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Low Back Pain Management in Primary Healthcare: Findings from a Scoping Review on Models of Care

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Title Page

Low Back Pain Management in Primary Healthcare: Findings from a Scoping Review on Models of Care

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Low Back Pain Management in Primary Healthcare: Findings from a Scoping Review on Models of Care

ABSTRACT

Introduction: Models of care (MoCs) describe evidence-informed healthcare that should be delivered to patients. Several MoCs have been implemented for low back pain (LBP) in the last years to reduce evidence-to-practice gaps and increase the effectiveness and sustainability of healthcare services.

Objective: To synthetize research evidence regarding the core characteristics, context features and key common elements of MoCs implemented in primary healthcare for the management of LBP.

Design: Scoping review.

Data sources: Searches on MEDLINE(Pubmed), EMBASE, Cochrane Central Register of Controlled Trials, PEDro, Scopus, Web of Science and grey literature databases were conducted.

Eligibility criteria: Eligible records included MoCs implemented for adult LBP patients in primary healthcare settings.

Data extraction and synthesis: Data extraction was carried out independently by two researchers and included a summary of the studies, the identification of the MoCs and respective key elements, such as levels of care, settings, health professionals involved, type of care delivered and core components of the interventions. Findings were investigated through a descriptive qualitative content analysis using a deductive approach.

Results: Twenty-nine studies reporting 11 MoCs were included. All MoCs were implemented in high-income countries and had clear objectives. Most MoCs included a stratified care approach. Assessment of LBP patients typically occurred in primary healthcare, while care delivery usually took place in community-based settings or outpatient clinics. Care provided by general practitioners and physiotherapists was reported in most of the studies. Education and exercise were the most common health interventions, but intervention content, follow-ups and discharge criteria were not fully reported.

Conclusions: MoCs for LBP in primary healthcare share relevant key elements, but report of interventions is heterogenous. This study provided a comprehensive understanding of the characteristics of the existing MoCs, which may contribute to inform future research implementation studies and the development of health policies and services for LBP.

Keywords: Low back pain; models of care; primary healthcare; implementation science

Registration: Open Science Framework Registries (https://osf.io/rsd8x)

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ARTICLE SUMMARY

Strengths and limitations of this study

- To the best of our knowledge, this is the first study aiming to map the available evidence regarding the core characteristics, context features and key elements of MoCs implemented in primary healthcare for the management of LBP;
- To safeguard the transparency and methodological rigour of this study, it followed the Joanna Briggs Institute Methodological Guidelines and Preferred Reporting Items for Systematic Reviews and Meta-Analysis extension for Scoping Reviews;
- One limitation of this review is potential selection bias due to search strategies and language restrictions, as well as uncertainty in MoC terminologies;
- Strategies to overcome potential limitations included the use of a broad search strategy across databases, an overinclusion approach during articles screening and regular team discussions during data extraction and analysis;
- This study offers a comprehensive and detailed understanding of the key characteristics of the MoCs implemented for the management of LBP in primary healthcare, which may inform researchers, health professionals and policy makers in the development of future implementation research studies on this topic.

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INTRODUCTION

Low back pain (LBP) is a significant global public health concern, acknowledged as the leading contributor to disability worldwide. In 2020, 619 million (95% UI 554–694) people reported having this health condition and prevalence projections suggest it will escalate to 843 million (95% UI 759–933) by 2050, an increase in total cases of 36.4%(1). It is recognized that the burdensomeness of LBP is related to long-term disability and poor health-related quality of life(2–4), associated with more medical costs and utilization of healthcare resources, such as medication, medical appointments, imaging and physiotherapy(2,5–7). Thus, the impact of LBP goes beyond the individual burden, representing a growing demand for society and healthcare systems.

Although care delivery may vary between health systems, primary healthcare is recognized as the appropriate setting to manage LBP(8,9), which is already one of the most common reasons for general practice consultations worldwide(8,10). Accompanying the estimates of the rising prevalence of LBP, it is also expected a significant increase in primary healthcare workload in the upcoming years(9), so there is an urgent need to develop efficient and sustainable solutions to face these healthcare challenges.

Additionally, evidence shows there is a present gap between the recommended practice for LBP and the care provided in real-world contexts(9). Current patterns of care may vary between settings and lack alignment with clinical practice guideline recommendations, which succinctly endorses the delivery of nonpharmacological interventions, such as education, exercise and manual therapy(8,11–13). However, many LBP patients receive unnecessary low-value care, which does not align with quality standards(14,15), leads to poor clinical outcomes(4,16) and waste healthcare resources(17–19). Therefore, system-level reform strategies are necessary to overcome these evidence-to-practice gaps and to promote the delivery of high-quality care to LBP patients (9,17,20).

The implementation of models of care (MoCs) is one of the most auspicious strategies suggested to increase the responsiveness of health systems to the impact of LBP. A Model of Care (MoC) is a person-centered and principle-based guide that describes evidence-informed best practice care for particular health conditions, outlining what care should be provided and how to implement it(21,22). Its principles are in line with the quadruple aim of value-based care, targeting better health outcomes, better patient and health professional experiences and improved use of healthcare resources(17,22)**.** MoCs usually reflect regional or national health policies that are implemented as health services at local settings(21,23). When implemented locally, a MoC include the key core components from the system-level framework, but other elements should be adapted to meet the specific context and needs(17). The operationalization of a MoC for local service delivery is usually designated as ‘model of service delivery’(17).

Several MoCs have been implemented for LBP patients over the last few years in different countries(24–52). Commonly, these MoCs deliver care through stepped or stratified approaches, supporting the decision-making process. In stepped care, all patients are initially offered the same treatment options and more complex care is only proposed if they have not recovered sufficiently, while, in risk-stratified MoCs, patients are stratified according to their prognosis at initial assessment and treatment is targeted to patient subgroups, with more comprehensive care offered to those at risk of poor outcomes(53).

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Although some MoCs reveal promising results regarding their effectiveness and cost-effectiveness(24,32,50), they are very heterogeneous in terms of their characteristics, making it difficult to assess the suitability of a MoC to a given context over another. These characteristics include, but are not limited to, the target population, clinical pathways, levels of care and health professionals involved, type of care (stepped/stratified approaches), health interventions and context features.

To our knowledge, there are no published reviews with the specific purpose of mapping the available evidence on the MoCs implemented for LBP patients. Therefore, this scoping review aims to systematically synthetize the literature on MoCs implemented for the management of LBP patients in primary healthcare, examining the extent and range of available research and summarizing the findings. It is expected that this knowledge would provide a broader overview of their nature, diversity and key common elements. Likewise, the results of this study may help policy makers, health administrators and managers, advocacy organizations, clinicians, researchers, funders and LBP patients to inform the development of health services and future research on the implementation of health interventions.

METHODS

A scoping review was deemed the most appropriate study design to answer the research questions as it aims to map the available evidence and identify characteristics or factors related to an emerging and complex concept(54,55). The uncertainty regarding the evidence sources, methodologies and amount and quality of available data driven the choice of this approach.

This study was conducted in accordance with the Joanna Briggs Institute (JBI) scoping review guidance and the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for scoping reviews (PRISMA-ScR) (Supplementary File 1). The protocol was registered within the Open Science Framework Registries (https://osf.io/rsd8x) and it was published elsewhere(56). Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Research questions

Four research questions were framed in the protocol of this study(56):

- Which MoCs have been implemented for patients with LBP attending primary healthcare services?
- What are the key elements of the MoCs?
- What are the patient-, system- and implementation-related outcomes of the MoCs and how have they been measured?
- What are the context-specific factors contemplated in the implementation of the MoCs at macro (system), meso (organizational), micro (patient) and multiple levels?

However, during the processes of data extraction and analysis, it has become clear that the complexity of the topic and richness of the available data justify a rigorous description and interpretation of the

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findings. Therefore, this paper will answer to the first two research questions, while findings concerning the last two will be reported in a subsequent paper.

Inclusion criteria

Eligibility criteria was defined through the PCC framework(54,55). A detail description of the population, concept, context and evidence sources is provided in the protocol of this review(56).

Target population include LBP patients, with or without radicular pain, of any duration. Individuals with LBP related to specific causes, such as pregnancy, fracture, inflammatory diseases, infection or other serious pathologies were excluded. MoCs that were not specifically directed to LBP and included broader populations, such as “musculoskeletal pain” or “spinal pain”, were excluded.

MoC was the concept of interest and it entails what care should be provided and how it should be delivered in a local setting, including processes of care, organization of providers and management of services(21,22,57). Based on *A Framework to Evaluate Musculoskeletal Models of Care*(21), operational criteria were defined to differentiate a MoC from other types of interventions. Only one criterion was added to those that were published in the protocol, which is the MoC is not digital, which include telemedicine, telerehabilitation, web-based programs and/or mobile apps.

Regarding the context, this review included MoCs implemented in primary healthcare(57). MoCs were included if they were developed in primary healthcare or in other levels of healthcare delivery, as long as they include primary care interventions in the clinical pathway.

Additionally, this study covered a broad spectrum of evidence sources, including peer-reviewed primary research and grey literature(54,55). The first comprised quantitative, qualitative and mixed methods study designs, while the latter encompassed organizational reports, policy documents, research reports, pilot studies, dissertations and theses. Reviews, meta-analysis, guidelines, books, book chapters, editorials, expert opinions, conference proceedings and presentations were excluded.

Search Strategy

A comprehensive search was conducted on MEDLINE(PubMed), EMBASE, Cochrane Central Register of Controlled Trials, PEDro, Scopus and Web of Science. Grey literature databases included the Grey Literature Report, MedNar Search Engine and the World Health Organization Institutional Repository for Information Sharing (WHO-IRIS). Hand searching was also carried out in relevant peer-reviewed journals and websites of important organizations(58). The list of hand searched journals and organizations is provided in Figure 1. Additional studies were identified by screening the reference lists of relevant reviews.

[Please insert Figure 1 – PRISMA flow diagram showing the identification, screening, eligibility and inclusion process of the articles]

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An initial limited search of PubMed was undertaken in May 2021, using the PCC framework, so the key search terms “low back pain”, “model of care” and “primary care” were included. Text words contained in the titles and abstracts, index terms describing the articles, Medical Subject Headings and truncation were used to develop a full search strategy(56). A second search using a tailored strategy were performed across all databases, including grey literature databases, with the required adjustments to the features of each one (Supplementary File 2). Reflecting the contemporary paradigms of healthcare delivery and the concept of MoC(9), only records published since 2000 were eligible for inclusion. Language restrictions were set for English, Portuguese or Spanish.

The searches started on the inception date of this review (January 2022) and the last update was performed on December 2022. All search strategies for the different databases were reviewed by and performed with the assistance of an information scientist (HD), who is an experienced research librarian. Reference lists of the eligible records were also screened to find additional studies.

Study Selection

All records were imported to EndNote X9 (Clarivate Analytics, USA) for removal of duplicates and screening. Two reviewers (STD and DC) independently screened their titles and abstracts and studies included by at least one reviewer were retrieved. Eligibility criteria were tested by piloting a random sample of 25 records and refinements were made until an agreement equal or greater than 75% was reached(58). For full text screening, two researchers (STD and AM) independently assessed the potential for inclusion and divergences were discussed with a third reviewer (DC). Once again, a pilot test was completed with a random sample of 10 studies to ensure consistency during the process.

Data charting

Several steps were taken to ensure transparency and rigour of data extraction process(54). First, the planned extraction approach was reported in the protocol(56). Secondly, a standardized data extraction form (Supplementary File 3) based on research questions and the PCC framework was developed and piloted. Data extraction included a summary of the studies (title, authors, year of publication, citation, peer-reviewed/grey literature source, study design, study objectives and sample size), the identification of the MoC (name, country, target population, main objetives and main context features) and respective key elements (levels of care and settings, health professionals involved, type of care delivered and core components of health interventions).

As endorsed, two researchers (STD and AM) extracted data independently from each evidence source and a pilot test of five records concerning different study designs was carried out(54). Uncertainties or disagreements regarding to the data to be extracted were discussed with the research team and, in accordance, adjustments to the form were made. Only data relevant to the research question were extracted and authors of the included studies were emailed to clarify uncertain information and/or to request missing data related to the MoCs. Regular meetings through videoconferencing were performed

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by the research team, in order to check the data charting, assess the need to update the extraction form and discuss progress of the review process.

In line with the recommendations for conducting scoping reviews(54,55), a quality or risk of bias assessment was not performed by the reviewers.

Synthesis and presentation of results

Findings were synthetized through a basic descriptive qualitative content analysis, which concerns 3 distinct phases: 1) preparation; 2) organizing and 3) reporting(59). As this review is informed by *A Framework to Evaluate Musculoskeletal Models of Care*(21), a deductive approach was deemed adequate to perform data extraction and presentation in the preparation phase.

In the organization stage, the research team familiarized themselves with the data, understanding how the data are important to answer the research questions. During and after the extraction process, reviewers and research team discussed the relevance of the data according to the underlying framework, respectively.

To report the findings, data is presented in narrative, tabular and chart formats regarding each MoC implemented for the management of LBP. As aforementioned in the data charting section, descriptive results include the identification of the MoCs, their general description and core components, main context features and organisational components, such as settings and healthcare professionals involved. Additionally, quantitative data using a descriptive numerical summary are presented, such as frequency counts of the overall number of studies included, study designs, geographical distribution of the MoCs, type of care delivered, among others. As each MoC is the unit of interest in this review, multiple records of the same MoC are linked and reported together.

RESULTS

Literature search

The literature search yielded 4081 publications, of which 3238 were identified from databases and registers and 843 from grey literature and handsearching of relevant journals and institutions. Thirty-nine records were further retrieved after examining reference lists of published reviews and results of the automatic searches performed monthly in the selected databases. After removing duplicates, 3255 records were screened through title and abstract, and of these, 255 full texts were assessed for eligibility. The PRISMA flow diagram (Figure 1) outlines the search and selection process, including the reasons for exclusion of the studies. Twenty-nine studies(24–52), published between 2011 and 2022, were included. They portray 11 models of care (MoCs) implemented in primary healthcare.

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Characteristics of the included studies

Table 1 summarizes the designation of each MoC and their corresponding studies. Of the 29 records, 19 were quantitative, five were qualitative and five used a mixed methods approach. Among the quantitative studies, randomized controlled trials (RCTs) (n=9) and observational cohorts (n=9) were the most common, followed by one non-randomized controlled trial. Through RCT designs, it was evaluated MoCs clinical effectiveness (4 MoCs)(24,29,32,50,51), cost-effectiveness (3 MoCs)(24,48,50,51), efficacy (2 MoCs)(48,52), cost-utility (1 MoC)(25,46), healthcare resources utilization (4 MoCs)(24,25,29,46,48,50–52) and healthcare quality (1 MoC)(33). The clinical effectiveness of the Irish STarT Back(47) was assessed through a non-randomized controlled trial, while observational cohort studies reported findings regarding clinical efficacy (1 MoC)(36), changes in outcomes over time (4 MoCs)(34,36,38,39,41,45), healthcare resources utilization (3 MoCs)(36,42–44), costs (1 MoC)(36) and implementation outcomes (1 MoC)(30). Implementation outcomes (3 MoCs)(31,35,49) and implementation strategies (2 MoCs)(26,27) were also evaluated through qualitative studies. Three mixed methods studies explored patient and organizational outcomes and experiences of different stakeholders simultaneously in three MoCs(28,37,40). Additional characteristics of the included studies, such as eligibility criteria, sample sizes, outcomes and outcome measures can be found in Supplementary File 4.

[Please Insert Table 1 – MoCs identification and corresponding studies]

Research question 1: Which MoCs have been implemented for patients with LBP attending primary healthcare services?

General description

The 11 MoCs implemented in primary healthcare for the management of LBP patients are the STarT Back(24,25,36,46–48), SCOPiC(49–51), MATCH(26,52), TARGET(27–29), BetterBack☺ Model of Care(30,31,33,50), Low Back and Radicular Pain Pathway(34,35,37–39), Beating Back Pain Service (BBPS)(40), North East Essex Primary Care Trust (PCT) manual therapy service(41), Interprofessional Spine Assessment and Education Clinics (ISAEC)(42), Saskatchewan Spine Pathway(SSP)(43,44) and Back Pain Assessment Clinic (BAC)(45).

Target population involved adults with LBP, with or without radicular pain, or radiculopathy. North East Essex PCT manual therapy service(41) and BAC(45) also included patients with neck pain. BBPS(40) and Irish STarT Back(47) were the only MoCs that established the duration of pain as an eligibility criterion, namely, the presence of LBP for more than 6 weeks and 3 months, respectively (Supplementary File 4).

As shown in Table 2, most MoCs were developed to promote evidence-informed practice and guideline-concordant care to improve clinical effectiveness. MoCs comprising more than one level of care, such as interface services and/or secondary care(34,35,38,39,42–45,49–51), were especially concerned in

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reducing waiting times and optimizing referral behaviors for imaging, care delivery and specialist review. Goals related to equitable access to care were only identified for the Low Back Pain and Radicular Pain Pathway(34) and the North East Essex PCT manual therapy service(41). Detailed information on the goals of the different MoCs, as well as context features, settings and health professionals involved in care delivery is presented in Table 2.

[Please insert Table 2 – General characteristics of the MoCs]

Context features

All MoCs were implemented in high-income countries from Europe (United Kingdom, Ireland, Denmark, Sweden), North America (United States of America and Canada) and Australia, as illustrated in Figure 2. United Kingdom is the country that has implemented the largest number of MoCs (n=5), followed by United States of America (EUA) (n=2) and Canada (n=2). The only MoC implemented in three countries (United Kingdom, Ireland, Denmark) was the STarT Back(24,25,36,46–48). However, adaptations of this MoC, with significant adjustments to its core characteristics, were also implemented in the United States of America (MATCH and TARGET)(26–29,52) and Sweden (BetterBack☺)(30,31,33,50).

