS 141 min				
			Non-AMP, N=729	123 min (wait time 32 min)	LOS 175 min				
			Statistics	P=0.159 (**p<0.001**)	**P<0.001**				
"Physical Therapists as Primary Practitioners in the Emergency Department: Six-Month Prospective Practice Analysis" De Grunchy, Granger, and Gorelik, 2015, Australia	Good	ED of the Royal Melbourne Hospital, a teaching hospital. All patients who had a discharge diagnosis of hand fracture, ankle sprain of lumbar pain.	PT, N=120	118 min	Discharged: 87.5%				
			ED physician, N=700	235 min	Discharged: 59.4%				
			Statistics	**P<0.001**	**P=0.037**				
"Dedicated emergency department physical therapy is associated with reduced imaging, opioid administration, and length of stay: A prospective	Good	University of Utah ED patients with a MSK complaint.	PT, N=381 (57.7% spine related)		LOS 240 min	Opioid prescription: 17.9% (back pain subgroup)		25% (back pain subgroup)	
			No PT, N=143 (53.1% spine related)		LOS 372 min	Opioid prescription 17.9%		57%	

Reference	Quality	Setting & Population	Groups, Statistics	Treatment time	Stay at hospital	Medication	Clinical outcomes	Imaging	Patients-satisfaction
observational study" Pugh et al., 2020, USA			Statistics		**P<0.001**	NS		**Sig. difference**	
"Comparing patient outcomes for care delivered by advanced musculoskeletal physiotherapists with other health professionals in the emergency department—A pilot study" Schulz et al., 2016, Australia	Excellent	Two major metropolitan hospitals in Melbourne. Patients aged 18-65 with acute MSK LBP, a knee soft tissue injury, or an ankle soft tissue injury.	AMP, N=29 (low back pain subgroup)			Opioid (no/yes): 10/1	RMDQ at 6w: 5.4; NPRS at 6w: 2.2;	Imaging undertaken (no/yes): 19/0	>50% answered "strongly agreed" on all the questions days off work at 6w:13.8
			Non-AMP, N=10			Opioid (no/yes): 6/0	RMDQ at 6w: 5.3; NPRS at 6w: 3.0;	Imaging undertaken (no/yes):7/3	11-22.2% answered "strongly agreed" on the questions days off work at 6w: 12.0
			Statistics			P=0.742	P=0.988 p=0.769	**P=0.042**	**Sig. difference** on 4 of the 7 questions (0.009-0.535) P=0.870

Note. Abbreviations: Physiotherapist= PT, Musculoskeletal= MSK, Emergency department= ED, Roland Morris Disability Questionnaire: RMDQ, Numeric pain rating scale= NPRS, Length of stay= LOS, Advanced musculoskeletal physiotherapist= AMP. **Significant results (p< 0.05) in bold**.

3. Data extraction

Throughout all regular care studies, there are different study populations included. In the study by Crowell et al. (2022) they work with athletic young patients (18-24 years) with LBP in a military setting. Another study also investigated DA to physiotherapy in a military setting, among active duty members with acute LBP (Halfpap et al., 2022). Two studies examined a national sample of people with new-onset LBP and a commercial or Medicare Advantage insurance from the age of 18 years (Garrity et al., 2020; Kazis et al., 2019). Commercial health insurance claims from patients aged 18–64 years with a new primary diagnosis of LBP were examined in another study (Frogner, Harwood, Andrilla, Schwartz, & Pines, 2018). Fritz et al. (2015) included new consultations for patients with LBP and private, employer-based insurance between 18-60 years. A study investigated musculoskeletal disorders with a back pain subgroup, after triage the included patients could have acute or chronic pain and were in the working age population (16-64) (Bornhöft, Larsson, & Thorn, 2015). Pendergast et al. (2012) compared episodes of outpatient physiotherapy for DA and physician-referred in the population with a private insurance between 18-64 years. One study did include patients with a LBP complaint from an age of 16 years(Overman, Larson, Dickstein, & Rockey, 1988). Magel et al. (2018) examined patients with non-specific LBP eligible after a screening. All employees from the Greenville Health System with the age of 18 or older, and with back or neck pain, were included in the Denniger et al. (2018) study. Triage was performed in the study of Kiljańska et al. (2021) for patients with a new episode of LBP to determine if eligible for DA to physiotherapy. Differences in outcomes between first health care providers for an episode of LBP were examined in the 18+ years population (Harwood, Pines, Andrilla, & Frogner, 2022). In total 11 studies in regular care have been carried out in the USA, one study has been carried out in Poland (Kiljańska, Soszyński, Motyl, & Walewska-Zielecka, 2021)and one in Sweden (Bornhöft et al., 2015). All studies are about non-specific LBP, because most patients with red flags or specific LBP are excluded from the study population.

In the study of Sayer et al. (2018) advanced musculoskeletal physiotherapists (AMP) self-selected patients with LBP from a triage-list aged 18-65. Schulz et al. (2016) examined AMP who treated patients presenting to the ED with lower limb soft tissue injuries or acute LBP based on a triage, aged 18-65. All patients who had a discharge diagnosis of hand fracture,

ankle sprain, or lumbar pain were included in the study of de Grunchy et al. (2015), outcomes were compared between an advanced practice physiotherapist and an ED physician. A subgroup of patients with atraumatic LBP presenting in the ED, aged 18+, were evaluated in the study of Pugh et al. (2020). Three studies have been carried out in the ED of Australia (de Gruchy, Granger, & Gorelik, 2015; Sayer et al., 2018; Schulz et al., 2016) and one in the USA (Pugh et al., 2020).