[Please insert Figure 2 – Geographical representation of the MoCs (n=11) implemented for LBP in primary healthcare worldwide]

The majority of MoCs were implemented within the National Healthcare Systems through local (n=3) and regional (n=7) pathways. Only the Low Back Pain and Radicular Pain Pathway refers to a national MoC(34,35). MATCH(26,52) and TARGET(27–29) were implemented in integrated healthcare delivery systems of the USA. Additionally, only four studies(29,42,48,50) reported that MoCs (Danish STarT Back, SCOPiC, TARGET and ISAEC) were implemented in different geographical areas, covering urban, inner city and rural settings.

As aforementioned, most MoCs expressed the intention to deliver evidence-based care and followed specific clinical practice guidelines to design the service delivery and health interventions for the management of LBP. Among the European MoCs that reported being informed by guidelines (n=6), five followed the National Institute for Health and Care Excellence guidance of the United Kingdom. The BetterBack☺(30,31,33,50) also was informed by the Danish Health and Medicines Authority. Considering the MoCs implemented in the United States of America, MATCH(26,52) was informed by treatment guidelines of the health system where it was implemented (Group Health) and TARGET(27–29) by the American College of Physicians and the American Physical Therapy Association guidelines. Canadian MoCs (ISAEC(42) and SSP(43,44)) do not specify the guidelines they followed, although the studies mention the need to provide care in line with current recommendations.

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Settings and Healthcare Professionals

Most MoCs for LBP encompass more than one healthcare setting. General practices are the leading entry point into 8 MoCs (STarT Back, SCOPiC, Low Back and Radicular Pain Pathway, ISAEC, BBPS, SSP, North East Essex PCT service and BAC), being important in the initial management of LBP patients. In these MoCs, the continuity of care is delivered in outpatient physiotherapy clinics and community care, where patients receive the main health interventions. SCOPiC(49–51), Low Back and Radicular Pain Pathway(34,35,37–39) and BAC(45) also include other settings, such as interface, secondary and tertiary care services. MATCH(26,52), TARGET(27–29) and BetterBack☺(30,31,33,50) were implemented only in primary healthcare clinics with onsite physiotherapy departments.

The most common health professionals mentioned in MoCs are general practitioners and physiotherapists. The former contributes predominantly to the initial assessment and referral of patients to the health services where they will be treated, while the latter are responsible for the rehabilitation process. Some models also include osteopaths, chiropractors and acupuncturists(34,35,40–42), depending on the context of each country with regard to the integration of these health professionals into the health systems. MoCs that incorporate more than one level of care(34,35,43–45,49–51), comprise consultations of medical specialities with surgeons and rheumatologists. Four MoCs (Low Back and Radicular Pain Pathway(34,35,37–39), ISAEC(42), SSP(43,44) SCOPiC(49–51), also include advanced practice clinicians, usually physiotherapists, who are specialized in triage processes and identification and management of red flags and emergency conditions.

Research question 2: What are the key elements of the MoCs?

Type of care

The majority of MoCs (n=7) use a stratified care approach, targeting health intervention to patients' subgroups based on their prognostic profile (STarT Back, MATCH, TARGET and SCOPIC) and/or pattern diagnosis (SCOPIC, ISAEC, SSP and BAC). Less treatment is given to those who are at low risk or whose signs and symptoms are less severe, while high-risk patients receive more specialized treatment or are referred to secondary care. The only MoC that is characterized by a stepped approach is the BAC(45), being essentially a health service dedicated to the screening and referral of LBP patients.

Hybrid care, combining stratified and stepped approaches, were identified in four MoCs. BetterBack☺(30,31,33,50) and Low Back and Radicular Pain Pathway(34,35,37–39) stratify patients based on clinical prognosis. If there are no improvements after the main health intervention, patients are referred to additional group care in BetterBack☺(30,31,33,50) and to Pain Management Services and specialist spinal surgical options in the Low Back and Radicular Pain Pathway(34,35,37–39). In BBPS(40) and North East Essex PCT service(41), the stepped care occurs first through education sessions and usual general practitioner care, respectively. Patients are stratified a posteriori based on their treatment preferences, such as care provided by physiotherapists, osteopaths or chiropractors. Figure 3 and Table 2 summarize the type of care provided in each MoC.

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[Please insert Figure 3 – Sunburst chart representing the different approaches of care delivered by the MoCs]

Core components of MoCs

To facilitate the reporting, core components were separated into five moments, which correspond to Referral, Assessment, Health Interventions, Follow-ups and Discharge. These elements are presented in Supplementary File 5.

Referral and Assessment

As aforementioned, the initial consultation with a general practitioner is an entry point on the pathway in all MoCs. In some cases, self-referral through direct access to services is possible (STarT Back(24,25), BetterBack☺(30,31,33,50) and Low Back and Radicular Pain Pathway(34,35)), as well as referral by other health professionals (MATCH, TARGET and ISAEC). Surgeons are the main referrers in SSP(44) and BAC(45).

The assessment of LBP patients concerns mainly the exclusion of red flags, physical assessment and stratification. Physiotherapists (n=9) are the most common health professionals to carry out the assessment, followed by the GP and triage specialists. The only model that does not carry out an assessment before an intervention is the BBPS(40), which is only performed after a group education session.

Health Interventions

Education (n=10), exercise (n=9) and manual therapy (n=7) were the key core elements of MoCs reported by most studies. With the exception of North East Essex PCT service(40) and BAC(45), all MoCs included at least a minimal education intervention, focusing on the reassurance about the benign nature of LBP and self-management strategies. These messages were communicated directly by the health professionals or through support tools, such as written information, DVDs and online contents.

In MoCs that include a stratified approach, patients receive appropriate matched treatments, with different doses of education, exercise and manual therapy, according to their prognosis, pattern diagnosis or treatment preference. More complex interventions, such as interventions for high-risk patients(24–31,33,36,38,39,46–48,50,52) and community-based spinal rehabilitation programmes(34,35,37–39,45), combine physical and psychological therapies, adding cognitive-behavioural approaches and support for long-term self-management.

The majority of MoCs include a health intervention that may vary from a single session (for low-risk patients in stratified approaches according to prognosis profile) to several weeks of multifaceted rehabilitation programmes. However, not all models establish a specific duration for these interventions. Individualized treatments are the chosen format for healthcare delivery in most MoCs, with the exception

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of Irish STarT Back(47). Group interventions appear to be a second treatment option (BetterBack☺(30,31,33,50)) and Low Back and Radicular Pain Pathway(34,35,37–39)), when the main health intervention did not result in benefits for LBP patients.

Other interventions, such pain medication prescription or review, were usually delivered by GP or other medical doctor in the initial consultation (STarT Back, TARGET, Low Back and Radicular Pain Pathway and SSP). None of the MoCs included occupational interventions or treatments focused on the adoption of healthy lifestyles.

Follow-up and Discharge

Follow-up management and criteria for discharge were not well-defined in the included studies. When there are no improvements in the health condition, follow-ups may combine referral to additional group interventions, interface or secondary/tertiary care services. Irish(47) and Danish(48) STarT Back, TARGET(27–29) and BBPS(40) did not reported how and when follow-ups are conducted.

Concerning discharges, it seems they occur at the end of health interventions, but the reporting is not clear. In risk-stratified models, such as STarT Back, patients attend a preset number of appointments to receive treatments. However, it is poorly described if patients are discharged after this period, with 6 MoCs not mentioning any criteria or timing. In TARGET(27–29), Low Back and Radicular Pain Pathway(34,35,37–39) and North East Essex PCT service(41) patients can be discharged at any point along the pathway upon improvement of the LBP.

DISCUSSION

This study mapped the available evidence regarding the core characteristics, context features and key elements of MoCs implemented in primary healthcare for the management of LBP. Our findings revealed 11 MoCs, which share some similarities, but also some differences between them. Most MoCs have been implemented in high-income countries with solid primary healthcare services, where general practitioners and physiotherapists are the main referrers. The majority of MoCs involves complex interventions delivered by physiotherapists, showing great variability in terms of components and duration and unclear follow-up and discharge criteria.

Firstly, it seems important to underline that most MoCs are still under research and not effectively embedded into health systems as a form of routine practice. Excluding Low Back Pain and Radicular Pain Pathway(34,35), the only MoC implemented nationwide, the remaining continue to be tested locally or regionally. This was already expected as the relevance of implementing MoCs for LBP has been highlighted recently and discussed in contemporary research(60).

In general, all MoCs sought to introduce healthcare consistent with current clinical guidelines, which is a central recommendation from implementation frameworks(21). Most studies reported they designed the service delivery and health interventions according to national or international clinical practice guidelines.

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This decision is supported by contemporary trends suggesting that LBP patients who underwent adherent guideline interventions demonstrate better clinical outcomes and decrease of healthcare utilization and an overall healthcare savings(61). However, it seems important to highlight that only BetterBack☺(30,31,33,50,62) evaluated care delivery against quality standards. These researchers developed assessment and treatment quality indexes informed by current recommendations and concluded that the adoption of clinical practice guidelines could be substantially improved by introducing a MoC(33). Although these promising findings, it remains unknown if MoCs can overcome the evidence-to-practice gaps identified in LBP literature(9,63) as this outcome was not investigated in the remaining studies.

Our findings also show that general practices, outpatient physiotherapy clinics and community care are the entry points in most MoCs for LBP patients. Moreover, these are the settings where first health interventions are delivered, mainly provided by general practitioners and physiotherapists. These results are also in accordance with the guidance for MoCs implementation, which states that primary and community care should be prioritised over other levels of care(21).

Most MoC used stratified care approaches. UK STarT Back(24) was the first MoC using a prediction tool (STarT Back Screening Tool) to stratify patients according to their risk of poor clinical outcome and offer more comprehensive care to those with higher predicted risk. Considering its successful implementation in terms of clinical and cost-effectiveness(24,25,36,46), other MoCs were developed and adapted to specific contexts. Recently, a systematic review found that a stratified care approach provides substantial clinical, economic and health related cost benefits in the medium and high-risk subgroups compared with usual care in short- and medium-term follow-ups(64). This may explain why most MoCs tend to follow a stratified or hybrid approach to deliver care using the STarT Back Screening Tool. However, there is no evidence that stratified are more effective than stepped approaches for the management of LBP. Although most MoCs do not deliver stepped care, this approach has already showed its clinical efficacy for other musculoskeletal conditions, such as osteoarthritis(53). Both approaches, guided by the patient's response to previous care or the results of risk prediction tools, are recommended by several guidelines for the management of LBP(11,13,65,66).

Regarding health interventions, education and exercise were the front-line care provided for LBP in the majority of the MoCs. These findings portray an important step on the right direction for its management, because they are aligned with contemporary standards of care for quality and best practice(11,13,20,65,66). For example, older studies reported that only 20% were given advice and education in a primary care setting(14,67), although education is sufficient for many LBP patients. Nevertheless, high heterogeneity was found in the report of the care continuum of health interventions, including discharge criteria, which limited comparisons between studies. The improvements in reporting core components of MoCs may provide additional insights for their development and might inform how to facilitate their implementation in clinical practice.

Several studies reported objectives related to reduction of healthcare utilization, optimization of referral behaviours and decrease wait times for care, imaging or specialist review. To achieve these goals, it is essential an efficient coordination across care sectors and clinical settings, facilitating integrated and

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interprofessional healthcare delivery that is responsive to people's needs(17,21). However, our findings suggest that most MoCs did not detail how care coordination was achieved, confining this information to the description of the clinical pathways and the use of electronic health records. Although integrated care is advocated, recent studies show that clinical pathways for LBP demonstrate basic levels of care integration across primary and secondary care(68,69). Indeed, the findings of our review indicate that promoting integrated care is a goal that was only reported by four of the 11 MoCs(32,33,35–37,44–46), perhaps uncovering that care integration is not a priority or is not being addressed in a successful way. It is necessary to develop innovative mechanisms that encourage communication between health providers, promoting close collaboration across different levels of care.

This scoping review has strengths and limitations. The major strength include adherence to JBI recommendations(54,55,58), ensuring a robust and systematic methodology, right from protocol design to the presentation of results. Critical aspects such as construction of the search strategy, screening of records by two independent reviewers, and regular team discussions during data extraction and analysis were conducted under this guidance. However, the study also faced challenges such as potential evidence selection bias due to search strategies and language restrictions, possibly excluding some pertinent studies on MoCs. Variations in MoC terminologies in literature and ambiguity between specific evidence-based interventions and MoCs posed additional issues. Despite a focus on LBP-related MoCs, other relevant studies concerning spinal disorders may have been missed. To mitigate these issues, a broad search strategy, an overinclusion approach during screening, and regular reviewer discussions were employed. Yet, the diversity in MoC reporting possibly led to the omission of certain information, even though specific frameworks and a continuously adapted data form were utilized to tackle this challenge.

The main purpose of this review was to inform research, practice and policies on the development and implementation of MoCs. It is our intention to continue this reflection by responding the research questions that remain unanswered in this article. A following paper will focus on synthetizing context-specific factors and outcomes used to evaluate the implementation of MoCs for LBP in primary healthcare. It is expected that this information may provide a comprehensive understanding of how implementation processes and strategies may have influenced outcomes.

Throughout this process, it became evident that most of the MoCs implemented for LBP in primary healthcare are still under investigation and require further testing to produce robust estimates on their effectiveness, as well as guidance for optimal implementation. Some studies focused on investigating clinical effectiveness of MoCs through RCT designs, but the majority used frailer study designs to report changes in clinical outcomes and health resources utilization, such as observational or registry-based studies. Future research should focus on effectiveness-implementation studies with pragmatic designs to reproduce the challenges of implementing MoCs in real-world clinical settings, such as integration across care sectors and differences on funding models, context features and teams of healthcare providers(62,70,71). Additionally, systematic reviews and meta-analysis are needed to assess the methodological quality of the studies and provide stronger conclusions on their findings. This knowledge may contribute to the development of health policies, interventions and infrastructures favouring the

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implementation of a MoC that promote the delivery of high-quality care for LBP patients in the most efficient and sustainable way for health systems.

CONCLUSION

Despite clear differences between MoCs implemented for LBP patients in primary healthcare, this study provides a broad overview of their key common elements, which is essential new knowledge to inform the development of health services and to underpin future research implementation studies. Most MoCs for LBP are aligned with current clinical practice guideline recommendations. Primary healthcare is the entry point for patients into the health system and they are offered stratified care approaches, based on education, exercise and manual therapy. More complex interventions or referral to secondary and tertiary care are feasible options when first approaches fail. However, most studies were very heterogeneous in the reporting of the care continuum of the MoCs, making comparison between them difficult.

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766 **Table 1. MoCs identification and corresponding studies**

MoC designation	Country	Population	Study	Objective	Type of study
START BACK Subgroups for Targeted Treatment	UK	LBP, radiculopathy	Hill et al. (2011)(24)	To compare the clinical effectiveness and cost-effectiveness of stratified primary care with non-stratified current best practice (STarT Back trial)	RCT
			Whitehurst et al. (2012)(25)	To determine the economic implications of providing stratified care compared with non-stratified current best practice for each specific risk-defined subgroup (STarT Back trial)	RCT (cost-utility)
			Foster et al. (2014)(36)	To determine the effects of implementing risk-stratified in family practice on physician's clinical behaviour, patient outcomes and costs (IMPaCT Back trial)	Observational cohort, before-after
			Whitehurst et al. (2015)(46)	To explore the cost-utility of implementing stratified care in general practice, compared with usual care, within risk-defined patient subgroups (IMPaCT Back trial)	RCT (cost-utility)
	Ireland	LBP, radicular pain	Murphy et al. (2016)(47)	To explore the effectiveness of group-based (high-risk group) stratified care in primary care	Nonrandomized controlled trial
	Denmark	LBP, radicular pain	Morsø et al. (2021)(48)	To evaluate the clinical efficacy and cost-effectiveness of stratified care compared with current practice in Danish primary care	RCT
SCOPiC SCiatica Outcomes in Primary Care	UK	LBP, radicular pain (suspected sciatica)	Saunders et al. (2020)(49)	To explore patients' and clinicians' perspectives on the acceptability of the 'fast-track' pathway	Qualitative
			Konstantinou et al. (2020)	To investigate the clinical and cost-effectiveness of stratified care versus non-stratified usual care for patients presenting with sciatica in primary care	RCT
			Foster et al. (2020)(51)	To compare the clinical effectiveness and cost-effectiveness of the SCOPiC care versus non-SCOPiC care in primary care	Mixed methods
MATCH Matching Appropriate Treatment to Consumers' Healthcare needs	USA	LBP	Cherkin et al. (2018)(52)	To evaluate the effect of implementing an adaptation of the STarT Back strategy in a US primary care setting	Cluster RCT
			Hsu et al. (2019)(26)	To describe the implementation strategies and uptake of an intervention that incorporated the STarT Back stratified care model into several primary care clinics	Qualitative
TARGET Targeted Interventions to Prevent Chronic Low Back Pain in High-Risk Patients	USA	LBP	Beneciuk et al. (2019)(27)	To describe the training developed and delivered to prepare PTs for providing treatment in the TARGET trial	Qualitative
			Middleton et al. (2020)(28)	To examine variation in risk stratification and referral of high-risk patients to psychologically informed physical therapy; and to identify barriers and facilitators related to the risk stratification and referral processes.	Mixed methods
			Delitto et al. (2021)(29)	To test if implementation of a risk-stratified approach to care would result in lower rates of chronic LBP and improved self-reported disability; and if the stratified approach supplemented with referral to PIPT is superior to stratified care alone	Cluster RCT
BETTERBACK☺ Model of Care	Sweden	LBP	Schröder et al. (2020)(30)	To evaluate PTs´ confidence, attitudes and beliefs in managing patients before and after a multifaceted implementation of the BetterBack☺ and to evaluate determinants of implementation behaviours among PTs	Observational cohort, before-after
		LBP, radiculopathy	Enthoven et al. (2021)(31)	To describe patient experiences of received primary care according to the BetterBack☺ in primary care	Qualitative
		LBP, radiculopathy	Schröder et al. (2021)	To evaluate the effectiveness and a sustained multifaceted implementation strategy of the BetterBack☺ compared to routine PT care; To compare patient outcomes based on the fidelity of clinical practice quality index adherence regarding PT care.	Cluster RCT