a. Regular Care (Table 1)

i. HEALTHCARE USE

Medication prescription

In the context of healthcare utilization, the available data from various studies indicate that patients who underwent DA to physiotherapy services were less likely to receive prescriptions for medication. Out of the seven studies that investigated the effect of DA on medication prescription, five demonstrated a significant difference in medication prescription in favor of DA (Bornhöft et al., 2015; Crowell et al., 2022; Frogner et al., 2018; Kazis et al., 2019; Overman et al., 1988). Crowell et al. (2022) reported a significantly lower prescription rate of nonsteroidal anti-inflammatory drugs (NSAIDs) for DA patients (Physiotherapist, 19%; Primary care clinic (PCC), 50%; $p<0.001$). Kazis et al. (2019) found a lower utilization of opioids in the short and long term for patients who directly consulted a physiotherapist. Kazis et al. (2019) did observe a significant difference (early use, Odds Ratio (OR) 0.15, 95% confidence interval 0.13-0.17; long term, OR 0.27, 95% confidence interval 0.13-0.17; $p<0.01$), while Harwood et al (2022) did not found a significant difference. The study of Frogner et al. (2018) supported those findings on opioid use (PT first, 20.4%; PT later, 31.5%; $p<0.001$). Overman et al. (1988) reported that both narcotic and non-narcotic medication use was significantly lower for patients who initially sought treatment through DA (narcotic: PT, 3%; Physician, 18%; $p<0.01$; non-narcotic: PT, 22%; Physician, 57%; $p<0.001$). Bornhöft et al. (2015) focused on analgesic prescriptions and found a significant reduction at 6 months (24.5% versus 77%; $p<0.001$) and at 12 months (28.6% versus 76.8%; $p<0.001$) for DA compared to referral. Halfpap et al. (2022) investigated medication use (PT, 26%, Non-PT, 20%; not significant), but found no significant differences.

Medical imaging

Patients had a significantly lower utilization of medical imaging services when they received physiotherapy through DA compared to physician referrals. The percentage of people who used radiographs and advanced imaging, being magnetic resonance imaging or computer tomography, was examined in five studies. All the results were in favor of the DA pathway, most of them were significant (Fritz, Kim, & Dorius, 2016; Frogner et al., 2018; Halfpap et al., 2022; Harwood et al., 2022; Magel et al., 2018). Out of those studies, three found significantly fewer radiographs prescriptions ($p=0.017$; $p<0.001$; $p<0.05$) (Fritz et al., 2015; Frogner et al., 2018; Magel et al., 2018), and two found significantly fewer advanced imaging prescriptions ($p<0.001$;$p<0.05$)(Frogner et al., 2018; Magel et al., 2018). Kiljańska et al. (2021) described the number of imaging services, with a mean of 0.17 for DA and 0.53 for patients in the physician-led pathway ($p<0.001$). Crowell et al. (2022) researched the population of patients who did not have imaging in the first 28 days after the initial complaint (PT, 96.7%; PCC, 82%; $p<0.001$), they also determined the clinically significant findings identified on the performed imaging (PT, 31%; PCC, 20%, $p=0.180$), those differences were not significant, but more prominent in the DA patients.

Specialist referral

Four studies investigated the impact of DA on specialist referral, yielding varying results. Two studies did identify significant differences. Bornhöft et al. (2015) examined specialist referral rates at six months and 12 months. They observed rates of 15.7% and 17.9% for DA, respectively, compared to 33.3% and 34.2% for the regular care pathway ($p<0.001$) (Bornhöft et al., 2015). In the study by Magel et al. (2018), the specialist referral rates were 2.4% for DA and 8% for referral, showing a significant difference ($p<0.05$). On the other hand, the remaining two studies from Crowell et al. (2022) and Fritz et al. (2015) reported values that slightly favored the physician-led pathway but did not reach statistical significance.

Injections

Two studies examined the utilization of injections for pain relief. Magel et al. (2018) reported a significant higher use of epidural steroid injections in the physician-led pathway (DA, 8.1%; Referral, 29%; $p<0.05$). Similarly, Fritz et al. (2015) found that the utilization of spinal injections

was lower with DA compared to referral, although the difference was not statistically significant (DA: 2.1%; Referral: 8.6%).

ii. Costs

The data derived from the included studies provided support for lower costs of care when patients directly sought the services of a physiotherapist compared to receiving physician-led care. Denninger et al. (2018) (DA, $1542; Referral, $3085; p=0.04), Frogner et al. (2018) (PT-first, $6562; PT later, $9883; p<0.001), all identified lower costs for the DA pathway. Fritz et al. (2015) (PT, $904; Primary care, $1167; p=0.34) did not report a significant difference. Moreover, one study measured the physiotherapy costs only, those were significantly lower in the DA pathway, meaning lower costs if self-referred compared to physician-referred (self-referred, $347.23; physician-referred, $419.89; p<0.001) (Pendergast et al., 2012). In contrast, the study by Garrity et al. examined cost ratios at 30 days and 90 days in different states, with provisional access and unrestricted access. In general, all outcomes had a higher cost ratio for DA (30 days: PA, 1.19; p<0.0001; 90 days: PA, 1.28; p<0.0001; UA, 1.14; p=0.002), except for the 30 days cost ratio in UA states (p=0.30)(Garrity et al., 2020). Harwood et al. (2022), detected no differences (PT, $7413; Primary care provider, $5660).