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		LBP, radiculopathy	Schröder et al. (2022)(33)	To evaluate if PT' adherence to clinical practice guideline recommendations improves after a multifaceted implementation of the BetterBack☺	Cluster RCT
Low Back and Radicular Pain Pathway	UK (National)	LBP, radicular pain	Greenough (2017)(34)	To produce and use a generic pathway for the management of LBP and radicular pain in adults, from the general practitioner's surgery to specialised care	Report (grey literature)
		Sciatica	Ryan et al. (2020)(35)	To explore how people experience being managed for sciatica within a National Health Service pathway	Qualitative
	UK (North)	LBP, radicular pain	Martin et al. (2018)(37)	To evaluate what changes are seen in patient outcomes and experiences, and in the performance of the health service following the implementation of the pathway	Mixed methods (grey literature)
	UK (North East)	LBP, radicular pain	Jess et al. (2018)(38)	To investigate the association between the duration of pain at baseline and the clinical outcomes of patients with LBP enrolled on NERBPP	Observational cohort
			Jess et al. (2021)(39)	To evaluate the association between baseline pain duration and medium-to-long term clinical outcomes in LBP patients enrolled on the NERBPP	Observational cohort
Beating Back Pain Service (BBPS)	UK	LBP	Cheshire et al. (2013)(40)	To report patient outcomes and experiences of the BBPS	Mixed methods
North East Essex Primary Care Trust manual therapy service	UK	Back or neck pain	Gurden et al. (2012)(41)	To describe and evaluate a community-based musculoskeletal service in terms of patient-reported outcomes and satisfaction	Observational cohort
Inter-professional Spine Assessment and Education Clinics (ISAEC)	Canada	LBP	Zarrabian et al. (2017)(42)	To determine the effect of ISAEC on access for surgical assessment, referral appropriateness and efficiency for patients meeting a priori referral criteria in rural, urban and metropolitan settings	Observational cohort
Saskatchewan Spine Pathway (SSP)	Canada	LBP, radicular pain	Kindrachuk & Fourney (2014)(43)	To determine how the SSP pathway affects utilization of MRI and spine surgery	Retrospective study, registry-based
			Wilgenbusch et al. (2014)(44)	To determine if outpatient referrals through a multidisciplinary spine care pathway were more likely to be candidates for surgery than conventional physician referrals; to compare clinical differences wait times for magnetic resonance imaging and surgical assessment.	Retrospective study, registry-based
Back Pain Assessment Clinic (BAC)	Australia	LBP and neck pain	Moi et al. (2018)(45)	To report on the design, implementation and evaluation of the safety and effectiveness of the BAC model	Observational cohort pilot study

Abbreviatures:
BAC – Back pain Assessment Clinic; BBPS – Beating Back Pain Service (BBPS); ISAEC – Inter-professional Spine Assessment and Education Clinics; LBP – Low Back Pain; MoC – Model of Care; MRI – Magnetic Resonance Imaging; NERBPP – North East Low Back and Radicular Pain Pathway; PTs – Physiotherapists; RCT – Randomized controlled trial; SCOPiC - Sciatica Outcomes in Primary Care; SSP – Saskatchewan Spine Pathway;

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Table 2. General characteristics of the MoCs

MoC	Study	MoC Goals	Type of care	Settings	Health professionals	Context features
START BACK	(24,25) STarT Back	- Implement stratified care - Promote EBP/guideline-concordant care - Improve care effectiveness - Reduce costs - Optimize referrals for care and/or imaging	Stratified (by prognosis)	PHC (general practices and PT-led back pain clinic)	GPs, nurses and PTs	- NHS (Primary Care Trusts). - General practices within the Keele GP Research Partnership (network of practices). - Underlying guidelines: Royal College of General Practitioners (1996), Working Group on Guidelines for the Management of Acute LBP in Primary Care (2006) and Arthritis and Musculoskeletal Alliance (2004).
	(36,46) IMPaCT Back			PHC (general practices and community-based PT practices)	GPs and PTs	- NHS (Primary Care Trusts). - Underlying guidelines: NICE guidelines (2009)
	(47) Ireland	- Implement stratified care - Improve care effectiveness - Promote EBP/guideline-concordant care - Reduce healthcare resources use	Stratified (by prognosis)	PHC (PT-led spinal triage clinic - Back Pain Clinic)	GPs and PTs	- NHS (Waterford City Primary Care) - Underlying guidelines: NICE guidelines for LBP (2009)
	(48) Denmark	- Implement stratified care - Improve care effectiveness - Promote EBP/guideline-concordant care - Reduce costs - Optimize referrals for care and/or imaging	Stratified (by prognosis)	PHC (general practices and PT clinics)	GPs and PTs	- PHC from different geographical areas of the Regions of Southern and Central Denmark.
SCOPiC	(49,51)	- Reduce wait times - Promote EBP/guideline-concordant care - Improve care effectiveness - Implement stratified care	Stratified (by prognosis and pattern diagnosis)	PHC (general practices, community PT services), primary/secondary care interface services and secondary care	GPs, PTs, spinal specialist PTs and spinal surgeons	- NHS (Trusts) - General practices localized in a mix of urban, inner city, semi-rural and rural areas. - Spinal specialist services include specialist clinics at the primary/secondary care interface, spinal orthopaedic and pain clinic teams (treatments offered are part of NHS care).
MATCH	(26,52)	- Implement stratified care - Improve care effectiveness - Reduce healthcare utilization - Optimize referrals for care and/or imaging	Stratified (by prognosis)	PHC (clinics with onsite PT departments)	Medical doctors, physician assistants/nurse practitioners and PTs	- Integrated healthcare delivery system (Group Health); - Adaptation of the STarT Back approach: major differences concern the delivery of care, which follows the Group Health treatment guidelines.
TARGET	(27–29)	- Implement stratified care - Improve care effectiveness - Reduce healthcare resources use - Optimize referrals for care and/or imaging	Stratified (by prognosis)	PHC (clinics)	PHC physicians and PTs	- Five health care systems (University of Pittsburgh Medical Center, Boston Medical Center, Johns Hopkins Medicine, Intermountain Health, Medical University of South Carolina) - network of PHC clinics in both urban and rural environments. - Directed to manage high-risk patients (according to SBST stratification).
BETTERBACK©	(30,31,33)	- Promote EBP/guideline-concordant care - Improve care effectiveness - Promote integrated care	Hybrid - Stratified/stepped	PHC (PT clinics)	PTs	- Underlying guidelines: Best practice clinical guidelines of the Danish Health and Medicines Authority (2016) and the English NICE (2016) (adapted to the Swedish context)

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Low Back and Radicular Pain Pathway	(34,35) National	- Improve care effectiveness - Promote timely/equitable access to care - Promote EBP/guideline-concordant care - Promote integrated care - Reduce wait times - Optimize referrals for care and/or imaging	Hybrid – Stratified/stepped	PHC, Community Services, Secondary Care and Specialist Pain Management Services	GPs, PTs, chiropractors, osteopaths, pharmacists, TTPs, specialist spinal surgeon, multidisciplinary staffing	- NHS - The implementation of the National Pathway is a decision of the Clinical Commissioning Groups, considering services and provision within their commissioning area. - TTPs play a core role in the pathway.
	(37) North		Not reported	PHC (outpatient PT service)	GPs and TTPs (specialized nurses and PTs)	- NHS (Community Trust) - Part of the national pathway (UK Low Back and Radicular Pain Pathway) - Underlying guidelines: NICE guidelines for LBP (2009)
	(38,39) North East		Hybrid – Stratified/stepped	PHC, primary/secondary care interface services and secondary care		- Underlying guidelines: NICE guidelines for LBP (2009)
BBPS	(40)	- Promote EBP/guideline-concordant care - Reduce wait times	Hybrid - Stepped/Stratified (by patient preference)	PHC and community care	GPs, occupational therapists, acupuncturists, psychotherapists	- NHS (Primary Care Trust) - Underlying guidelines: NICE guidelines for LBP (2009)
North East Essex PCT service	(41)	- Improve care effectiveness - Promote timely/equitable access to care - Reduce wait times - Optimize referrals for care and/or imaging - Reduce healthcare resources use	Hybrid - Stepped/Stratified (by patient preference)	PHC and community care (chiropractic, osteopathic and PT clinics)	GPs, chiropractors, osteopaths and PTs	- NHS (North East Essex Primary Care Trust) - Underlying guidelines: NICE guidelines for LBP (2009)
ISAEC	(42)	- Promote EBP/guideline-concordant care - Reduce wait times - Optimize referrals for care and/or imaging - Promote integrated care	Stratified (by pattern diagnosis)	PHC and ISAEC clinics	Doctors, nurse practitioners, PTs, chiropractors, surgeons, pain specialists and rheumatologists	- Funded by the Ontario Ministry of Health and Long-Term Care to enable shared-care management of LBP. - Implemented in rural, urban and metropolitan settings.
SSP	(43,44)	- Promote EBP/guideline-concordant care - Promote integrated care - Improve care effectiveness and efficiency - Reduce variations in practice patterns - Reduce wait times - Optimize referrals for care and/or imaging	Stratified (by pattern diagnosis)	PHC and SSP clinics	Physicians, spine surgeons and specialized PTs	- Pathway developed by spine surgeons. - It uses a multidisciplinary triage process and treatment algorithms based on the SSP classification. - The SSP classification defines 4 clinical patterns of symptoms and signs determined by history and physical examination.
BAC	(45)	- Promote EBP/guideline-concordant care - Promote integrated care - Optimize referrals for care and/or imaging - Reduce wait times	Stepped	PHC, tertiary neurosurgery and orthopaedic referral centre	Practice PTs, rheumatology registrars, rheumatologists, neurosurgeons, orthopaedic spinal surgeons	- BAC is a community-based specialist service for assessing and managing neck and LBP. - Pathway developed by health professionals of the Royal Melbourne Hospital (RMH), which serves as a tertiary neurosurgery and orthopaedic referral centre. - Rheumatologist coordinate BAC care.

Abbreviatures: BAC – Back pain Assessment Clinic; BBPS – Beating Back Pain Service; EBP – Evidence-Based Practice; GPs – General Practitioner; ISAEC – Inter-professional Spine Assessment and Education Clinics; LBP – Low Back Pain; MoC – Model of Care; NERBPP – North East Low Back and Radicular Pain Pathway; NICE - National Institute of Health and Care Excellence; NHS – National Health System; PHC – Primary Healthcare; PT – Physiotherapy; PTs – Physiotherapists; SSP – Saskatchewan Spine Pathway; TTPs - Triage and Treat practitioners;

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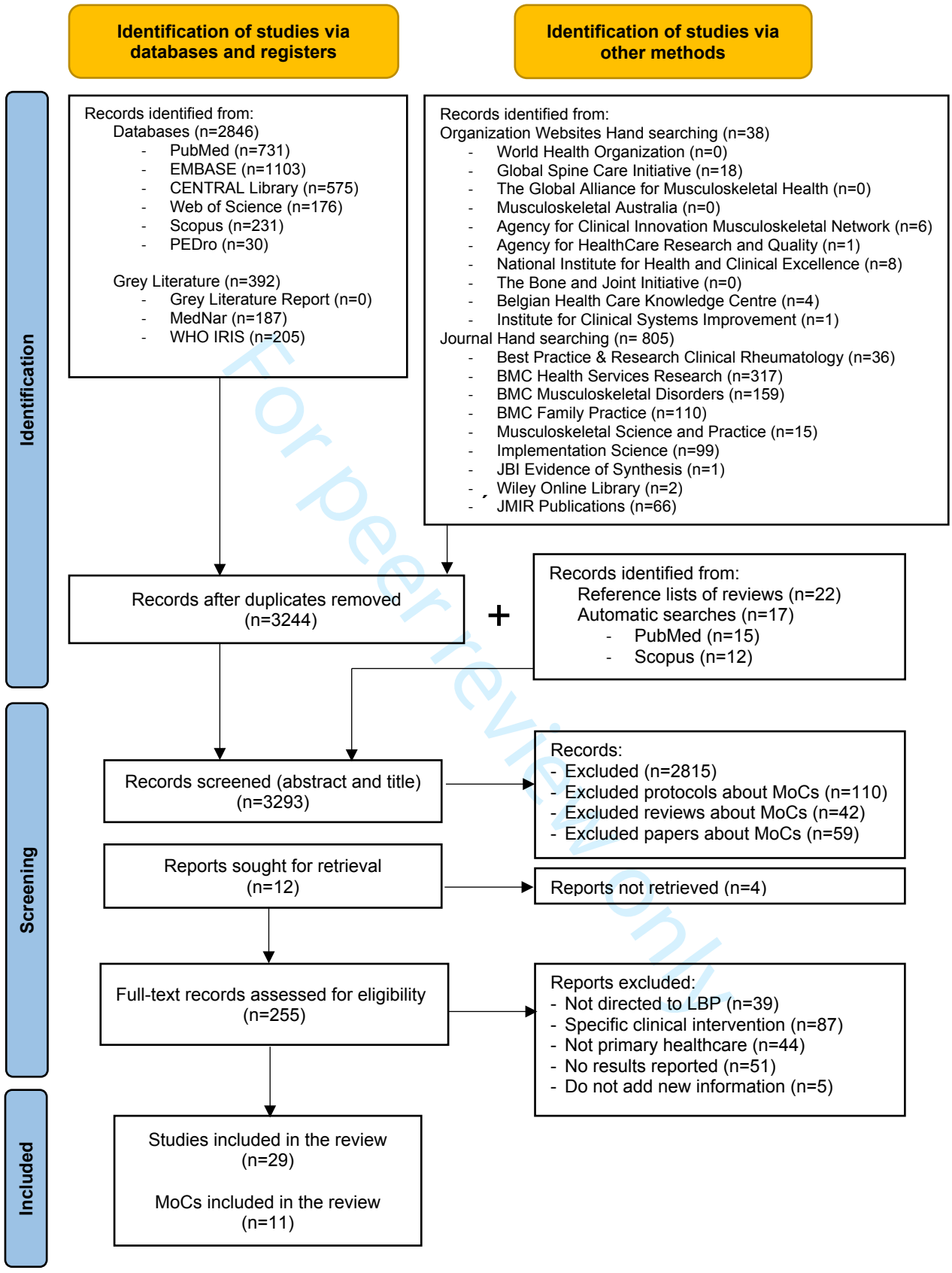

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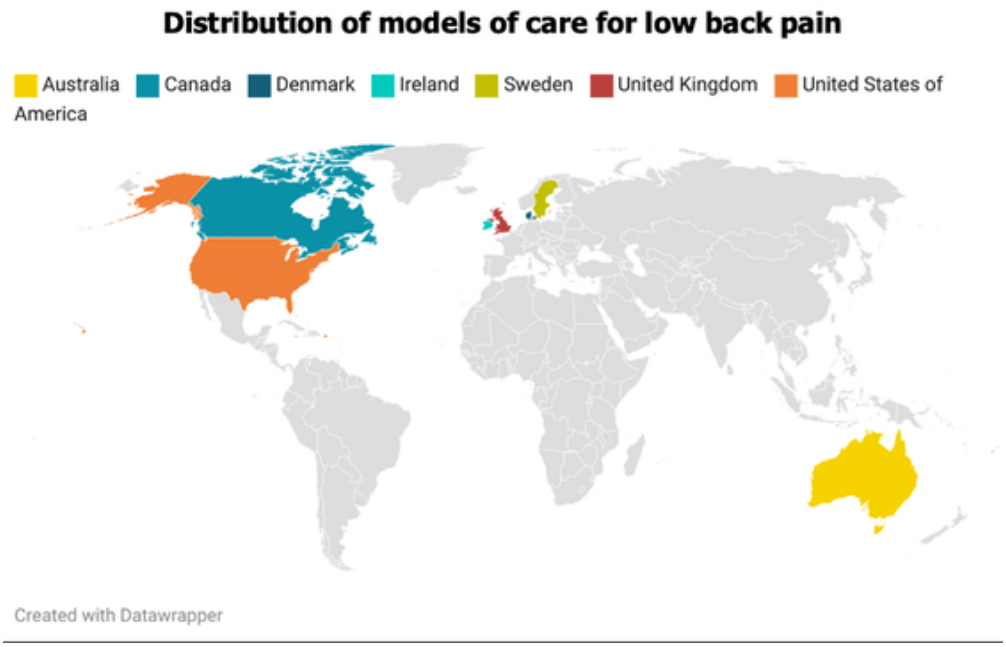

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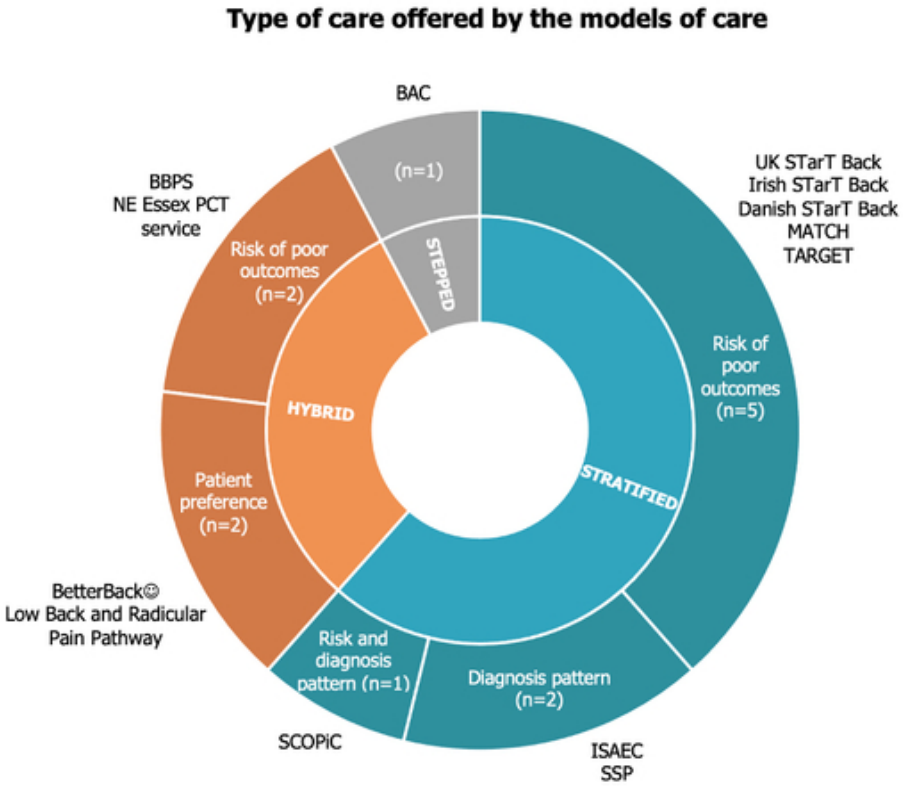

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SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
TITLE			
Title	1	Identify the report as a scoping review.	Title page – page 1
ABSTRACT			
Structured summary	2	Provide a structured summary that includes (as applicable): background, objectives, eligibility criteria, sources of evidence, charting methods, results, and conclusions that relate to the review questions and objectives.	Abstract – page 2
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known. Explain why the review questions/objectives lend themselves to a scoping review approach.	Pages 4 and 5
Objectives	4	Provide an explicit statement of the questions and objectives being addressed with reference to their key elements (e.g., population or participants, concepts, and context) or other relevant key elements used to conceptualize the review questions and/or objectives.	Introduction section – last sentence (page 5); Methods section – Research question (page 5) and Inclusion criteria (page 6)
METHODS			
Protocol and registration	5	Indicate whether a review protocol exists; state if and where it can be accessed (e.g., a Web address); and if available, provide registration information, including the registration number.	Page 5
Eligibility criteria	6	Specify characteristics of the sources of evidence used as eligibility criteria (e.g., years considered, language, and publication status), and provide a rationale.	Inclusion criteria and Search Strategy (page 6 and 7)
Information sources*	7	Describe all information sources in the search (e.g., databases with dates of coverage and contact with authors to identify additional sources), as well as the date the most recent search was executed.	Search strategy (pages 6 e 7)
Search	8	Present the full electronic search strategy for at least 1 database, including any limits used, such that it could be repeated.	Supplementary File 2
Selection of sources of evidence†	9	State the process for selecting sources of evidence (i.e., screening and eligibility) included in the scoping review.	Study selection (page 7)
Data charting process‡	10	Describe the methods of charting data from the included sources of evidence (e.g., calibrated forms or forms that have been tested by the team before their use, and whether data charting was done independently or in duplicate) and	Data charting (pages 7 and 8); supplementary File 3

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SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
		any processes for obtaining and confirming data from investigators.	
Data items	11	List and define all variables for which data were sought and any assumptions and simplifications made.	Data charting (pages 7 and 8); Supplementary File 3
Critical appraisal of individual sources of evidence	12	If done, provide a rationale for conducting a critical appraisal of included sources of evidence; describe the methods used and how this information was used in any data synthesis (if appropriate).	Not applicable
Synthesis of results	13	Describe the methods of handling and summarizing the data that were charted.	Synthesis and presentation of results (page 8)
RESULTS			
Selection of sources of evidence	14	Give numbers of sources of evidence screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally using a flow diagram.	Literature search (page 9); Figure 1
Characteristics of sources of evidence	15	For each source of evidence, present characteristics for which data were charted and provide the citations.	Page 9; Table 1
Critical appraisal within sources of evidence	16	If done, present data on critical appraisal of included sources of evidence (see item 12).	Not applicable
Results of individual sources of evidence	17	For each included source of evidence, present the relevant data that were charted that relate to the review questions and objectives.	Pages 9 to 13
Synthesis of results	18	Summarize and/or present the charting results as they relate to the review questions and objectives.	Pages 9 to 13
DISCUSSION			
Summary of evidence	19	Summarize the main results (including an overview of concepts, themes, and types of evidence available), link to the review questions and objectives, and consider the relevance to key groups.	Page 13 - First paragraph
Limitations	20	Discuss the limitations of the scoping review process.	Page 15
Conclusions	21	Provide a general interpretation of the results with respect to the review questions and objectives, as well as potential implications and/or next steps.	Page 16
FUNDING			
Funding	22	Describe sources of funding for the included sources of evidence, as well as sources of funding for the scoping review. Describe the role of the funders of the scoping review.	Page 16

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MEDLINE (Pubmed) – January 13th, 2022

Search	Query	Records retrieved
#1	((“back pain” [MesH]) OR (“back pain” [tiab]) OR (“low-back pain” [MesH]) OR (“low back pain” [tiab]) OR (“sciatica” [MesH]) OR (“sciatica neuropathy” [MesH]) OR (“sciatica” [tiab]) OR (“backache” [tiab]) OR (“back ache” [tiab]) OR (“lumb* pain” [tiab]) OR (“lumbago” [tiab]) OR (“spinal pain” [tiab]) OR (“spondylosis” [tiab]) OR (“back disorder” [tiab]))	91 347
#2	((“Models, Organizational”[MesH]) OR ((theor*[tiab] OR concept*[tiab] OR framework*[tiab] OR model*[tiab] OR program*[tiab] OR approach*[tiab])) **AND** ((“critical pathways”[MeSH] OR “model of care”[tiab] OR “care model”[tiab] OR “functional integration”[tiab] OR “clinical integration”[tiab] OR “case management”[MeSH] OR “delivery of health care, integrated”[MeSH] OR “disease management”[MeSH] OR “patient care management”[MeSH] OR “patient-centered care”[MeSH] OR “continuity of patient care”[MeSH] OR “comprehensive health care”[MeSH] OR “managed care program*”[tiab] OR “multidisciplinary care”[tiab] OR “interdisciplinary care”[tiab] OR “inter-disciplinary care”[tiab] OR “cross disciplinary care”[tiab] OR “cross-disciplinary care”[tiab] OR “multiple interventions”[tiab] OR “care chain”[tiab] OR “care chains”[tiab] OR “care continuity”[tiab] OR “care continuation”[tiab] OR “care transition*”[tiab] OR “chain of care”[tiab] OR “continuity of care”[tiab] OR “cross sectoral care”[tiab] OR “integrated health care”[tiab] OR “integrated medicine”[tiab] OR “integrated social network*”[tiab] OR “integration of care”[tiab] OR “intersectoral care”[tiab] OR “linked care”[tiab] OR “management model”[tiab] OR “service network*”[tiab] OR “transition of care”[tiab] OR “transitional care”[tiab] OR “transmural care”[tiab] OR “holistic care”[tiab]))	384 556
#3	("primary health care"[MeSH] OR (("primary"[tiab] AND "health"[tiab]) AND "care"[tiab])) OR ("primary health care"[tiab] OR ("primary"[tiab] AND "care"[tiab]) OR "primary care”[tiab])) **OR** (("general practice"[MeSH] OR ("general"[tiab] AND "practice"[tiab]) OR "general practice"[tiab])) OR ("general"[tiab] AND "medicine"[tiab]) OR "general medicine”[tiab]) **OR** ("family practice"[MeSH] OR ("family"[tiab] AND "practice"[tiab]) OR "family practice"[tiab])) OR ("family"[tiab] AND "medicine"[tiab])) OR "family medicine”[tiab]) **OR** (("primaries"[tiab] OR "primary"[tiab]) AND "servic*"[tiab])	597 247
#4	#1 AND #2 AND #3	854
Limited to: since 2000, English, Portuguese and Spanish		731

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SUMMARY OF THE PAPER	
Title	
Authors	
Year of publication	
Source of information *(Peer review or grey literature)*	
Study design *(Define intervention vs control group, if applicable)*	
Objectives	
Population *(Include inclusion and exclusion criteria)*	
Sample size *(Intervention vs control group, if applicable)*	
IDENTIFICATION OF THE MoC	
Name or Acronym *(if applicable)*	
Country	
Other references *(Protocol, other studies, if applicable)*	
Goals of the MoC	
Funding *(How the MoC is funded and how is it sustained at long-term)*	E.g., research funding or funding at a system level
CORE COMPONENTS OF THE MoC[1–3]	
Underlying theories, models or frameworks[2] **Process models/frameworks** *Definition: Describe or guide the process of translating*	**Process models/frameworks** *(e.g., CIHR Model of Knowledge Translation, ACE Star Model of Knowledge Transformation, Knowledge-to-Action Model, Ottawa Model, Quality Implementation Framework).*

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research into practice, including the implementation and use of research. Provide practical guidance in the planning and execution of implementation endeavors and/or implementation strategies to facilitate implementation. **Determinant frameworks** *Definition: Frameworks that identify determinants, which act as barriers and enablers (independent variables) that influence implementation outcomes (dependent variables), such as predicting outcomes or interpreting outcomes retrospectively. Some frameworks also specify relationships between some types of determinants.* **Classic theories** *Definition: Theories that originate from fields external to implementation science, such as psychology, sociology and organizational theory, which can be applied to provide understanding and/or explanation of aspects of implementation.* **Implementation theories/frameworks** *Definition: Theories/frameworks that have been developed by implementation researchers to provide understanding and/or explanation of aspects of implementation.* **Evaluation frameworks** *Definition: Identify aspects of implementation that could be evaluated to determine implementation success.*	**Determinant frameworks, classic theories or implementation frameworks** *Definition: Understand and explain what influences implementation outcomes.* • **Determinant frameworks** *(e.g., Theoretical Domains Framework, PARIHS, CFIR, Active Implementation Framework, Understanding-User-Context Framework).* • **Classic theories** *(e.g., Theory of Diffusion, social cognitive theories, theories concerning cognitive processes and decision making, social networks theories, communities of practice, professional theories, organizational theories).* • **Implementation theories/frameworks** *(e.g., COM-B, Implementation Climate, Absorptive Capacity, Organizational Readiness, Normalization Process Theory)* **Evaluation frameworks** *(e.g., RE-AIM, PRECEDE-PROCEED, framework by Proctor et al.)*
Setting *(Describe the settings where assessment/care/other is provided)*	E.g., Assessment – Primary care; Delivery of care – private outpatient clinic
Care pathway *(Summary description of the care pathway)*	E.g., Community pharmacist consultation [evaluation, education and medication review] – GP referral and PT referral – PT guided exercise program (only if approved by the GP), re-assessed in 3-6 weeks
Characteristics of the intervention	E.g., Education + exercise: two patient education sessions and a supervised exercise program twice a week for 6 weeks in a group setting.

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(Describe the interventions - what care is provided, by who and for how long)	Education: encourage the patients to actively engage in the management of LBP – group sessions – first about LBP, treatment options (including exercise). Exercise: 6 weeks, twice a week of supervised, targeted and individualized exercise in a group setting; home exercises were encouraged as individuals developed quality movement and participants were encouraged to increase their engagement in enjoyable physical activities.
Care Coordination(3) *Definition: Care coordination is the deliberate organization of patient care activities between two or more participants (including the patient) involved in a patient's care to facilitate the appropriate delivery of health care services. Organizing care involves the marshalling of personnel and other resources needed to carry out all required patient care activities, and is often managed by the exchange of information among participants responsible for different aspects of care.*	**Health professionals involved** **Care Coordination** *(Summary description of who is involved in providing care and how care is coordinated)* **Exchange of clinical information** *(e.g., tools to record clinical data, meetings, case manager)*
IMPLEMENTATION STRATEGY	
Duration	
Implementation Strategies(4) *Definition: methods or techniques used to enhance the adoption, implementation, and sustainability of a clinical program or practice*	
Workforce capacity *(Description of the training for health professionals, staff or other team members)*	
Barriers and Facilitators to Implementation	
CONTEXT SPECIFIC COMPONENTS OF THE MoC(5,6)	
Micro/Patient level factors *Patients' preferences, expectancies, attitudes, knowledge, needs and resources that can influence implementation; specific geographic areas with different access to health services, sub-populations with special socio-demographic and clinical characteristics.*	
Meso/Organizational level factors **Organizational culture and climate**	

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Shared visions, norms, values, assumptions and expectations in an organization that can influence implementation (i.e., organizational culture) and surface perceptions and attitudes concerning the observable, surface-level aspects of culture (i.e. climate). **Organizational readiness to change** *Influences on implementation related to an organization's tension, commitment or preparation to implement change, the presence of a receptive or absorptive context for change, the organization's prioritization of implementing change, the organization's efficacy or ability to implement change, practicality and the organization's flexibility and innovativeness.* **Organizational Support** *Various forms of support that can influence implementation, including administration, planning and organization of work, availability of staff, staff workload, staff training, material resources, information and decision-support systems, consultant support and structures for learning.* **Organizational structures** *Influences on implementation related to structural characteristics of the organization in which implementation occurs, including size, complexity, specialization, differentiation and decentralization of the organization.*	
Macro/External level factors *Exogeneous influences on implementation in health care organizations, including policies, guidelines, research findings, evidence, regulation, legislation, mandates, directives, recommendations, political stability, public reporting, benchmarking and organizational networks.*	
Multiple level factors **Social relations and support** *Interpersonal processes, including communication, collaboration and learning in groups, teams and networks, visions, conformity, identity and norms in groups, opinion of colleagues, homophily (tendency of individuals to associate and bond with similar others) and alienation.*	

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Financial resources *Funding, reimbursement, incentives, rewards, costs and other economic factors that can influence implementation.* **Leadership** *Influences on implementation related to formal and informal leaders, including managers, key individuals, change agents, opinion leaders, champions, etc.* **Time availability** *Time restrictions that can influence implementation.* **Feedback** *Evaluation, assessment and various forms of mechanisms that can monitor and feedback results concerning the implementation, which can influence implementation.* **Physical environment** *Features of the physical environment that can influence implementation (e.g., equipment, facilities and supplies).*		
OUTCOMES(1,7) **AND RESULTS**		
Patient level outcomes *Definition: impact of the model of care on patients (e.g., pain, function or quality of life, satisfaction, collected with self-reported questionnaires or interview questionnaires or performance measures, at baseline and 3-month follow-up)*	**Outcomes** **Outcome measures** **Follow-ups**	**Results**
Organizational level outcomes *Definition: impact on health services, providers or on health-system (e.g., rate of referral or prescription for exercise, rate of prescribed exams, healthcare costs, waiting times – collected with administrative/clinical databases, quality indicators, questionnaires or interviews with providers)*	**Outcomes** **Outcome measures** **Follow-ups**	**Results**
Implementation level outcomes *Definition: Effects of deliberate and purposive actions to implement new treatments, practices, and services. Implementation outcomes serve as indicators of the implementation success and are key intermediate outcomes in relation to service system or clinical outcomes in treatment*	**Outcomes** **Outcome measures** **Follow-ups**	**Results**

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effectiveness and quality of care research – Acceptability; Adoption; Appropriateness; Costs; Feasibility; Fidelity; Penetration; Sustainability		

References

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Additional File 4 – Description of the included studies

MoC design ation	Study	Population	Sample Size	Outcome Domains (Follow-ups)	Outcomes (outcome measures)
START BACK – Subgroups for Targeted Treatment	Hill et al. (2011)(1)	- Inclusion: LBP of any duration, ≥18 years-old, with or without radiculopathy. - Exclusion: serious illness or spinal pathology, serious comorbidity (including mental disorders), surgery in the last 6 months, pregnancy, currently receiving back treatment.	N=851 patients - Intervention: n=568 - Control: n=283	Patient (4 and 12 mo)	**4 and 12 months** - Primary outcome: Disability [Roland Morris Disability Questionnaire (RMDQ)] at 12 months; Back pain intensity (NRS); Catastrophizing [Pain Catastrophizing Scale (PCS)]; Fear-avoidance beliefs [Tampa Scale of Kinesiophobia (TSK)]; Anxiety and depression [Hospital Anxiety and Depression Scale (HADS)]; Health-related quality of life [EuroQol EQ-5D; Short Form 12 (SF-12)]; Risk subgroup reduction [STarT Back Screening Tool (SBST)]; Global change (single question); Adverse events **12 Months** - Work loss (one question)
				Organizational (4 and 12 mo)	**Process of care [Case Report Forms (CRFs)]** - Referral for further PT; Number of PT sessions; Attendance at initial PT **4 months** - Patient satisfaction (self-reported questionnaire) **12 months** - Healthcare resource use (self-reported questionnaire); cost-utility (QALYs estimates using the EuroQol EQ-5D)
	Whitehurst et al. (2012)(2)			Patient (4 and 12 mo)	**4 and 12 months** - Health-related quality of life [EQ-5D] **12 months** - Work-related outcomes - Employment status (self-reported questionnaire)
				Organizational (4 and 12 mo)	**12 months** - Number of PT sessions (CRF); Healthcare resource use (self-reported questionnaire) – PHC consultations (GPs and practice nurses), consultations with other healthcare professionals (NHS and private), hospital-based procedures (diagnostic tests, epidural injections, inpatient episodes) and prescribed medication; Healthcare costs - Out of pocket expenditures on treatments and/or aids (self-reported questionnaire) and QALYs estimates (EuroQol EQ-5D)
	Foster et al. (2014)(3)	- Inclusion: ≥18 years-old, LBP patients of any duration, with or without leg pain, identified through diagnostic codes.	N=922 patients - Phase 1 (usual care): n=368 - Phase 3 (stratified care): n=554	Patient (2 and 6 mo)	**2 and 6 months** - Primary outcome: Disability (RMDQ) at 6 months; Back pain intensity (NRS); Catastrophizing [Coping Strategies Questionnaire – Catastrophizing subscale (CSQ-CAT)]; Pain self-efficacy [Pain Self-efficacy Questionnaire (PSEQ)]; Health-related quality of life (SF-12); Global change (single question) **6 months** - Fear-avoidance beliefs (TSK); Anxiety and depression (HADS); Pain self-efficacy (PSEQ); Risk group (STarT Back Screening Tool); Work loss (one question); Adverse events
				Organizational (2 and 6 mo)	**Process of care (medical records and CRF)** - Numbers of referrals to PT or other services; Ordered diagnostic tests (radiographs, magnetic resonance Imaging and computed tomography scans, blood tests); Prescribed medications; Reconsultations with the physician; Sickness certifications; Risk-appropriate use of PT (CRF). **2 and 6 months** - Patient satisfaction (self-reported questionnaire) **6 months**