iii. CLINICAL OUTCOMES

Denninger et al. (2018) and Overman et al. (1988) reported results for both pain and disability after treatment, but these were not statistically significant. Denninger et al. (2018) found that pain levels after treatment were similar between DA and referral groups (2.0/10; p=0.92), also no differences found in disability (DA: 5.6/50; Referral: 6.1/50; p=0.40), this study did not measure the mean difference between pre- and post-treatment. Overman et al. (1988) reported no difference in pain and disability between DA and referral groups (32%), (disability, DA: 26%; Referral: 17%; not significant). The only study that observed significant differences in disability was conducted by Magel et al. (2018). They assessed changes in the Promis CAT questionnaire for physical function and found a significant average increase in the DA group compared to referral (DA: 5.1; Referral: 2.6; p=0.002) (Magel et al., 2018).

iv. OTHER OUTCOMES

Various other outcomes have been investigated, but only a few outcomes were investigated in more than one study, including patient satisfaction, and sick leave. Overman et al. (1988) utilized a questionnaire to assess satisfaction and found no significant differences when considering all questions together but reported no p-value (DA: 42%; Physician: 32%; not significant). However, single items on the questionnaire showed significant differences in favor of DA (Overman et al., 1988). Kiljanska et al. (2021) examined patient satisfaction using the Net Promoter score, but only with a limited subgroup, which was 83 for DA and 73.9 for referral patients ($p<0.001$). Sick leave was taken into account by Kiljanska et al. (2021), who found a significantly lower number of sick leaves and a shorter duration ($p<0.001$). Bornhöft et al. (2015) had the same conclusion for the number of sick leaves at six months and 12 months ($p=0.001$; $p=0.009$).

b. Emergency department (Table 2)

i. Healthcare use

Medication prescriptions

Pugh et al. (2020) investigated opioid prescription and found no significant difference between the different groups, both having an opioid prescription rate of 17.9% ($p=0.129$). Schulz et al. (2016) analyzed the number of opioid prescriptions, reporting one prescription for DA patients and zero prescriptions for non-DA patients at discharge, without a significant difference ($p=0.742$).

Medical imaging

Two studies examined the differences in imaging, both concluded that there was less imaging utilization with DA. Pugh et al. (2020) (PT: 25%; No PT: 57%), and Schulz et al. (2016) (PT: 0%; Non- PT: 30%; $p=0.042$) found that DA is associated with significantly less imaging use in the emergency department.

ii. Clinical outcomes

Schulz et al. (2016) examined pain and disability. They found no significant differences between DA and physician-led groups for disability measured with the Roland Morris Disability

Questionnaire (DA: 5.4; Referral: 5.3; p=0.988), pain measured with Numeric Pain Rating Scale (DA: 2.2; Referral: 3.0; p=0.769), those results were measured after discharge to home from the ED.

iii. Other outcomes

Various other outcomes have been investigated, but only a few outcomes were investigated in more than one study, including patient satisfaction, sick leave, and treatment times. Schulz et al. (2016) assessed patient satisfaction, 50% of patients "strongly" agreed with all questions on the questionnaire, which means that they were satisfied about the care they received. Significant differences with the physician pathway were observed in four out of seven questions (p=0.009-0.535) (Schulz et al., 2016). Differences in days off work were not significant (PT: 13.8 days; non-PT: 12.0; p=0.870) (Schulz et al., 2016). Sayer et al. (2018) reported no significant difference is treatment time, but a significant reduce in waiting time if treated by an AMP (AMP: 13 min; non-AMP: 32 min; p<0.001). Regarding length of stay, DA had a lower average duration compared with referral (DA: 141 min; referral: 175 min; p<0.001; Sayer et al., 2018)(Da:240 min; referral 372 min; p<0.001; Pugh et al., 2020). De Grunchy et al. (2015) confirmed these findings (DA: 118 min; referral: 235 min; p<0.001). Additionally, they found significant more patients being discharged from the hospital in the DA group (DA: 87.5%; 59.4%; p=0.037; de Grunchy et al., 2015).

Discussion

1. Reflection on the quality of studies

Our systematic review indicated that 12 of the 17 included studies were of "good" to "excellent" quality based on the Downs and Black checklist (≥68%). However, it is important to acknowledge certain limitations when interpreting the findings. Firstly, comparing the quality of the outcomes of the studies is not easy, because of the heterogeneity in study design. Most studies were retrospective, observational studies, some of them used data from a database, some did long term follow-up, but those were not the norm in all studies. Because of those differences in study design and origin of the extracted data, it is difficult to compare the quality of the studies. However, converting the outcome of the assessment to a percentage was a way to still make a comparison. Many studies exhibited a high risk of performance and detection bias due to the lack of blinding, introducing potential bias in performance and detection of outcomes. This was due to the fact that the included studies

examined DA within the existing healthcare framework in their country or state. Cohort studies are mainly used to evaluate a specific care pathway compared with another one or the normal care pathway going on in a certain country (Garrity et al., 2020; Kazis et al., 2019; Magel et al., 2018). Some caution is advised to draw a conclusion from these results, because of the potential biases that could had slipped in.