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					- Healthcare resource use (self-reported questionnaire) – Inpatient stays, outpatient visits, other health care appointments including those in private practice and over-the-counter medications and treatments; Healthcare costs (QALYs estimates)
	Whitehurst et al. (2015)(4)			Patient (2 and 6 mo)	**2 and 6 months** - Disability (RMDQ); Health-related quality of life (EQ-5D-3L) **6 Months** - Work-related – Employment status (self-reported questionnaire) and work loss (self-reported questionnaire)
				Organizational (2 and 6 mo)	**6 months** - Healthcare resource use (self-reported questionnaire) – PHC consultations (GPs and practice nurses), consultations with other healthcare professionals (NHS and private), hospital-based procedures (diagnostic tests, epidural injections, inpatient episodes), prescribed medication and out of pocket expenditure on treatments and/or aids; Cost-utility (QALYs estimates using the EQ-5D-3L).
	Murphy et al. (2016)(5)	- Inclusion: ≥18 years old, LBP > 3 months, with or without leg symptoms. - Exclusion: serious illness or spinal pathology, surgery, pregnancy.	N=583 - Intervention: n=251 - Control: n=332	Patient (3 mo)	**3 months** - Primary outcome: Disability (RMDQ); LBP intensity [Visual Analog Scale (VAS)]; Back beliefs [Back Beliefs Questionnaire (BBQ)]; Distress [Distress and Risk Assessment Method (DRAM)]; Depression (Modified Zung Depression Index); Anxiety [Modified Somatic Perception Questionnaire (MSPQ)]; Benefit (6-point self-rated scale).
	Morsø et al. (2021)(6)	- Inclusion: ≥18 years, non-specific LBP of any duration, with or without leg pain, referred to PT by the GP. - Exclusion: serious illness or spinal pathology, psychiatric illness, spinal surgery in the last 6 months, pregnancy, currently receiving PT.	N=333 - Intervention: n=169 - Control: n=164	Patient (3 and 12 mo)	**3 and 12 months** - Primary outcome: Disability (RMDQ); Primary outcome: Time off work (days/weeks) [patient self-report and Danish National Register of Public Transfer Payments (DREAM)]; Primary outcome: Patient reported global change (7-point Likert scale); Pain intensity (NRS); Well-being [World Health Organization Well-Being Index (WHO5)]
				Organizational (3 and 12 mo)	**3 and 12 months** - Satisfaction with improvement (single-item rating) **12 months** - Healthcare resource use (Danish Nationwide Patient Registry - DNPR) – Number of PT sessions, PHC consultations, secondary care (imaging and other contacts) and medication; Healthcare costs use (Danish Nationwide Patient Registry - DNPR) – PHC consultations, secondary care (imaging and other contacts), medication and total costs; QALYs estimates (EQ-5D-5L).
SCOPiC – SCiatica Outcomes in Primary Care	Konstantinou et al. (2020)(7)	- Inclusion: ≥18 years, with mobile phone or landline, consulted in GP with back and/or leg symptoms, with diagnosis of sciatica confirmed with at least 70% diagnostic confidence by a PT. - Exclusion: serious spinal pathology or red flags, previous lumbar spine surgery, receiving ongoing care from or had been in consultation with a secondary care doctor	RCT: N=476 - Intervention: n=238 - Control: n=238 Qualitative study: N=40	Patient (Weekly for the first 4 mo, 4 and 12 mo)	**Weekly for the first 4 months, 4 weeks between 4 and 12 months, or until "stable resolution" of symptoms** - Primary outcome: time to first resolution of sciatica symptoms (6-point ordinal scale) **4 and 12 months** - Global Perceived Change (6-point ordinal scale); Physical Function (Modified RMDQ); Impact of sciatica symptoms [Sciatica Bothersomeness Index (SBI)]; Back and leg pain intensity (NRS); Sleep disturbance [Jenkins Sleep Questionnaire (JSQ)]; Fear of movement (TSK); Anxiety and depression (HADS); Health-related quality of life (EQ-5D-5L); General health [Short-form 1 (SF1)]; Neuropathic pain symptoms [Self-report Leeds Assessment of Neuropathic Symptoms and Signs (S-LANSS)]; Work and productivity loss (self-reported questionnaire); Serious adverse events.

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		or PT for the same problem in the previous 3 months, serious physical or mental comorbidities, pregnancy, taking part simultaneously in another study related to sciatica.	- 20 patients - 7 spinal PTs - 9 GPs - 4 spinal surgeons	Organizational (4 and 12 mo)	**12 months** - Healthcare resource use (self-reported questionnaire and medical records) – Number of PT sessions, duration of PT treatments, timing of referral and treatment, spinal injections and spinal surgery; Healthcare costs (self-reported questionnaire and medical records) – Total costs and QALYs estimates (EQ-5D-5L)
	Foster et al. (2020)(8)			Patient (Weekly for the first 4 mo, 4 and 12 mo)	**Weekly for the first 4 months, 4 weeks between 4 and 12 months, or until "stable resolution" of symptoms** - Primary outcome: time to first resolution of sciatica symptoms (6-point ordinal scale) **4 and 12 months** - Global Perceived Change (6-point ordinal scale); Physical Function (Modified RMDQ); Impact of sciatica symptoms (SBI); Back and leg pain intensity (NRS); Sleep disturbance (JSQ); Fear of movement (TSK); Anxiety and depression (HADS); Risk of poor outcome (SBST); Health-related quality of life (EQ-5D-5L); General health (SF1); Neuropathic pain symptoms (S-LANSS); Employment status (self-reported questionnaire); Work loss (self-reported questionnaire); Presenteeism/productivity [single question with NRS response (0–10 scale); Work Production Index]; Adverse events
				Organizational (4 and 12 mo)	**Process of care (CRFs)** - Number of referrals to PT services; Number of PT sessions; Number of referrals to specialist spinal services and/or secondary care; Treatments provided; Timing of referral and treatment **4 and 12 months** - Patient satisfaction (5-point scale) **12 months** - Healthcare resource use (self-reported questionnaire and medical records) – PHC consultations (GPs, nurses and PTs), secondary care consultations, prescriptions, hospital-based tests and procedures, spinal injections and spinal surgery, nature and length of inpatient stays; Healthcare costs (self-reported questionnaire and medical records) – Over-the-counter purchases, out-of-pocket expenses, total costs and QALYs estimates (EQ-5D-5L).
				Implementation (4 mo after the follow-up of the RCT and at the end of recruitment)	**4 months after the follow up of the RCT (patients, PTs and surgeons) and at the end of RCT recruitment (GPs)** - Acceptability of the 'fast-track' pathway for patients with severe sciatica symptoms (interviews)
	Saunders et al. (2020)(9)	- Inclusion: Patients on the 'fast-track' pathway in the stratified care arm of the SCOPiC trial and clinicians			
MATCH – Matching Appropriate Treatment to	Cherkin et al. (2018)(10)	- Inclusion: Adults receiving primary care, ≥ 18 years, identified in the EHR with a primary diagnosis of non-specific LBP - Exclusion: Specific causes of pain (e.g., pregnancy, disc herniation, vertebral fracture, spinal stenosis) or job injuries.	N=1901 - Intervention: n=756 - Control: n=945	Patient (2 and 6 mo)	**2 and 6 months** - Primary outcome: Physical function (modified RMDQ); Primary outcome: LBP severity in previous week (NRS); Anxiety [Generalized Anxiety Disorder (GAD-7)]; Depression [Patient Health Questionnaire (PHQ-9)]; Self-efficacy (PSEQ); Fear of movement (TSK); Work loss and productivity [2 items of the Work Productivity and Activity Impairment (WPAI)]; Global improvement [Patient Global Impression of Change (PGIC)]
				Organizational (2 and 6 mo)	**2 and 6 months** - Patient satisfaction (10-item instrument) **6 months**

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					- Healthcare resource use (EHR) – Lumbar spine imaging, additional PHC visits, emergency department visits, narcotic analgesics, PT visits, CAM visits, behavioural health visits, spine surgeon visits, injections of lumbar spine and back-related hospitalizations.
	Hsu et al. (2019)(11)	- Inclusion: PTs and PCPs (medical doctors, osteopathic doctors, nurses, physician assistants)	- Questionnaire: N=402 - Interviews: N=22 (PTs and PCPs)	Implementation (post-training)	**Post-training** - Attendance at training sessions (not reported); Perspectives and experiences regarding implementation strategies and experiences using the stratified care model (Ethnography and interviews with PHC team members and PTs)
TARGET – Targeted Interventions to Prevent Chronic Low Back Pain in High-Risk Patients	Beneciuk et al. (2019)(12)	- Inclusion: Outpatient PTs	N=471	Implementation (post-training and 4 mo)	**Post-training and 4 months** - PTs' attitudes and beliefs about biomedical and biopsychosocial treatment orientations [Pain Attitudes and Beliefs Scale for Physical Therapists (PABS-PT)] **Post-training** - PTs' confidence in implementing PIPT (11-point Likert scale)
	Middleton et al. (2020)(13)	- Inclusion: Adult primary care patients with evidence of acute LBP management in the EHR.	- Quantitative study: N=23,913 (9030 patients stratified by risk) - Qualitative study: N=13 clinics	Organizational (24 mo)	**24 months** (EHR) - Risk stratification rates; Rates of referral of acute high-risk patients; Relationship between risk stratification and referral rates within clinics
				Implementation (24 mo)	**24 months** (ethnography and interviews with clinical staff) - Barriers and facilitators of the risk stratification and referral processes
	Delitto et al. (2021)(14)	- Inclusion: ≥18 years with a primary complaint of LBP. - Exclusion: Chronic symptoms based on a 2-item LBP Questionnaire derived from the NIH Chronic LBP task force; serious spinal pathology.	N=2300 - Intervention: n=1207 - Control: n=1093	Patient (6 mo)	**6 months** - Primary outcome: transition to chronic LBP [2-item questionnaire adapted from the NIH Task Force]; Primary outcome: back-related disability [Oswestry Disability Index (ODI)]
				Organizational (12 mo)	**12 months** - Process of care (EHR) – Referral to PT or PIPT, referral to medical specialists, diagnostic imaging and orders for opioid prescriptions and other LBP-related pain medications; Healthcare resource use (EHR) – Outpatient visits (PHC and specialists), receipt of diagnostic imaging, interventional pain procedures (e.g., epidural injections), electrodiagnostic tests (e.g., nerve conduction velocity), surgeries, hospitalizations and emergency department visits.
BETTERBACK©	Schröder et al. (2020)(15)	- Inclusion: PTs working with LBP patients who attended the BetterBack© workshop	N=116	Implementation (after, 3 and 12 mo)	**After, 3 and 12 months** - Primary outcome: Self-confidence in managing LBP patients [Practitioner Self-Confidence Scale (PCS)]; Determinants of PT's behaviour [Determinants of Implementation Behaviour Questionnaire (DIBQ)]. **3 and 12 months** - PTs' attitudes and beliefs about biomedical and biopsychosocial treatment orientations (PABS-PT).
	Enthoven et al. (2021)(16)	- Inclusion: Participants previously treated according to the BetterBack MoC for a first-time or recurrent episode of benign LBP with or without radiculopathy.	N=15	Implementation (4-14 mo)	**4-14 months** - Patients' experiences of receiving care according to the MoC (interviews)
	Schröder et al. (2021)(17)	Patients: - Inclusion: 18–65 years, accessing public primary care due to a first-time or recurrent episode of acute, subacute, or chronic-phase benign LBP, with or without	N=467 - Intervention: n=264	Patient (3, 6 and 12 mo)	**3, 6 and 12 months** - Primary outcome: Pain intensity (NRS-LBP); Primary outcome: Function and activity limitations (ODI); Risk stratification (SBST); Health-related quality of life (EQ-5D); Cognitive and emotional representations of illness [Brief Illness Perception Questionnaire (BIPQ)]; Ability to understand and cope with LBP [Pain Enablement Instrument (PEI)]; Perceived change (PGIC)

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		radiculopathy. - Exclusion: current or previous malignancy in the last 5 years, serious spinal pathology, spinal surgery the last 2 years, current or previous pregnancy in the last 3 months, participants who fulfil the criteria for multimodal/multiprofessional rehabilitation for complex long-standing pain and severe psychiatric diagnosis. PTs: - Inclusion: PTs who worked regularly with patients with LBP.	- Control: n=203 PTs: N=104	Organizational (3, 6 and 12 mo)	**Process of care** - Clinical Practice Quality Index – Guideline adherence [(Clinical Reasoning and Process Evaluation tool - CRPE)], number of PT treatments [((Public Healthcare Regional Registry - PHRR)], referral to specialist consultation (PHRR) and medical imaging (PHRR) **3, 6 and 12 months** - Patient satisfaction [Patient Satisfaction (PS)]
	Schröder et al. (2022)(18)		Register cohort - PTs: N=105 - LBP patients: N=500 (intervention n=278; control n=222) CRPE- smaller cohort: - PTs: N=98 (intervention n=44; control n=54) - LBP patients: N=388 (intervention n=223; control n=165)	Organizational	**Process of care** - Adherence to clinical practice guidelines recommendations - Clinical Practice Quality Index (PHRR and CRPE): • Primary outcome: Proportion of patients receiving referral to specialist consultation (PHRR), Proportion of patients receiving medical imaging (PHRR), Proportion of patients receiving stratified number of PT visits (PHRR), Proportion of patients receiving educational interventions (CRPE), Proportion of patients receiving exercise interventions (CRPE), Proportion of patients receiving manual therapy (CRPE), Proportion of patients receiving acupuncture (CRPE) and Proportion of patients receiving non-evidence-based treatments (CRPE).
Low Back and Radicular Pain Pathway	Greenough (2017)(19)	- Inclusion: Patients with LBP with or without leg pain.	Not reported	Patient (discharge)	**Discharge** - Pain intensity (NRS); Disability (ODI); Health-related quality of life (EQ-5D); Anxiety (GAD-7); Depression (PHQ-9); Readiness to self-manage (0–10-point scale).
				Organizational (discharge)	**Process of care** - Percentage of discharges from treatments (pathway database) **Discharge** - Patient satisfaction [Friends and Family Test (FFT)]
	Ryan et al. (2020)(20)	- Inclusion: ≥18 years, with sciatica, who were under the care of a specialist PT, undergone investigations and received the results within the previous 6 weeks. - Exclusion criteria: previous spinal surgery, cauda equina syndrome or sinister pathology, patients unable to communicate or provide consent; or the researcher had treated them in a previous episode of LBP.	N=14	Implementation (6 weeks)	**6 weeks** - Patients' experiences within the NHS pathway (interviews)
	Martin et al. (2018)(21)	- Quantitative study: All patients attending during the evaluation period. No exclusion criteria. - Qualitative study: People engaged in the development, implementation, delivery, or patient of the NERBPP (key decision makers, triage and treat practitioners, healthcare professionals, GPs, patients)	- Quantitative study: N=3834 - Qualitative study: N=35	Patient (Discharge, 6 and 12 mo)	**Discharge, 6 and 12 months** - Pain intensity (NRS); Function (ODI); Health status/quality of life (EQ-5D-5L); Anxiety (GAD-7); Depression (PHQ-9) **Discharge** - Global Subjective Outcome Scale (GSOS); Readiness to self-manage (0–10-point scale)
				Organizational (6 weeks)	**Discharge** - Patient satisfaction (FFT)
				Implementation	**Before, during and after implementation**

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					- Opinions of clinicians, commissioners and patients regarding the implementation of the pathway (interviews and focus groups)
	Jess et al. (2018)(22)	- Inclusion: ≥18 years, patients referred onto the NERBPP by their GP due to acute, new onset, LBP episode or a flare-up of LBP with at least 6 months since their last attack.	N=3834 - Standard discharge: n=2071 - Same-day discharge: n=1147 - Non-Attender: n=616	Patient (discharge)	**Discharge** - Pain intensity (NRS); Functional disability (ODI); Health-related quality of life (EQ-5D-5L); Anxiety (GAD-7); Depression (Patient Health Questionnaire -PHQ-9); Perception of improvement (GSOS); Readiness to self-manage (0–10-point scale).
				Organizational (discharge)	**Discharge** - Patient satisfaction (FFT)
	Jess et al. (2021)(23)		- 6-month follow-up: N=786 - 6-month follow-up: N=552	Patient (6 and 12 mo)	**6 and 12 months** - Pain intensity (NRS); Functional disability (ODI); Health-related quality of life (EQ-5D-5L); Anxiety (GAD-7); Depression (Patient Health Questionnaire -PHQ-9); Perception of improvement (GSOS)
				Organizational (6 and 12 mo)	**6 and 12 months** - Patient satisfaction (FFT)
Beating Back Pain Service	Cheshire et al. (2013)(24)	- Inclusion criteria: non-specific LBP, >6 weeks duration, ≥18 years. - Exclusion: presence of red flags, inability to communicate in English, mental health problems and substance abuse.	N=80	Patient (discharge and 3 mo)	**Discharge and 3 months** - Musculoskeletal pain [Bournemouth Questionnaire (BQ)]; Health-related quality of life (EQ-5D); Self-efficacy (PSEQ); Positive well-being [5 questions on a 0–10-point scale]; Physical activity levels (0–10-point scale); Analgesic use (single question); Work status (single question).
				Implementation (post-treatment)	**Post-treatment** - Benefits, improvements, comments or suggestions regarding the service [open-ended questions at the end of the self-reported questionnaire]
NE Essex PCT service	Gurden et al. (2012)(25)	- Inclusion: Adults, consulting GP for at least 4 weeks for back or neck pain, suitable for manual therapy. - Exclusion: serious pathology or red flags and serious comorbidity.	N=696	Patient (discharge)	**Discharge** - Back and neck pain (BQ); Impact of symptoms (Bothersomeness Questionnaire); Global improvement scale (7-point scale); Work status (self-reported questionnaire); Medication use (self-reported questionnaire)
				Organizational (discharge)	**Discharge** - Patient satisfaction (5-point scale); Healthcare resource use (self-reported questionnaire) – Number of treatments, referrals to secondary care, referrals to GP/other health professionals and discharges.
ISAEC	Zarrabian et al. (2017)(26)	- Inclusion: Potential surgical candidates with unmanageable, persistent LBP for more than 6 weeks but less than 52 weeks or recurrent LBP. - Exclusion criteria: pain disorder, narcotic dependency, pregnancy or postpartum less than a year, red flags.	N=422	Patient (after assessment)	**At the initial assessment and after the surgeons' assessment** - Presenting pain pattern (medical records)
				Organizational (after assessment)	**At the initial assessment and after the surgeons' assessment** - Number and type of imaging (medical records); Referral appropriateness for surgery (medical records); Wait time from PCP referral to assessment at ISAEC (medical records).
Saskatchewan Spine Pathway	Kindrachuk & Fourney (2014)(27)	- Inclusion: Nonemergency referrals of LBP and leg pain. - Exclusion: option of refusing the SSP visit.	N=87 - Group A: n=62 - Group B: n=25	Patient (7 mo)	**7 months (May 2011 – November 2011)** - Disability (ODI); Back and leg pain (VAS); Health-related quality of life (EQ-5D); Presence of clinical "red flags" (not reported); SSP clinical classification (not reported).
				Organizational (7 mo)	**7 months (May 2011 – November 2011)** - Surgery rate (not reported); MRI utilization (not reported).
	Y		N= 215	Patient	**1 year (June 2011 – May 2012)**