2. Reflection on results related to the research question

The results of our systematic review provide valuable insights into the effects of DA to physiotherapy for patients with LBP. The included studies demonstrated that DA could have positive impacts on healthcare utilization, particularly in terms of medication prescription. For the medication five out of seven studies in regular care, one with fair quality (Overman et al., 1988), four with good to excellent quality (Bornhöft et al., 2015; Crowell et al., 2022; Frogner et al., 2018; Kazis et al., 2019), found a significant difference. Patients who received DA to physiotherapy were less likely to be prescribed medication compared to those who followed a physician-led pathway. In one study the physiotherapist was allowed to prescribe medication, in a military setting (Crowell et al., 2022). Physiotherapists in the other studies with significant differences were not allowed to prescribe medication, a physician was consulted for prescription (Bornhöft et al., 2015; Frogner et al., 2018; Kazis et al., 2019; Overman et al., 1988). In one study the distribution between the two groups was based on triage, so a significant difference in demographics and patient characteristics was reported between the two groups (Bornhöft et al., 2015). One study of good quality (Harwood et al., 2022) and one of poor quality (Halfpap et al., 2022), did not perform any statistics. The later study only took a subsample of 100 people to compare the two groups and assessed active duty service members at a military treatment facility, this is a specific population, so it is necessary to interpret the results with caution. Generally, a significant difference is found over the different studies, if we leave out those without a statistical analysis. This is in line with previous reviews investigating DA to physiotherapy for the population with MSK deficits (Babatunde et al., 2020; Ojha et al., 2014). In the ED there were no differences found between the type of initial provider (i.e., physiotherapist vs. medical doctor) regarding medication prescription. In the study of Pugh et al. (2020), the primary provider had the right to prescribe medication in the ED. In the other study the advanced musculoskeletal physiotherapists were not qualified to prescribe the medication (Schulz et al., 2016). A lower prescription rate of

medications is possibly explained by a faster pathway to treatment. Also, most physiotherapist are not qualified to prescribe medications, therefor an additional visit to a physician is needed for a prescription (Bornhöft et al., 2015; Frogner et al., 2018; Kazis et al., 2019; Overman et al., 1988). Physician that did not refer the patients to physiotherapy, which is a big portion (Bealing & Welvaert, 2020; Dennis et al., 2018), are more inclined to prescribe medication (Denninger, Cook, Chapman, McHenry, & Thigpen, 2018). Also, guidelines stated that treatment by a physiotherapist is mostly focused on education, advice to stay active, and exercise therapy, the use of medication is not prescribed if not necessary (Foster et al., 2018; *KNGF-richtlijn Lage Rugpijn*, 2020; NICE, 2016).

Regarding imaging, the results consistently demonstrated significantly fewer imaging tests executed in the DA to physiotherapy pathway in regular care (Fritz et al., 2016; Frogner et al., 2018; Kiljańska et al., 2021; Magel et al., 2018). The study of Harwood et al. (2022), did not perform a statistical analysis, therefore no conclusion about the outcome can be made. All the other studies were of "fair" to "excellent" quality and found a lower healthcare use regarding imaging (Crowell et al., 2022; Fritz et al., 2016; Fritz et al., 2015; Frogner et al., 2018; Magel et al., 2018). Those findings were expected, based on the recent evidence for reduced imaging in other reviews regarding DA to physiotherapy in the population with MSK deficits. (Babatunde et al., 2020; Ojha et al., 2014; Piscitelli, Furmanek, Meroni, De Caro, & Pellicciari, 2018). In the ED, two studies (Pugh et al., 2020; Schulz et al., 2016) found significantly less imaging when the first provider was a physiotherapist. The findings above suggested that physiotherapists may possess the skills to effectively assess and manage LBP patients without the need for extensive imaging, potentially leading to cost savings and reduced radiation exposure (Hadian, Jabbari, Mazaheri, & Norouzi, 2021; Pike et al., 2022).

Furthermore, the review reported conflicting results regarding the economic evaluations. Two "excellent" quality studies found significantly lower total costs for the DA to physiotherapy pathway (Frogner et al., 2018; Garrity et al., 2020). Garrity et al. (2020) an "excellent" quality study investigated the cost-ratio for new-onset LBP, by initial provider in provisional access and unrestricted access states. They found a significantly higher cost-ratio for physiotherapists as initial providers, compared with primary care providers in provisional access states. In those states, physiotherapists are not allowed to prescribe imaging or medication, nor were the

economic burden of opioid use taken into account when making the analysis (Garrity et al. 2020). Altogether, the results suggested that implementing DA to physiotherapy programs can result in cost savings for both patients and the healthcare system (Frogner et al., 2018). In line with the study of Fritz et al. (2012), who reported a lower imaging cost for LBP if the patients had early physiotherapy. When the cost of visiting a physician is eliminated, the average cost of treatment is reduced by 21%, according to a study from New Zealand (Bealing & Welvaert, 2020). If the traditional medical pathway is not followed, there is less healthcare utilization (i.e. medical imaging, medication prescription, specialist referral), resulting in lower costs (Denninger et al., 2018; Hon, Ritter, & Allen, 2020)

The studies included in the review primarily focused on pain and disability as clinical outcomes. The studies (Denninger et al., 2018; Overman et al., 1988) did not find significant differences in pain reduction. They did use a comparison between the post-treatment outcomes of the two groups, instead of a comparison of the change between the baseline score and post-treatment score. One study identified a significant improvement, when baseline scores were compared with post-treatment, in disability for patients in the DA pathway (Magel et al., 2018). This suggests that DA to physiotherapy may be beneficial in enhancing clinical outcomes and reducing disability in the LBP population. Duration of the symptoms can reduce the efficacy of the therapy (Hon, Ritter, & Allen, 2020), leading to a higher risk of developing a chronic condition (Tygiel, Smith, Robertson, Shropshire, & Thorsen, 2008). Further a more medical approach can lead to an inappropriate use of different treatments (i.e. medical imaging, medication prescription, surgery) prior to physiotherapy (Denninger et al., 2018; Hon et al., 2020). More patients getting treatment from a physiotherapist will lead to increased quality-adjusted life years (Bealing & Welvaert, 2020). We need more high-quality evidence to vouch for those potential benefits.