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	gen bus ch	- Inclusion; New elective outpatient surgeon referrals for LBP and leg pain seen by 2 neurosurgeons. - Exclusion: red flags.	- Group A: n=66 - Group B: n=149	(12 mo)	- Disability (ODI); Back and leg pain (VAS); Number of patients with SSPc patterns; Health-related quality of life (EQ-5D-5L).
				Organizational (12 mo)	**1 year (June 2011 – May 2012)** - Number of referrals to surgery; Wait time for surgeon assessment; Wait time for MRI.
Back pain Assessment Clinic	Moi et al. (2018)(29)	- **Inclusion:** ≥18 years, referrals for neck or LBP, with or without limb symptoms, already on outpatient spinal surgical waiting lists, triaged as 'non-urgent' or assigned a 'next available' appointment by neurosurgery and orthopaedic spinal units. Low likelihood of surgical intervention. - **Exclusion:** red flags, spinal surgery within the last 2 years, radiculopathy accompanied by limb weakness, moderate-to-severe scoliosis, peripheral entrapment neuropathies, high likelihood of need for surgical intervention, comorbidities, referred for medicolegal opinions or compensable claims.	N=522 - Qualitative study: N=94 (Patients n=54; Health professionals and managers n=14; and referrers n=26)	Patient (12 weeks)	**After a 12-week rehabilitation programme** - Pain [Brief Pain Inventory (BPI) short form]; Disability [(ODI) or Neck Disability Index (NDI)]; Overall well-being [Global Improvement Scale].
				Organizational (12 weeks)	**After a 12-week rehabilitation programme** - Patient satisfaction (survey); Waiting times (survey) - time from referral to initial consultation, patients redirected from neurosurgery waiting lists, patients redirected from orthopaedic waiting lists; Appropriate and safe care (survey) – medication adjustments, spinal injections, MRI utilization, referrals to community-based spinal rehabilitation, referrals to specialist services, discharges, GP satisfaction; Efficiency and sustainability (survey) – Costs/patient, cost-savings.
				Implementation (12 mo)	**1 year (July 2014 – June 2015)** - Victorian Innovation Reform Impact Assessment Framework domains (BAC activity audit, patient surveys and stakeholders' interviews) – Access to care, Appropriate and safe care, Workforce optimization and integration and Efficiency and sustainability.

Abbreviatures:
BAC – Back pain Assessment Clinic; CAM - Complementary and Alternative Medicine; CRPE - Clinical Reasoning and Process Evaluation; EHR – Electronic Health Record; GP – General Practitioner; ISAEC – Inter-professional Spine Assessment and Education Clinics; LBP – Low Back Pain; MoC – Model of Care; MRI – Magnetic Resonance Imaging; NERBPP – North East Low Back and Radicular Pain Pathway; NHS – National Health System; PCP – Primary Care Provider; PHC – Primary Healthcare; PHRR - Public Healthcare Regional Registry; PIPT - Psychologically Informed Physical Therapy; PT – Physiotherapy; PTs – Physiotherapists; QALYs – quality-adjusted life years; RCT – Randomized controlled trial; SBST – Start Back Screening Tool; SSP – Saskatchewan Spine Pathway;

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Additional File 5 – Core components of the MoCs

MoC	Study	Referral	Assessment	Health Interventions	Follow-up	Discharge
START BACK	(1,2) STarT Back	GP, practice nurse or the local Physiotherapy Direct Access service (Physio Direct) referral to PT	PT assessment and risk stratification (SBST)	PTs deliver risk-matched group care: - All risk groups: Education + booklet The Back Book + video "Get Back Active"; - Low risk: Single session (30 minutes) of minimal intervention (education + advice + reassurance); - Medium risk: 30-minute session of education + standardized PT (exercise + manual therapy); - High risk: Education + PIPT (CBT with traditional PT)	- Patients are advised to access their GP for ongoing care in the usual way or if their condition worsens.	- Low risk: after the initial education session; - Medium risk: after a maximum of 6 sessions; - High risk: after a maximum of 12 sessions.
	(3,4) IMPaCT Back	GPs referral to PT	GP risk stratification (SBST) + PT assessment of medium and high-risk patients	GPs deliver care to: - Low risk: Single session of minimal intervention (education + reassurance + information on self-management). Pain medication if appropriate; PTs deliver risk-matched group care: - Medium risk: education + standardized PT (exercise + manual therapy); - High risk: education + PIPT (CBT with traditional PT)	- If needed, medium and high-risk patients referred for further investigations or secondary care.	- Low risk: after the initial education session; - Medium risk: after a maximum of 6 sessions; - High risk: after a maximum of 12 sessions.
	(5) Ireland	GP or PT team refer to the Back Pain Clinic	PT assessment and risk stratification (SBST)	PTs deliver risk-matched group care: - Low risk: 1.5-hour small group session of education + exercise to promote active self-management; - Medium risk: Four 90-minute group sessions (8-10 patients) of education + generic exercise over 4 weeks; - High risk: Four 120-minute group sessions (4-6 patients) of exercise (as medium risk group) + problem solving approach + CBT to promote self-management	Not reported	- Low risk: after the initial education session; - Medium risk: after 12 weeks; - High risk: after 12 weeks.
	(6) Denmark	GPs referral to PT	GPs assessment + PT assessment and risk stratification (SBST)	PTs deliver risk-matched group care: - All risk groups: Education (education + advice + reassurance + booklet similar to *The Back Book*) - Low-risk: minimal intervention (education + advice + reassurance) - Medium risk: individualized PT treatment + intervention focusing prevention of new LBP episodes - High risk: individualized PIPT (CBT and/or behavioural techniques with traditional PT)	Not reported	Not reported

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SCOPiC	(7–9)	GP or other HCP refer to the SCOPiC sciatica clinic	PT assessment and risk stratification (SBST)	PTs deliver risk-matched group care: - Subgroup 1 (low risk): 30-minute sessions (advice + education + self-management support + sciatica booklet) - Subgroup 2 (medium risk with score ≤3 or high risk with score ≤2): one 45-minute session + 30-minute sessions of individualised treatment (advice + reassurance + education + exercise + manual therapy + acupuncture + sciatica booklet) - Subgroup 3 (medium risk with score =4 or high risk with score ≥3): Referral to a fast-track care pathway at the primary/secondary care interface services.	- Subgroups 1 and 2: Patients are able to access other care via their GP. - Subgroup 3: specialist spinal PT assessment + referral to imaging (MRI or alternative) + referral to specialist clinics services (orthopaedics, neurosurgery or pain clinic).	- Subgroup 1: after up to 2 sessions within 4 weeks; - Medium risk: after up to 6 sessions within 6 to 12 weeks; - High risk: not reported
MATCH	(10,11)	PCPs referral: - Medium risk patients to PT or CAM - High-risk patients to psychologist and PT	PCP assessment and risk stratification (SBST)	PCPs deliver care to: - Low risk: Reassurance + self-management recommendations + online DVDs PTs or CAM professionals deliver care to: - Moderate risk: Self-management recommendations + PT-led exercise and yoga. For patients not interested these treatments, refer to passive options (acupuncture, chiropractic or massage) PTs and psychologists: - High risk: PIPT and CBT (access to CBT is very limited)	Low and medium risk patients: Not reported High-risk patients: Proactive follow-up within 2 weeks by PCPs	Not reported
TARGET	(12–14)	PCPs referral to PIPT	PCP assessment and risk stratification (2-item Chronic Low Back Pain Questionnaire + SBST for patients in acute stage)	- PCPs deliver education and pain medication to high-risk patients - PTs deliver PIPT (cognitive behavioural training, motivational interviewing, pain-coping skills and activity-based treatments that include graded activity and graded exposure)	Not reported.	Not reported. There are no limits placed on the duration of any therapies or treatments.
BETTERBACK©	(15–18)	- Self-referral to the PHC PT rehabilitation clinics - Referral from the PHC general practices	PT assessment and risk stratification (SBST)	PTs deliver treatment matched to functional impairments based on SBST results (BetterBack part 1): - Individualised information + neuromusculoskeletal mobilisation techniques if indicated + exercise + patient education (brochure): - Low-risk: 1-3 sessions - Medium-risk: ≥4 sessions - High-risk: ≥4 sessions with additional training + education with a behavioural approach.	PT assessment and evaluation of treatment outcomes – if needed PT group based-care (BetterBack part 2): - Group-based education: One 90-minute session (2-10 patients) - Group training (6 weeks, 2x/week): graded training of posture, motor control and, if needed, range of movement exercises	Not reported
Low Back and Radic	(19,20) National	GP, self-referral to a chiropractor, osteopath or PT and 111 telephone service	GP, chiropractor, osteopath or PT assessment and risk stratification (SBST)	GP, chiropractor, osteopath or PT initial management: - Advice + information + pain medication + PT core therapies (education + manual therapy + exercise) with a 2-week review.	- If imaging concordant with structural cause of sciatica, referral to epidural injection or surgery (after 8-12 weeks)	Patients can be discharged at any point along the pathway upon improvement of the LBP.

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				- If no improvement, referral to TTP assessment + referral to imaging (if indicated) within 6 weeks.	- If non-concordant structural cause, referral to CPPP (12-18 weeks) - If no improvement, referral to Specialist Pain Management Services (18 weeks) - Pain management programmes (physical, psychological and behavioural interventions)	
ular Pain Path way	(21) North	GP referral or other first contact professional	GP or other first contact professional assessment and risk stratification (SBST)	GP or other first contact professional initial management: - Advice on self-management or referral to secondary care or referral to TTP - If referral to TTP: assessment + referral to a combination of core therapies (education + manual therapy + exercise) or intensive CPPP (residential programme of intensive exercise + education + support with long-term self-management)	- If not improved, referral for Pain Management Services and specialist spinal surgical options	- After initial management - After treatments: not reported
	(22,23) North East	GP referral	GP risk stratification (SBST) + referral to TTP	GP deliver care to low-risk patients: - Low risk: advice + education TTP assessment and delivery of risk-matched group care: - Referral to further investigations if necessary; - Moderate to high risk: Core therapies (PT incorporating exercise, manual therapy or acupuncture) or CPPP (100-hour residential, combined physical and psychological therapies program for a small number of patients)	Not reported	- Low-risk patients: after initial consultation
Beating Back Pain Service	(24)	GP, PT or osteopath referral to BBPS	No assessment before group session	GP and occupational therapist deliver care to all patients - 2h group session of education on pain and self-management + BBPS pack (booklet + CD with information and mobility and strength exercises) + SBST assessment + referral to combination of care according to patient preference (individualized combination of acupuncture, self-management groups and/or BBPS packs): - Acupuncture: Up to 6 weekly sessions (30 minutes) of individualized TCM acupuncture treatment; - Self-management groups: group sessions of education on self-management + goal setting + mindfulness + CBT. - BBPS pack	Not reported	Not reported
North East Essex PCT service	(25)	GP referral to the manual therapy service	GP assessment	- GP deliver usual care (advice + reassurance + analgesia) to all patients for 4-6 weeks + referral to chiropractor/osteopath/PT according to patient preference. - Chiropractor/Osteopath/PT care: Up to 6 sessions of manual therapy or additional treatments with GP approval	If no improvements, referral to psychotherapy/CBT or referral to secondary care via GP recommendation (surgical/ radiological/ pain consultant)	- Discharge and referral back to GP after chiropractor/ Osteopath/PT care with a report of recommendations for further management

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ISAEC	(26)	PCP referral to ISAEC (could order MRI)	APC evaluation and stratification by pattern diagnosis	APC deliver care according to clinical presentation patterns: - Back dominant pattern (surgery unlikely): APC education and management (Physiatry/pain clinic, counselling, rheumatology, self-management, allied health management) - Leg dominant (surgery likely): referral to spine surgeon (imaging, blocks, surgery, nonoperative)	- Back dominant pattern (surgery unlikely): recommendations communicated to referring PCP. - Leg dominant (surgery likely): APC education and management (Physiatry/pain clinic, counselling, rheumatology, self-management, alliead health management) + recommendations communicated to referring PCP.	Not reported
Saskatchewan Spine Pathway	(27)	Physician referral to SSP clinic	Patients triage into Group A (non-surgical management) or Group B (spine surgeon assessment)	- Group A: education including self-care instruction, medication advice and/or mechanical therapies - Group B – surgical consultation (imaging and surgery)	- Group A: follow-up by the SSP clinic when required	- Group A: Discharge after care delivery - Group B: Not reported
	(28)	- Group A: Referred by neurosurgeons at the SSP clinic - Group B: Referred by physicians at primary care	Physicians (at PHC) or specialized PTs (at SSP clinics) assessment If red flags present, referral for emergency (imaging + surgery consultation)	- Group A (SSP clinic): assessment (directly) or reassessment (from PHC referral) of pattern diagnosis + treatment according to SSP classification (pattern diagnosis). If patient improves, continue treatment in PHC. - Group B (PHC referral): treatment according to SSP classification in PHC. Treatment according to SSP classification: - Pattern 1, 2 and 4: Reassurance + Advice and Information + Treatment schedule (position, movement, pharmacology and adjunct therapies) - Pattern 3: Similar, but exclude exercise.	Group A: If no improvement: - Pattern 1 e 2 – Refer back to PHC with recommendations for additional mechanical treatment and referral to surgery if symptoms persist after 6 months; - Pattern 3 – Urgent referral for imaging + surgery consultation if pain persist after 6 weeks; - Pattern 4 – Non-urgent referral for imaging + surgery consultation. Group B (PHC referral): If no improvement, referral to SSP clinic.	Not reported
Back pain Assessment Clinic	(29)	GP referral to Royal Melbourne Hospital + Surgeon's referral to BAC	Rheumatologist, neurosurgeon, orthopaedic spinal surgeon or APP (PTs) assessment	If BAC consultation: - Referral to community treatment services (12-week community-based spinal rehabilitation programme seen within 2–4 weeks) - Referral to rheumatology, orthopaedics, neurosurgery or pain services	- Outpatient specialist clinics consultations (Rheumatology, Orthopaedics, Neurosurgery, Pain services)	- To initial referrer after BAC assessment; - After orthopaedics or neurosurgery consultations - After community treatment services: Not reported

Abbreviatures:
APC - Advanced Practice Clinician; APP - Advanced Practice Physiotherapist; BAC – Back pain Assessment Clinic; BBPS – Beating Back Pain Service; CAM - Complementary and Alternative Medicine; CBT – Cognitive Behavioural Techniques; CCCP - Combined Physical and Psychological Therapies program; EBP – Evidence-Based Practice; GPs – General Practitioner; HCP – Health Care Provider; ISAEC – Inter-professional Spine Assessment and Education Clinics; LBP – Low Back Pain; MoC – Model of Care; NERBPP – North East Low Back and Radicular Pain Pathway; PCP – Primary Care Provider; PHC – Primary Healthcare; PIPT - Psychologically Informed Physical Therapy; PT – Physiotherapy; PTs – Physiotherapists; SBST – Start Back Screening Tool; SSP – Saskatchewan Spine Pathway; TCM – Traditional Chinese Medicine; TTPs - Triage and Treat practitioners;

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Title Page

Low Back Pain Management in Primary Healthcare: Findings from a Scoping Review on Models of Care

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Low Back Pain Management in Primary Healthcare: Findings from a Scoping Review on Models of Care

ABSTRACT

Introduction: Models of care (MoCs) describe evidence-informed healthcare that should be delivered to patients. Several MoCs have been implemented for low back pain (LBP) to reduce evidence-to-practice gaps and increase the effectiveness and sustainability of healthcare services.

Objective: To synthesize research evidence regarding core characteristics and key common elements of MoCs implemented in primary healthcare for the management of LBP.

Design: Scoping review.

Data sources: Searches on MEDLINE(Pubmed), EMBASE, Cochrane Central Register of Controlled Trials, PEDro, Scopus, Web of Science and grey literature databases were conducted.

Eligibility criteria: Eligible records included MoCs implemented for adult LBP patients in primary healthcare settings.

Data extraction and synthesis: Data extraction was carried out independently by two researchers and included a summary of the studies, the identification of the MoCs and respective key elements, concerning levels of care, settings, health professionals involved, type of care delivered and core components of the interventions. Findings were investigated through a descriptive qualitative content analysis using a deductive approach.

Results: Twenty-nine studies reporting 11 MoCs were included. All MoCs were implemented in high-income countries and had clear objectives. Ten MoCs included a stratified care approach. Assessment of LBP patients typically occurred in primary healthcare, while care delivery usually took place in community-based settings or outpatient clinics. Care provided by general practitioners and physiotherapists was reported in all MoCs. Education (n=10) and exercise (n=9) were the most common health interventions. However, intervention content, follow-ups and discharge criteria were not fully reported.

Conclusions: This study examines the features of MoCs for LBP, highlighting that research is in its early stages and stressing the need for better reporting to fill gaps in care delivery and implementation. This knowledge is crucial for researchers, clinicians and decision-makers in assessing the applicability and transferability of MoCs to primary healthcare settings.