It is important to acknowledge potential variations among populations. The studies in this review included acute LBP or new-onset LBP (Crowell et al., 2022; Halfpap et al., 2022; Garrity e al., 2020; Kazis et al., 2019; Frogner et al., 2018). Patients with red flags or specific LBP, those who are more likely to order imaging, are excluded (Magel et al., 2018; Garrity et al., 2020). Also, the studies about the ED were about a population with acute LBP, they worked with a triage system, where they distinguish between less or high severity and complexity. This could

possibly lead to more positive outcomes in favor of DA, because of the less severe population with acute, non-specific LBP (de Gruchy et al., 2015; Pugh et al., 2020; Sayer et al., 2018; Schulz et al., 2016). Acute LBP cases typically involve less frequent imaging requests, unless there are indications of serious pathologies (Jenkins et al., 2018). Furthermore, medication utilization is lower in these cases, as initial management often encompasses conservative measures such as rest, thermotherapy, and gentle exercise (Chou et al., 2017). Consequently, the reduced utilization of imaging and medications in acute and non-specific LBP cases contributes to a reduction in costs.

All studies were carried out in high-income countries, which Belgium is also part of (World Population Review, n.d.). In the United States there is no universal coverage for the whole population. Different models are mixed in the United States, but mostly based on private insurance (*Anatomy of Healthcare | the U.S. Healthcare System Explained*, 2022). In Australia there is a combination of private and public insurance (Australian Government Department of Health and Aged Care, 2022), comparing to Belgium is possible because in Belgium an additional private insurance can be obtained (Admin-Kce, n.d.). The Healthcare system in Poland is based on social health insurance, taxes are the main sources of funding (*Poland Health System Information*, n.d.). The Swedish health system provides universal health coverage for all residents, funded by taxes with a little out-of-pocket expenditure (*Sweden Health System Information*, n.d.). The healthcare systems in Poland and Sweden are comparable with the system in Belgium (Admin-Kce, n.d.), only two studies were carried out in those countries (Bornhöft et al., 2015; Kiljańska et al., 2021).

These different approaches can influence various aspects of healthcare. Understanding the context of each country and considering factors such as financing, regulations, cultural norms, and population health is important when comparing healthcare systems. These factors can be determinative of the differences between countries, including Belgium, and can have an impact on how healthcare is organized, financed, and delivered.

3. Reflection on strengths and limitations of the literature study

One strength of our literature study is the employment of a comprehensive search strategy that encompassed multiple databases and a meticulous screening process. The researchers conducted a systematic search using appropriate keywords and MeSH terms, while also

considering the reference lists of retrieved articles to ensure the inclusion of relevant studies. This rigorous approach enhances the validity and reliability of the review. Another strength is the quality assessment of the included studies using the Downs and Black checklist. This assessment provides an objective evaluation of the methodological quality of each study, enabling researchers to determine the overall quality of the evidence. A quality assessment can help to detect bias within a study and give a recommendation of which study outcomes needed to be interpreted with caution. Differences between the quality of studies can give an indication why the outcomes may vary. The inclusion of this assessment strengthens the overall findings and conclusions of the review. However, there are also limitations to consider. One limitation is the language restriction applied in the search strategy, which only included articles published in Dutch, English, or French. This may introduce language bias and potentially exclude relevant studies published in other languages. This is not likely, because most studies are written in English, the scientific language, and the implementation of DA to physiotherapy is mostly in countries where the languages above are their first languages. Another limitation is the heterogeneity among the included studies in terms of study design, sample size, and outcome measures, but also in terms of the healthcare systems, demographics and patient characteristics. This heterogeneity poses challenges in conducting a meta-analysis and drawing definitive conclusions. Future research could benefit from more standardized study designs and outcome measures to facilitate better comparisons and synthesis of results. The core outcome measures for the patients with non-specific LBP are the Oswestry Disability Index version 2.1a or the 24-item Roland Morris Disability Questionnaire for physical functioning, the 11-point Numeric Rating Scale referring to average low back pain intensity over the last week for pain intensity, and the Short Form Health Survey 12 or the 10-item PROMIS Global Health form for health-related quality of life (Chiarotto et al., 2018; International Association for the Study of Pain, 2021)

4. Recommendations for future research

Based on the findings of our literature study, several recommendations for future research can be made. Firstly, there is a need for high-quality studies that monitor the effect of DA to physiotherapy in a more controlled manner especially the clinical outcomes, e.g. physical function, pain intensity, and health-related quality of life (Chiarotto et al., 2018), are still underexposed, specifically focusing on the effects of DA to physiotherapy for patients with

LBP. Additionally, long-term follow-up studies are needed to assess the sustained effects of DA to physiotherapy on patient outcomes and healthcare costs. This would give us more insight into the development of the chronicity of LBP.

Lastly, future research should also examine the potential barriers and facilitators to implementing DA to physiotherapy in different healthcare systems and countries. The lack of awareness of both patients and healthcare providers, insufficient educational level based on guidelines for management of LBP, insurance coverage restrictions, and legal and regulatory barriers are common barriers to implementing direct access to physiotherapy. Education and awareness campaigns, changes in insurance coverage policies, and legal and regulatory reforms are potential facilitators to implementing DA (Alnaqbi, Shousha, AlKetbi, & Hegazy, 2021; Bury & Stokes, 2013). However, the specific barriers and facilitators may vary depending on the country or healthcare system being studied. For Belgium there is no regulatory policy for DA to physiotherapy, the high educational level of the physiotherapist with a knowledge of the red and yellow flags in the population of people with LBP, should make it possible to introduce DA in Belgium (. Understanding the contextual factors that influence the adoption and success of DA programs can guide policymakers and healthcare professionals in promoting and integrating this model of care. It could help to convince policymakers in several countries to make this model the standard pathway in healthcare.