Keywords: Low back pain; models of care; primary healthcare; implementation science

Registration: Open Science Framework Registries (https://osf.io/rsd8x)

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ARTICLE SUMMARY

Strengths and limitations of this study

- To the best of our knowledge, this is the first study aiming to map the available evidence regarding the core characteristics and key elements of MoCs implemented in primary healthcare for the management of LBP.
- To aid the transparency and methodological rigour of this study, it followed the Joanna Briggs Institute Methodological Guidelines and Preferred Reporting Items for Systematic Reviews and Meta-Analysis extension for Scoping Reviews.
- One limitation of this review is potential selection bias due to search strategies and language restrictions, as well as heterogeneity in MoC terminologies.
- Strategies to overcome potential limitations included the use of a broad search strategy across databases, an overinclusion approach during article screening and regular team discussions during data extraction and analysis.
- This study offers a comprehensive understanding of key characteristics of the MoCs implemented for LBP patients in primary healthcare, which may help clinicians and decision-makers to plan implementation of MoCs in real-world settings, as well as researchers defining avenues to overcome the current evidence-to-practice gaps.

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INTRODUCTION

Low back pain (LBP) is a significant global public health concern, acknowledged as the leading contributor to disability worldwide. In 2020, 619 million (95% UI 554–694) people reported having this health condition and prevalence projections suggest it will escalate to 843 million (95% UI 759–933) by 2050, an increase in total cases of 36.4%(1). It is recognised that the burdensomeness of LBP is related to long-term disability and poor health-related quality of life(2–4), associated with more medical costs and utilisation of healthcare resources, such as medication, medical appointments, imaging and physiotherapy(2,5–7). Thus, LBP represents a growing burden for individuals, society and healthcare systems.

Although care delivery may vary between health systems, primary healthcare is recognised as the appropriate setting to manage LBP(8,9), which is already one of the most common reasons for general practice consultations worldwide(8,10). Accompanying the estimates of the rising prevalence of LBP, it is also expected a significant increase in primary healthcare workload in the upcoming years(9), so there is an urgent need to develop efficient and sustainable solutions to face these healthcare challenges.

Additionally, evidence shows there is a present gap between the recommended practice for LBP and the care provided in real-world contexts(9). Current patterns of care may vary between settings and lack alignment with clinical practice guideline recommendations, which succinctly endorses the delivery of nonpharmacological interventions, such as education and exercise, and manual therapy as an adjuvant treatment(8,11–14). However, many LBP patients receive unnecessary low-value care, which does not align with quality standards(14,15), leads to poor clinical outcomes(4,16) and waste healthcare resources(17–19). Therefore, system-level reform strategies are necessary to overcome these evidence-to-practice gaps and to promote the delivery of high-quality care to LBP patients(9,17,20).

The implementation of models of care (MoCs) is one of the most promising strategies suggested to increase the responsiveness of health systems to the impact of LBP. A Model of Care (MoC) is a person-centred approach that outlines evidence-informed best practices for managing specific health conditions(21–23). It details the optimal care that should be provided and the methods for its implementation. MoCs are built upon clinical guidelines - drawing from up-to-date recommendations – and they primarily serve to translate these recommendations into actionable strategies(23). While clinical pathways focus on the integrated delivery of care to patients with a specific condition, MoCs go beyond this aspect, focusing much of their attention on the factors that determine a successful implementation(22,23).

The principles of MoCs are in line with the quadruple aim of value-based care, targeting better health outcomes, better patient and health professional experiences and improved use of healthcare resources(17,21). MoCs usually reflect regional or national health policies that are implemented as health services in local settings(22,24). When implemented locally, a MoC include the key core components from the system-level framework, but other elements should be adapted to meet the specific context and needs(17). The operationalisation of a MoC for local service delivery is usually designated as *model of service delivery*(17).

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Several MoCs have been implemented for LBP patients over the last few years in different countries. Commonly, these MoCs deliver care through stepped or stratified approaches, supporting the decision-making process. In stepped care, all patients are initially offered the same treatment options and more complex care is only proposed if they have not recovered sufficiently, while, in risk-stratified MoCs, patients are stratified according to their prognosis at initial assessment and treatment is targeted to patient subgroups, with more comprehensive care offered to those at risk of poor outcomes(25).

Although some MoCs reveal promising results regarding their effectiveness and cost-effectiveness(9,23), they are very heterogeneous in terms of their characteristics, making it difficult to assess the suitability of a MoC to a given context over another. These characteristics include, but are not limited to, the target population, clinical pathways, levels of care and health professionals involved, type of care (stepped/stratified approaches), health interventions and context features.

Two recent reviews(26,27) have analysed the evidence on initiatives for implementing LBP management. One review focuses specifically on MoCs implemented in Australia(26). The other, a systematic review(27), aims to describe clinical pathways and care integration across different levels of care, without focusing on the details of care delivery and implementation. Therefore, our work seeks to expand on these contributions by providing a broader overview of the diversity, content and resource requirements of MoCs for LBP patients. This is important information to support policy makers, managers, clinicians in the development and implementation planning of MoCs, as well as pinpoint evidence gaps related to implementation in real-world settings.

METHODS

A scoping review was deemed the most appropriate study design to answer the research questions as it aims to map the available evidence and identify characteristics or factors related to an emerging and complex concept(28,29). The uncertainty regarding the evidence sources, methodologies and amount and quality of available data determined the choice of this approach.

This study was conducted in accordance with the Joanna Briggs Institute (JBI) scoping review guidance and the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for scoping reviews (PRISMA-ScR) (Supplementary File 1). The protocol was registered within the Open Science Framework Registries (https://osf.io/rsd8x) and it was published elsewhere(30).

Patient and Public Involvement

Patients and public were not included in the design, conduct, or reporting of this research as it is targeted for researchers, clinicians, managers and policy makers.

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Research Question and Aims

The research question of this review is '*What are the key characteristics of MoCs implemented in primary healthcare for patients with LBP?'* Our objectives are to identify which MoCs have been implemented for LBP management, describe their main characteristics and commonalities in care delivery, and highlight any gaps in knowledge regarding their real-world implementation.

Inclusion Criteria

Eligibility criteria were defined through the Population, Concept, Context (PCC) framework(28,29). Target population are LBP patients, with or without radicular pain, of any duration, excluding specific causes or serious pathologies. Records including broader populations, such as "musculoskeletal pain" or "spinal pain", were also excluded. MoC was defined as the provision and delivery of care in a local setting, including service planning, care coordination and management of services(21,22,31). Operational criteria were defined to differentiate a MoC from intervention programmes(22,30). Regarding the context, MoCs were included if they were developed in primary healthcare or other levels of healthcare delivery, as long as they included primary care interventions in the clinical pathway(31).

Search Strategy

A comprehensive search was conducted on MEDLINE(PubMed), EMBASE, Cochrane Central Register of Controlled Trials, PEDro, Scopus, and Web of Science, as well as grey literature sources (Figure 1). Hand searching was performed in peer-reviewed journals and relevant organisation websites(32). Additional studies were identified through reference list screening. Initial searches conducted in May 2021 used key terms like "low back pain," "model of care" and "primary care". Subsequent tailored searches across all databases were performed (Supplementary File 2). Only records published since 2000 were considered as we aim to examine evidence-based and coordinated healthcare delivery for LBP, reflecting the current concept of MoC. Language restrictions for English, Portuguese, or Spanish were established due to practical constraints related to the availability of translation resources. The search commenced in January 2022 and was last updated in December 2022, with search strategies reviewed and conducted by an experienced information scientist (HD).

[Please insert Figure 1 – PRISMA flow diagram showing the identification, screening, eligibility and inclusion process of the articles]

Study Selection

Records were imported to EndNote X9 (Clarivate Analytics, USA) for screening and duplicate removal. Two reviewers independently screened titles and abstracts (STD and DC). Eligibility criteria were tested with a random sample of 25 records. Afterwards, full-text screening was performed by two researchers

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(STD and AM), with a pilot test on 10 studies for consistency. Disagreements were discussed with a third reviewer (DC).

Data Charting

To ensure data extraction transparency(28), a standardised form (Supplementary File 3) was developed and piloted, covering a summary of the studies, the identification and description of the MoC (name, country, target population, main objectives) and respective key elements (levels of care and settings, health professionals involved, type of care delivered and core components of health interventions). Two researchers (STD and AM) extracted data independently and resolved uncertainties with the research team. Only relevant data to the research question were extracted, and when necessary, the authors were contacted for clarifications. Regular video meetings were held for data review and process updates.

Synthesis and Presentation of Results

Findings were synthesised through deductive content analysis in 3 phases: preparation, organisation, and reporting(33). Data is presented in narrative, tabular, and chart formats for each MoC for LBP management. Descriptive results include the identification of the MoCs, their general description, and key elements, while quantitative results refer to frequency counts of the data.

Protocol Deviations

Four research questions were framed in the protocol of this study(30). However, during the processes of data extraction and analysis, it became clear that the complexity of the topic and richness of the available data justified a rigorous description and interpretation of the findings. Therefore, findings on patient-, system- and implementation-related outcomes of MoCs and context-specific factors (macro, meso, micro and multiple levels) contemplated in their implementation will be reported in a subsequent paper. Additionally, one criterion was added to those published in the protocol, which is the MoC is not digital (e.g. telemedicine, telerehabilitation, web-based programs and/or mobile apps).

RESULTS

Search Results

The PRISMA flow diagram (Figure 1) outlines the search and selection process. From the 4081 records yielded in first instance, 29 studies(34–62), published between 2011 and 2022, were included. They portray 11 MoCs implemented in primary healthcare.

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Characteristics of the Included Studies

Table 1 identifies each MoC and their corresponding studies. Quantitative studies (n=19) mainly consisted of randomised controlled trials (n=9) and observational cohorts (n=9). These studies assessed the clinical effectiveness and efficacy of 9 MoCs(34,39,42,44,46,48,49,51,55,57,58,60–62) and healthcare resources utilisation of 7 MoCs(34,39,46,52–54,56–58,60–62). Only BetterBack☺ was evaluated for healthcare quality(43) and economic evaluations were solely performed for 3 MoCs(34,35,46,58,60,61). Qualitative studies (n=5; 5 MoCs) focused on implementation outcomes and strategies(36,37,41,45,59), while mixed methods studies (n=5; 3 MoCs) investigated patient and organisational outcomes, as well as the experiences of different stakeholders(38,47,50). Detailed characteristics of the studies, including eligibility criteria, sample sizes, outcomes and outcome measures, can be found in Supplementary File 4.

[Please Insert Table 1 – MoCs identification and corresponding studies]

General Description

The 11 MoCs implemented in primary healthcare for the management of LBP patients are the STarT Back (34,35,46,56–58), SCOPiC(59–61), MATCH(36,62), TARGET(37–39), BetterBack☺ Model of Care(40–43), Low Back and Radicular Pain Pathway(44,45,47–49), Beating Back Pain Service (BBPS)(50), North East Essex Primary Care Trust (PCT) manual therapy service(51), Interprofessional Spine Assessment and Education Clinics (ISAEC)(52), Saskatchewan Spine Pathway(SSP)(53,54) and Back Pain Assessment Clinic (BAC)(55).

All MoCs were implemented in high-income countries from Europe, North America and Australia (Figure 2). Most implementations (n=5) were set in the United Kingdom (UK), followed by the United States of America (USA) (n=2) and Canada (n=2). STarT Back(34,35,46,56–58) was the only MoC implemented in three countries (UK, Ireland and Denmark). However, adaptations of this MoC, with significant adjustments to its core characteristics, were also implemented in the USA (MATCH and TARGET)(36–39,62) and Sweden (BetterBack☺)(40–43).

[Please insert Figure 2 – Geographical representation of the MoCs (n=11) implemented for LBP in primary healthcare worldwide]

The target population of the MoCs involved adults with LBP, with or without radicular pain, or radiculopathy. North East Essex PCT manual therapy service(51) and BAC(55) also included patients with neck pain. BBPS(50) and Irish STarT Back(57) were the only MoCs that established the duration of pain as an eligibility criterion, namely, the presence of LBP for more than 6 weeks and 3 months, respectively (Supplementary File 4).

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Most MoCs (n=8) aimed to promote evidence-informed practice to improve clinical effectiveness. They were informed by national or international clinical practice guidelines to design the service delivery and health interventions for the management of LBP. Only Canadian MoCs, ISAEC(52) and SSP(53,54), did not specify the guidelines they followed, although the studies mentioned the need to provide care in line with current recommendations.

MoCs comprising more than one level of care, such as interface services and/or secondary care (44,45,48,49,52–55,59–61), were especially concerned with reducing waiting times and optimising referral behaviours for imaging, care delivery and specialist review. Goals related to equitable access to care were only identified for the Low Back Pain and Radicular Pain Pathway(44) and the North East Essex PCT manual therapy service(51).

The majority of MoCs were implemented within the National Healthcare Systems through local (n=3) and regional (n=7) pathways. Only the Low Back Pain and Radicular Pain Pathway refers to a national MoC(44,45), MATCH(36,62) and TARGET(37–39) were implemented in integrated healthcare delivery systems of the USA. Additionally, only four MoCs (Danish STarT Back, SCOPiC, TARGET and ISAEC)(39,52,58,60) were implemented in different geographical areas, covering urban, inner city and rural settings.

Table 2 presents detailed information on the general characteristics of the different MoCs, including target population, goals, type of care, settings and health professionals involved in care delivery.

[Please insert Table 2 – General characteristics of the MoCs]

Settings and Healthcare Professionals

Most MoCs (n=10) for LBP encompass multiple healthcare setting. General practices serve as the entry point for 8 MoCs, being important in the initial management of LBP patients. These MoCs ensure continuity of care in outpatient physiotherapy clinics and community care settings, where patients receive the main health interventions. SCOPiC(59–61), Low Back and Radicular Pain Pathway(44,45,47–49) and BAC(55) also include other settings, such as interface, secondary and tertiary care services. MATCH(36,62), TARGET(37–39) and BetterBack☺(40–43) were exclusively implemented in primary healthcare clinics featuring onsite physiotherapy departments.

The health professionals who most commonly deliver care in MoCs are general practitioners and physiotherapists. General practitioners are primarily involved in the initial assessment and referral of patients receiving health services, whereas physiotherapists oversee the rehabilitation process. Four models also include osteopaths, chiropractors, and acupuncturists(44,45,50–52), depending on the integration of these professionals within the specific healthcare system of each country. MoCs that incorporate more than one level of care(44,45,53–55,59–61) comprise consultations of medical specialties with surgeons and rheumatologists. Four MoCs(44,45,47–49,52–54,59–61) also include

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advanced practice clinicians, usually physiotherapists specialised in triage processes and identification and management of red flags and emergency conditions.

Type of Care

The majority of MoCs (n=7) use a stratified care approach, targeting health intervention to patients' subgroups based on their prognostic profile and/or pattern diagnosis. Less treatment is given to those who are at low risk or whose signs and symptoms are less severe, while high-risk patients receive more specialised treatment or are referred to secondary care. The only MoC that is characterised by a stepped approach is the BAC(55), being essentially a health service dedicated to the screening and referral of LBP patients.

Hybrid care, combining stratified and stepped approaches, was identified in four MoCs. BetterBack☺(40–43) and Low Back and Radicular Pain Pathway(44,45,47–49) stratify patients based on clinical prognosis. If there are no improvements after the main health intervention, patients are referred to additional group care in BetterBack☺(40–43) and to Pain Management Services and specialist spinal surgical options in the Low Back and Radicular Pain Pathway(44,45,47–49). In BBPS(50) and North East Essex PCT service(51), the stepped care occurs first through education sessions and usual general practitioner care, respectively. Patients are stratified a posteriori based on their treatment preferences, such as care provided by physiotherapists, osteopaths or chiropractors. Figure 3 and Table 2 summarise the type of care provided in each MoC.

[Please insert Figure 3 – Sunburst chart representing the different approaches of care delivered by the MoCs]

Core Components of MoCs

To facilitate the reporting, core components were separated into five moments, which correspond to Referral, Assessment, Health Interventions, Follow-ups and Discharge. These elements are presented in Supplementary File 5.

Referral and Assessment

As aforementioned, the initial consultation with a general practitioner is an entry point on the pathway in all MoCs. In 3 MoCs(34,35,40–45), self-referral through direct access to services is possible, as well as referral by other health professionals (MATCH, TARGET and ISAEC). Surgeons are the main referrers in SSP(53,54) and BAC(55).

The assessment of LBP patients concerns mainly the exclusion of red flags, physical assessment and stratification. Physiotherapists are the most common health professionals (n=9) to carry out the assessment, followed by the GP and triage specialists. The only model that does not carry out an

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assessment before an intervention is the BBPS(50), which is only performed after a group education session.

Health Interventions

Education (n=10), exercise (n=9) and manual therapy (n=7) were the key core elements of MoCs reported by most studies. With the exception of North East Essex PCT service(51) and BAC(55), all MoCs included at least a minimal education intervention, focusing on the reassurance about the benign nature of LBP and self-management strategies. These messages were communicated directly by the health professionals or through support tools, such as written information, DVDs and online content.

In MoCs that include a stratified approach, patients receive appropriate matched treatments, with different doses of education, exercise and manual therapy, according to their prognosis, pattern diagnosis or treatment preference. More complex interventions, such as interventions for high-risk patients(34–41,43,45,46,48,56–58,60,62) and community-based spinal rehabilitation programmes(44,45,47–49,55), combine physical and psychological therapies, adding cognitive-behavioural approaches and support for long-term self-management. However, these are poorly described in the included studies.

The majority of MoCs include a health intervention that may vary from a single session (for low-risk patients in stratified approaches according to prognosis profile) to several weeks of multifaceted rehabilitation programmes. However, not all models establish a specific duration for these interventions. Individualised treatments are the chosen format for healthcare delivery in most MoCs, except for Irish STarT Back(57). Group interventions appear to be a second treatment option in BetterBack☺(40–43) and Low Back and Radicular Pain Pathway(44,45,47–49), when the main health intervention did not result in benefits for LBP patients.

Other interventions, such pain medication prescription or review, were usually delivered by GP or other medical doctor in the initial consultation (STarT Back, TARGET, Low Back and Radicular Pain Pathway and SSP). None of the MoCs included occupational interventions or treatments focused on the adoption of healthy lifestyles.