Conclusion

In conclusion, this systematic review highlights the potential benefits of DA to physiotherapy for patients with LBP. The findings suggest that DA can positively impact healthcare use, costs, clinical outcomes and patient satisfaction. Patients who directly accessed physiotherapy services experienced reduced medication use, less reliance on unnecessary imaging and potentially lower rates of specialist referrals. Additionally, DA was associated with cost savings and may contribute to shorter treatment times and hospital stays. While further research is needed to explore the economic implications and clinical outcomes in more depth, these findings support the value of implementing DA to physiotherapy as a means of optimizing LBP management and improving patient-centered care.

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Appendix

Appendix 1.
Search strategies

Database	Search terms
Pubmed (03/10/2022) 6929	(("musculoskeletal pain"[MeSH Terms] OR **"musculoskeletal diseases"[MeSH Terms]** OR ("musculoskeletal"[All Fields] AND ("pain*"[All Fields] OR "pain"[MeSH Terms] OR "pathолog*"[All Fields] OR "abnormalit*"[All Fields] OR "condition*"[All Fields] OR "disease*"[All Fields])) OR "low back pain"[MeSH Terms] OR "low back pain*"[All Fields] OR "lower back pain*"[All Fields] OR ("low"[All Fields] AND "back"[All Fields] AND ("pain*"[All Fields] OR "ache*"[All Fields])) OR ("lower"[All Fields] AND "back"[All Fields] AND ("pain*"[All Fields] OR "ache*"[All Fields])) OR ("lumbar"[All Fields] AND ("pain*"[All Fields] OR "ache*"[All Fields])) OR "lumbago"[All Fields] OR "musculoskeletal"[All Fields] OR "lumbar pain"[All Fields] OR "lumbar ache"[All Fields] OR "musculoskeletal pain"[All Fields]) AND (((((((("direct"[All Fields] AND "access"[All Fields]) OR ("patient"[All Fields] AND "direct"[All Fields] AND "access"[All Fields])) OR ("self referr*"[All Fields])) OR (("first"[All Fields] OR "initial"[All Fields]) AND ("provider*"[All Fields] OR "contact*"[All Fields]))) OR (("primary"[All Fields] AND "health"[All Fields] AND "care"[All Fields]) OR

	("primary"[All Fields] AND "care"[All Fields])) OR ("referral and consultation"[MeSH Terms] OR ("referral"[All Fields] AND "consultation"[All Fields]) OR "referral and consultation"[All Fields])) OR ("health services accessibility"[MeSH Terms] OR ("health"[All Fields] AND "services"[All Fields] AND "accessibility"[All Fields]) OR "health services accessibility"[All Fields])) OR ("practice patterns, physicians"[MeSH Terms]))) AND ((("physical and rehabilitation medicine"[MeSH Terms] OR ("physical"[All Fields] AND "rehabilitation"[All Fields] AND "medicine"[All Fields]) OR "physical and rehabilitation medicine"[All Fields]) OR ("physiotherap*"[All Fields])) OR ("physical therapy modalities"[MeSH Terms] OR ("physical"[All Fields] AND "therapy"[All Fields] AND "modalities"[All Fields]) OR "physical therapy modalities"[All Fields] OR ("physical"[All Fields] AND "therap*"[All Fields]) OR "physical therap*"[All Fields]))
Web of science (30/09/2022) → 4007	TOPIC **Combined:** TS=((musculoskeletal AND (pain* OR patholog* OR abnormalit* OR condition* OR disease*)) OR musculoskeletal OR low back pain* OR low back ache* OR lower back pain* OR lower back ache* OR lumbar pain* OR lumbar ache* OR lumbago) AND TS=(direct access OR patient direct access OR self-referr* OR first provider* OR first contact* OR initial provider* OR initial contact* OR "primary health care" OR primary care OR "referral and consultation" OR "health services accessibility") AND TS=(physical therap* OR physiotherap* OR "physical and rehabilitation medicine")
Pedro (30/09/2022) → 391	**Physical therapy:** no keywords needed because all records are about PT. **MSK/LBP:** difficult to search on both, so no keywords **Direct access:** ● "direct access" → 7 records ● "patient direct access" → 1 record, already in "direct access" ● self-referr* → 221 records ● "first provider*" → 0 records ● "first contact*" → 4 records ● "initial provider*" → 0 records ● "initial contact*" → 22 records ● "primary health care" → 142 records ● "referral and consultation" → 0 records ● "health services accessibility" → 0 records Combined: 396 → without duplicates: 391
Embase (30/09/2022) → 3195 (combined)	**MSK/LBP:** (musculoskeletal AND (pain* OR patholog* OR abnormalit* OR condition* OR disease*)) OR 'low back pain*' OR 'lower back pain*' OR 'low back ache*' OR 'lower back ache*' OR 'lumbar pain' OR 'lumbar ache' OR lumbago OR musculoskeletal 30/09/2022: 317.393 **Direct access:** (direct NEAR/10 access) OR (patient NEAR/10 direct NEAR/10 access) OR 'self referr*' OR (first NEAR/10 contact*) OR (initial NEAR/10 contact*) OR (initial NEAR/10 provider*) OR (first NEAR/10 provider*) OR 'primary health care' OR 'primary care' OR 'health services accessibility' OR 'health care access' 30/09/2022: 458.273 **Physical therapy:** (physical AND therap*) OR physiotherap* OR 'physical and rehabilitation medicine' 30/09/2022: 710.471
CINAHL (30/09/2022) → 1792 (combined)	All text, TX **MSK/LBP:** (musculoskeletal AND (pain* OR condition* OR patholog* OR disease* OR abnormalit*)) OR musculoskeletal OR "low back pain*" OR "lower back pain*" OR "low back ache*" OR "lower back ache*" OR "lumbar pain" OR "lumbar ache" OR lumbago 30/09/2022: 91.237 **Direct access:** TX direct access OR TX self-referral OR TX first provider* OR TX first contact* OR TX initial provider* OR TX initial contact* OR TX (primary health care OR primary healthcare) OR TX primary care OR TX health services accessibility OR TX health services access OR TX health care use

	30/09/2022: 314.047 **Physical therapy:** TX physical therap* OR TX physiotherap* OR TX ("physical and rehabilitation medicine") 30/09/2022: 194.948

Appendix 2

Modified version Downs and Black checklist

Item	Criteria	Possible answers
Reporting		
1	Is the hypothesis/aim/objective of the study clearly described?	Yes=1 No=0
2	Are the main outcomes to be measured clearly described in the Introduction or Methods section? If the main outcomes are first mentioned in the Results section, the question should be answered no.	Yes=1 No=0
3	Are the characteristics of the patients included in the study clearly described? In cohort studies and trials, inclusion and/or exclusion criteria should be given. In case-control studies, a case-definition and the source for controls should be given.	Yes=1 No=0
4	Are the interventions of interest clearly described? Treatments and placebo (where relevant) that are to be compared should be clearly described.	Yes=1 No=0
5	Are the distributions of principal confounders in each group of subjects to be compared clearly described? A list of principal confounders is provided.	Yes = 2 Partially = 1 No = 0
6	Are the main findings of the study clearly described? Simple outcome data (including denominators and numerators) should be reported for all major findings so that the reader can check the major analyses and conclusions. (This question does not cover statistical tests which are considered below).	Yes = 1 No = 0
7	Does the study provide estimates of the random variability in the data for the main outcomes? In non-normally distributed data the interquartile range of results should be reported. In normally distributed data the standard error, standard deviation or confidence intervals should be reported. If the distribution of the data is not described, it must be assumed that the estimates used were appropriate and the question should be answered yes.	Yes = 1 No = 0
8	Have all important adverse events that may be a consequence of the intervention been reported? This should be answered yes if the study demonstrates that there was a comprehensive attempt to measure adverse events. (A list of possible adverse events is provided).	Yes = 1 No = 0
9	Have the characteristics of patients lost to follow-up been described? This should be answered yes where there were no losses to follow-up or where losses to follow-up were so small that findings would be unaffected by their inclusion. This should be answered no where a study does not report the number of patients lost to follow-up.	Yes = 1 No = 0
10	Have actual probability values been reported (e.g. 0.035 rather than <0.05) for the main outcomes except where the probability value is less than 0.001?	Yes = 1 No = 0
External validity		
11	Were the subjects asked to participate in the study representative of the entire population from which they were recruited? The study must identify the source population for patients and describe how the patients were selected. Patients would be representative if they comprised the entire source population, an unselected sample of consecutive patients, or a random sample. Random sampling is only feasible where a list of all members of the relevant population exists. Where a study does not report the proportion of the source population from which the patients are derived, the question should be answered as unable to determine.	Yes = 1 No = 0 Unable to determine = 0
12	Were those subjects who were prepared to participate representative of the entire population from which they were recruited? The proportion of those asked who agreed should be stated. Validation that the sample was representative would include demonstrating that the distribution of the main confounding factors was the same in the study sample and the source population.	Yes = 1 No = 0 Unable to determine = 0
13	Were the staff, places, and facilities where the patients were treated, representative of the treatment the majority of patients receive? For the question to be answered yes the study should demonstrate that the intervention was representative of that in use in the source population. The question should be answered no if, for example, the intervention was undertaken in a specialist centre unrepresentative of the hospitals most of the source population would attend.	Yes = 1 No = 0 Unable to determine = 0
Internal validity - bias		
14	Was an attempt made to blind study subjects to the intervention they have received? For studies where the patients would have no way of knowing which intervention they received, this should be answered yes.	Yes = 1 No = 0 Unable to determine = 0

15	Was an attempt made to blind those measuring the main outcomes of the intervention?	Yes = 1 No = 0 Unable to determine = 0
16	If any of the results of the study were based on “data dredging”, was this made clear? Any analyses that had not been planned at the outset of the study should be clearly indicated. If no retrospective unplanned subgroup analyses were reported, then answer yes.	Yes = 1 No = 0 Unable to determine = 0
17	In trials and cohort studies, do the analyses adjust for different lengths of follow-up of patients, or in case-control studies, is the time period between the intervention and outcome the same for cases and controls? Where follow-up was the same for all study patients the answer should be yes. If different lengths of follow-up were adjusted for by, for example, survival analysis the answer should be yes. Studies where differences in follow-up are ignored should be answered no.	Yes = 1 No = 0 Unable to determine = 0
18	Were the statistical tests used to assess the main outcomes appropriate? The statistical techniques used must be appropriate to the data. For example nonparametric methods should be used for small sample sizes. Where little statistical analysis has been undertaken but where there is no evidence of bias, the question should be answered yes. If the distribution of the data (normal or not) is not described it must be assumed that the estimates used were appropriate and the question should be answered yes.	Yes = 1 No = 0 Unable to determine = 0
19	Was compliance with the intervention/s reliable? Where there was noncompliance with the allocated treatment or where there was contamination of one group, the question should be answered no. For studies where the effect of any misclassification was likely to bias any association to the null, the question should be answered yes.	Yes = 1 No = 0 Unable to determine = 0
20	Were the main outcome measures used accurate (valid and reliable)? For studies where the outcome measures are clearly described, the question should be answered yes. For studies which refer to other work or that demonstrates the outcome measures are accurate, the question should be answered as yes.	Yes = 1 No = 0 Unable to determine = 0
Internal validity – confounding (selection bias)		
21	Were the patients in different intervention groups (trials and cohort studies) or were the cases and controls (case-control studies) recruited from the same population? For example, patients for all comparison groups should be selected from the same hospital. The question should be answered unable to determine for cohort and case-control studies where there is no information.	Yes = 1 No = 0 Unable to determine = 0
22	Were study subjects in different intervention groups (trials and cohort studies) or were the cases and controls (case-control studies) recruited over the same period of time? For a study which does not specify the time period over which patients were recruited, the question should be answered as unable to determine.	Yes = 1 No = 0 Unable to determine = 0
23	Were study subjects randomized to intervention groups? Studies which state that subjects were randomized should be answered yes except where method of randomization would not ensure random allocation. For example alternate allocation would score no because it is predictable.	Yes = 1 No = 0 Unable to determine = 0
24	Was the randomized intervention assignment concealed from both patients and health care staff until recruitment was complete and irrevocable? All nonrandomized studies should be answered no. If assignment was concealed from patients but not from staff, it should be answered no	Yes = 1 No = 0 Unable to determine = 0
25	Was there adequate adjustment for confounding in the analyses from which the main findings were drawn? This question should be answered no for trials if: the main conclusions of the study were based on analyses of treatment rather than intention to treat; the distribution of known confounders in the different treatment groups was not described; or the distribution of known confounders differed between the treatment groups but was not taken into account in the analyses. In non-randomized studies if the effect of the main confounders was not investigated or confounding was demonstrated but no adjustment was made in the final analyses the question should be answered as no.	Yes = 1 No = 0 Unable to determine = 0
26	Were losses of patients to follow-up taken into account? If the numbers of patients lost to follow-up are not reported, the question should be answered as unable to determine. If the proportion lost to follow-up was too small to affect the main findings, the question should be answered yes.	Yes = 1 No = 0 Unable to determine = 0
Power		
27	Did the study have sufficient power to detect a clinically important effect where the probability value for a difference being due to chance is less than 5%? Sample sizes have been calculated to detect a difference of x% and y%.	Yes = 1 No = 0 Unable to determine = 0

Appendix 3.

Quality assessment

Downs and Black checklist																												
Item	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	%
Crowell et al. (2022)	1	1	1	/	1	1	1	/	1	1	0	/	/	/	/	1	1	1	/	1	0	1	/	/	0	1	1	**78,95**
Denninger et al. (2018)	1	1	1	1	1	1	1	1	0	0	1	UTD	1	0	UTD	1	0	1	1	1	1	1	0	0	0	1	1	**64,29**
Garrity et al. (2019)	1	1	1	/	2	1	1	/	1	1	1	/	/	/	/	1	1	1	/	1	1	1	/	/	1	1	1	**100**
Harwood et al. (2022)	1	1	1	/	2	0	1	/	1	0	1	/	/	/	/	1	1	1	/	1	1	1	/	/	1	1	0	**84,21**
Kazis et al. (2019)	1	1	1	/	1	0	0	/	1	0	1	/	/	/	/	1	1	1	/	1	1	1	/	/	1	1	1	**78,95**
Overman et al. (1988)	1	1	1	1	1	1	0	1	1	0	1	UTD	1	UTD	UTD	1	1	1	1	1	1	1	1	0	0	0	1	**67,86**
Kiljanska et al. (2021)	1	1	1	1	1	1	1	0	1	1	1	UTD	0	0	0	1	1	1	1	1	1	0	0	0	0	1	1	**64,29**
Sayer et al. (2018)	1	1	1	1	1	1	1	1	1	1	1	UTD	1	UTD	0	1	1	1	1	1	1	1	0	0	1	1	1	**78,57**
De Grunchy et al. (2015)	1	1	1	1	1	1	1	1	1	1	1	UTD	1	UTD	0	1	1	1	1	1	1	UTD	0	0	0	1	1	**71,43**
Schulz et al. (2016)	1	1	1	/	1	1	1	/	1	1	1	1	/	/	/	1	1	1	/	1	1	1	/	/	0	1	1	**90**
Bornhoft et al. (2015)	1	1	1	1	1	1	1	0	1	1	1	1	0	0	0	1	1	1	1	1	0	1	0	0	1	1	1	**71,43**
Pendergast et al (2012)	1	1	1	/	1	1	1	/	1	1	1	/	/	/	/	1	1	1	/	1	1	1	/	/	1	1	1	**94,74**
Magel et al. (2018)	1	1	1	1	1	1	1	0	1	0	0	UTD	0	0	0	1	1	1	1	1	1	1	0	0	1	1	1	**64,29**
Halfpap et al. (2022)	1	1	1	1	0	1	1	1	0	0	1	UTD	0	0	0	1	UTD	0	1	1	0	1	0	0	0	0	0	**42,86**
Frogner et al. (2018)	1	1	1	/	1	1	1	/	1	0	1	/	/	/	/	1	1	1	/	1	1	1	/	/	1	1	1	**89,47**
Fritz et al. (2016)	1	1	1	/	1	1	1	/	1	1	1	/	/	/	/	1	1	1	/	1	1	1	/	/	1	1	1	**100**
Pugh et al. (2020)	1	1	1	1	1	1	0	0	/	1	1	UTD	1	UTD	0	1	/	1	1	1	1	1	0	0	1	/	1	**68**

Note. Unable to determine = UDT and score 0; items with '/' are items that are removed for the quality assessment of that study.