Follow-up and Discharge

Follow-up management and criteria for discharge were not well-defined in the included studies. When there are no improvements in the health condition, follow-ups may combine referral to additional group interventions, interface or secondary/tertiary care services. Irish(57) and Danish(58) STarT Back, TARGET(37–39) and BBPS(55) did not report how and when follow-ups are conducted.

Concerning discharges, it seems they occur at the end of health interventions, but the reporting is not clear. In risk-stratified models, such as STarT Back, patients attend a pre-set number of appointments to receive treatments. However, it is poorly described if patients are discharged after this period, with 6 MoCs not mentioning any criteria or timing. In TARGET(37–39), Low Back and Radicular Pain

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Pathway(44,45,47–49) and North East Essex PCT service(51) patients can be discharged at any point along the pathway upon improvement of the LBP.

DISCUSSION

This study mapped the available evidence regarding the core characteristics and key elements of MoCs implemented in primary healthcare for the management of LBP. Eleven MoCs were found, all of them implemented in high-income countries with strong primary healthcare services, where general practitioners and physiotherapists serve as the main referrers. The majority of MoCs involve complex interventions delivered by physiotherapists, showing great variability in the reporting of core components, including unclear duration, follow-up and discharge criteria.

Firstly, MoCs for LBP are in various stages of research and integration into health systems. While the Low Back Pain and Radicular Pain Pathway(44,45) is implemented nationwide, other MoCs are in trial phases regionally or locally. This reflects a growing emphasis on adopting MoCs for LBP, recognised for their potential to enhance care quality through evidence-based practices(63). However, given the inconsistent outcomes observed with these MoCs, they are not yet suitable for implementation beyond research environments.

Recent studies show that LBP patients receiving treatments aligned with guidelines see better clinical outcomes and less healthcare usage(64). Although the reviewed MoCs align with these guidelines, only BetterBack☺(40–43,65) has been assessed for its adherence to quality standards in care delivery. The reports suggest guideline-compliant designs, yet often lack detail on ensuring intended delivery of interventions. The gap between research findings and practical application in clinical settings remains(9,66), as the current evidence does not fully explore this transition. Future research should more thoroughly document care delivery assessment and monitoring processes.

Ten MoCs included stratified care approaches. Considering the successful implementation of the STarT Back(34) in UK on clinical and cost-effectiveness(34,35,46,56), adaptations of this MoC were developed to other countries. Recently, a systematic review found that a stratified care approach provides substantial clinical, economic and health related cost benefits in the medium and high-risk subgroups compared with usual care in short- and medium-term follow-ups(67). This may explain why MoCs tend to follow a stratified or hybrid approach to deliver care using the STarT Back Screening Tool. However, evidence shows that some adaptations of the MoC in other countries, such as in the USA, failed to show its clinical effectiveness. Moreover, despite there is no current evidence favouring stratified over stepped approaches for LBP management, the stepped care has demonstrated efficacy for other musculoskeletal conditions, such as osteoarthritis(25). The development of future MoCs may involve research on stepped care solutions as both strategies are endorsed by guidelines for treating LBP(11,13,68,69).

This review found that many MoCs for managing LBP align with recommended practices, emphasising primary and community care as initial contact points(22) involving specialised health professionals, and focusing on education and exercise interventions(8,11–14). However, there was significant variability in

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how health interventions were reported over time, with many studies lacking detailed documentation on follow-up procedures, discharge criteria, and specialised interventions across care levels. Accurate and detailed reporting of these interventions is essential for their replication and adaptation, critical for successful implementation in clinical settings.

MoCs aim to streamline and enhance healthcare efficiency through effective coordination across care sectors. Such coordination is key to delivering integrated, patient-centred care(17,22). Despite this emphasis, our review found that only a four(36–38,45,47,48,60,61) of the 11 MoCs provided clear details on achieving this coordination, often only mentioning clinical pathways and electronic health records. This gap suggests a potential underprioritisation of or challenges in implementing effective care integration, echoing broader findings of limited care integration for LBP patients between primary and secondary settings(27,70). Future research should focus on detailing strategies to improve healthcare provider collaboration, shared decision-making, and treatment plan adjustments to foster better care integration(71).

This review intended to inform clinicians and decision-makers on the current stage of MoCs implementation worldwide. We intend to continue this reflection through the synthesis of context-specific factors and outcomes used to evaluate the implementation of MoCs for LBP in primary healthcare. A subsequent paper will provide a comprehensive understanding of how implementation processes and strategies may have influenced outcomes.

Strengths and Limitations

The major strength include adherence to JBI recommendations(28,29,32), ensuring a robust and systematic methodology, right from protocol design to the presentation of results. Critical aspects such as the development of the search strategy, screening of records by two independent reviewers, and regular team discussions during data extraction and analysis were conducted under this guidance. However, the study also faced challenges such as potential evidence selection bias due to search strategies and language restrictions, possibly excluding some pertinent studies on MoCs. Variations in MoC terminologies in literature, the inclusive definition of MoC, and the ambiguity between specific evidence-based interventions and MoCs posed additional issues. Despite a focus on LBP-related MoCs, other relevant studies concerning spinal disorders may have been missed. To mitigate these issues, a broad and sensitive search strategy, an overinclusion approach during screening, several adjustments to the extraction form and regular reviewer discussions were employed. Yet, the diversity in MoC reporting possibly led to the omission of certain information, even though specific frameworks and a continuously adapted data form were utilised to tackle this challenge.

Implications

Throughout this process, it became evident that most of the MoCs implemented for LBP in primary healthcare are still under investigation and require further testing to produce robust estimates on their effectiveness, as well as guidance for optimal implementation. Future research should focus on

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effectiveness-implementation studies with pragmatic designs to reproduce the challenges of implementing MoCs in real-world clinical settings, such as integration across care sectors and differences in funding models, context features and teams of healthcare providers(70).

Additionally, in line with the recommendations for conducting scoping reviews(28,29), a quality or risk of bias assessment was not performed in this study. Systematic reviews and meta-analyses are needed to assess the methodological quality of the studies and provide stronger conclusions on their findings. This knowledge may contribute to inform health policies, interventions and infrastructures favouring the implementation of a MoC that promote the delivery of high-quality care for LBP patients in the most efficient and sustainable way for health systems.

Finally, this scoping review sheds light on features shared by MoCs for LBP, offering a detailed insight into their foundations, content and resource requirements. However, the heterogeneity in reporting reveals the need for guidelines on the development and implementation of MoCs. This guidance will facilitate their transferability and adaptation to primary healthcare settings.

CONCLUSION

This study provides a broad overview of the key common elements of eleven MoCs implemented for LBP patients in primary healthcare worldwide. These MoCs are aligned with clinical practice guideline recommendations. Primary healthcare is the entry point for patients into the health system and they are offered stratified care approaches, based on education, exercise and manual therapy. More complex interventions or referral to secondary and tertiary care are feasible options when first approaches fail. However, most studies were very heterogeneous in reporting care coordination and its delivery over time. Additionally, most MoCs are not integrated into health systems and are still in the early stages of research. These findings highlight the need for guidelines to support the research, development and implementation of MoCs in real-world settings.

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Ethics Approval: As this study involve a secondary analysis of previously published data, ethical approval is not required.

Author contributions: STD, EBC, PA and DC conceived the study. HD supported the formulation of search strategies and the literature search. Title and abstract screening were performed by STD and DC. Full-text screening and data extraction was carried out by STD and AM with the support of DC to solve

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disagreements. Data analysis was performed by STD and discussed with EBC, PA and BH throughout the process. STD drafted this manuscript. All authors revised and approved the final version of the manuscript.

Data sharing: Not applicable as no datasets were generated for this study. All relevant data were included in the article or as supplementary file. Additional data are not available.

Figure 1. PRISMA flow diagram showing the identification, screening, eligibility and inclusion process of the articles.

Figure 2. Geographical representation of the MoCs (n=11) implemented for LBP in primary healthcare worldwide.

Figure 3. Sunburst chart representing the different approaches of care delivered by the MoCs.

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Table 1. MoCs identification and corresponding studies

MoC designation	Country	Study	Objective	Type of study
START BACK Subgroups for Targeted Treatment	UK	Hill et al. (2011)(34)	To compare the clinical effectiveness and cost-effectiveness of stratified primary care with non-stratified current best practice (STarT Back trial)	RCT
		Whitehurst et al. (2012)(35)	To determine the economic implications of providing stratified care compared with non-stratified current best practice for each specific risk-defined subgroup (STarT Back trial)	RCT (cost-utility)
		Foster et al. (2014)(46)	To determine the effects of implementing risk-stratified in family practice on physician's clinical behaviour, patient outcomes and costs (IMPaCT Back trial)	Observational cohort, before-after
		Whitehurst et al. (2015)(56)	To explore the cost-utility of implementing stratified care in general practice, compared with usual care, within risk-defined patient subgroups (IMPaCT Back trial)	RCT (cost-utility)
	Ireland	Murphy et al. (2016)(57)	To explore the effectiveness of group-based (high-risk group) stratified care in primary care	Nonrandomised controlled trial
	Denmark	Morsø et al. (2021)(58)	To evaluate the clinical efficacy and cost-effectiveness of stratified care compared with current practice in Danish primary care	RCT
SCOPiC SCiatica Outcomes in Primary Care	UK	Saunders et al. (2020)(59)	To explore patients' and clinicians' perspectives on the acceptability of the 'fast-track' pathway	Qualitative
		Konstantinou et al. (2020)(60)	To investigate the clinical and cost-effectiveness of stratified care versus non-stratified usual care for patients presenting with sciatica in primary care	RCT
		Foster et al. (2020)(61)	To compare the clinical effectiveness and cost-effectiveness of the SCOPiC care versus non-SCOPiC care in primary care	Mixed methods
MATCH Matching Appropriate Treatment to Consumers' Healthcare needs	USA	Cherkin et al. (2018)(62)	To evaluate the effect of implementing an adaptation of the STarT Back strategy in a US primary care setting	Cluster RCT
		Hsu et al. (2019)(36)	To describe the implementation strategies and uptake of an intervention that incorporated the STarT Back stratified care model into several primary care clinics	Qualitative
TARGET Targeted Interventions to Prevent Chronic Low Back Pain in High-Risk Patients	USA	Beneciuk et al. (2019)(37)	To describe the training developed and delivered to prepare PTs for providing treatment in the TARGET trial	Qualitative
		Middleton et al. (2020)(38)	To examine variation in risk stratification and referral of high-risk patients to psychologically informed physical therapy; and to identify barriers and facilitators related to the risk stratification and referral processes.	Mixed methods
		Delitto et al. (2021)(39)	To test if implementation of a risk-stratified approach to care would result in lower rates of chronic LBP and improved self-reported disability; and if the stratified approach supplemented with referral to PIPT is superior to stratified care alone	Cluster RCT
BETTERBACK☺ Model of Care	Sweden	Schröder et al. (2020)(40)	To evaluate PTs´ confidence, attitudes and beliefs in managing patients before and after a multifaceted implementation of the BetterBack☺ and to evaluate determinants of implementation behaviours among PTs	Observational cohort, before-after
		Enthoven et al. (2021)(41)	To describe patient experiences of received primary care according to the BetterBack☺ in primary care	Qualitative
		Schröder et al. (2021)(42)	To evaluate the effectiveness and a sustained multifaceted implementation strategy of the BetterBack☺ compared to routine PT care; To compare patient outcomes based on the fidelity of clinical practice quality index adherence regarding PT care.	Cluster RCT
		Schröder et al. (2022)(43)	To evaluate if PT' adherence to clinical practice guideline recommendations improves after a multifaceted implementation of the BetterBack☺	Cluster RCT
Low Back and Radicular Pain	UK (National)	Greenough (2017)(44)	To produce and use a generic pathway for the management of LBP and radicular pain in adults, from the general practitioner's surgery to specialised care	Report (grey literature)

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Pathway		Ryan et al. (2020)(45)	To explore how people experience being managed for sciatica within a National Health Service pathway	Qualitative
	UK (North)	Martin et al. (2018)(47)	To evaluate what changes are seen in patient outcomes and experiences, and in the performance of the health service following the implementation of the pathway	Mixed methods (grey literature)
	UK (North East)	Jess et al. (2018)(48)	To investigate the association between the duration of pain at baseline and the clinical outcomes of patients with LBP enrolled on NERBPP	Observational cohort
		Jess et al. (2021)(49)	To evaluate the association between baseline pain duration and medium-to-long term clinical outcomes in LBP patients enrolled on the NERBPP	Observational cohort
Beating Back Pain Service (BBPS)	UK	Cheshire et al. (2013)(50)	To report patient outcomes and experiences of the BBPS	Mixed methods
North East Essex Primary Care Trust manual therapy service	UK	Gurden et al. (2012)(51)	To describe and evaluate a community-based musculoskeletal service in terms of patient-reported outcomes and satisfaction	Observational cohort
Inter-professional Spine Assessment and Education Clinics (ISAEC)	Canada	Zarrabian et al. (2017)(52)	To determine the effect of ISAEC on access for surgical assessment, referral appropriateness and efficiency for patients meeting a priori referral criteria in rural, urban and metropolitan settings	Observational cohort
Saskatchewan Spine Pathway (SSP)	Canada	Kindrachuk & Fourney (2014)(53)	To determine how the SSP pathway affects utilisation of MRI and spine surgery	Retrospective study, registry-based
		Wilgenbusch et al. (2014)(54)	To determine if outpatient referrals through a multidisciplinary spine care pathway were more likely to be candidates for surgery than conventional physician referrals; to compare clinical differences wait times for magnetic resonance imaging and surgical assessment.	Retrospective study, registry-based
Back Pain Assessment Clinic (BAC)	Australia	Moi et al. (2018)(55)	To report on the design, implementation and evaluation of the safety and effectiveness of the BAC model	Observational cohort pilot study

Abbreviatures:
BAC – Back pain Assessment Clinic; BBPS – Beating Back Pain Service (BBPS); ISAEC – Inter-professional Spine Assessment and Education Clinics; LBP – Low Back Pain; MoC – Model of Care; MRI – Magnetic Resonance Imaging; NERBPP – North East Low Back and Radicular Pain Pathway; PTs – Physiotherapists; RCT – Randomised controlled trial; SCOPiC - Sciatica Outcomes in Primary Care; SSP – Saskatchewan Spine Pathway;

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716 **Table 2. General characteristics of the MoCs**

MoC	Study	MoC Goals	Population	Type of care	Settings	Health professionals	Context
START BACK	STarT Back (34,35)	Implement stratified care; Promote EBP and/or guideline-concordant care; Improve care effectiveness; Reduce costs; Optimise referral behaviour for care and/or imaging	LBP, radiculopathy	Stratified (by prognosis)	PHC (general practices and PT-led back pain clinic)	GPs, nurses and PTs	NHS (Primary Care Trusts); General practices within the Keele GP Research Partnership (network of practices); Clinical manifestation of the guidelines of the Royal College of General Practitioners (1996), Working Group on Guidelines for the Management of Acute LBP in Primary Care (2006) and Arthritis and Musculoskeletal Alliance (2004).
	IMPaCT Back (46,56)				PHC (general practices and community-based PT practices)	GPs and PTs	NHS (Primary Care Trusts); Clinical manifestation of the NICE guidelines (2009)
	Ireland (57)	Implement stratified care; Improve care effectiveness; Promote EBP and/or guideline-concordant care; Reduce healthcare resources use	LBP, radicular pain	Stratified (by prognosis)	PHC (PT-led spinal triage clinic - Back Pain Clinic)	GPs and PTs	NHS (Waterford City Primary Care); Clinical manifestation of the NICE guidelines for LBP (2009)
	Denmark (58)	Implement stratified care; Improve care effectiveness; Promote EBP and/or guideline-concordant care; Reduce costs; Optimise referral behaviour for care and/or imaging	LBP, radicular pain	Stratified (by prognosis)	PHC (general practices and PT clinics)	GPs and PTs	PHC from different geographical areas of the Regions of Southern and Central Denmark.
SCOPiC	(59–61)	Reduce wait times for imaging and/or specialist review; Promote EBP and/or guideline-concordant care; Improve care effectiveness; Implement stratified care	LBP, radicular pain (suspected sciatica)	Stratified (by prognosis and pattern diagnosis)	PHC (general practices, community PT services), primary/secondary care interface services and secondary care	GPs, PTs, spinal specialist PTs and spinal surgeons	NHS (Trusts); General practices localised in a mix of urban, inner city, semi-rural and rural areas; Spinal specialist services include specialist clinics at the primary/secondary care interface, spinal orthopaedic and pain clinic teams (treatments offered are part of NHS care).
MATCH	(36,62)	Implement stratified care; Improve care effectiveness; Reduce healthcare utilisation; Optimise referral behaviour for care and/or imaging	LBP	Stratified (by prognosis)	PHC (clinics with onsite PT departments)	Medical doctors, physician assistants/ nurse practitioners and PTs	Integrated healthcare delivery system (Group Health); Adaptation of the STarT Back approach: major differences concern the delivery of care, which follows the Group Health treatment guidelines.
TARGET	(37–39)	Implement stratified care; Improve care effectiveness; Reduce healthcare resources use; Optimise referral behaviour for care and/or imaging	LBP	Stratified (by prognosis)	PHC (clinics)	PHC physicians and PTs	Five health care systems (University of Pittsburgh Medical Center, Boston Medical Center, Johns Hopkins Medicine, Intermountain Health, Medical University of South Carolina) - network of PHC clinics in both urban and rural environments; MoC directed to manage high-risk patients (according to SBST stratification).
BETTERBACK®	(40–43)	Promote EBP and/or guideline-concordant care; Improve care effectiveness; Promote integrated care	LBP, radiculopathy	Hybrid - Stratified/ stepped	PHC (PT clinics)	PTs	Adaptation of best practice clinical guidelines. developed by the Danish Health and Medicines Authority (2016) and the English NICE (2016) to the Swedish context

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Low Back and Radicular Pain Pathway	National (44,45)	Improve care effectiveness; Promote timely and/or equitable access to care; Promote EBP and/or guideline-concordant care; Promote integrated care; Reduce wait times for care, imaging and/or specialist review; Optimise referral behaviour for care and/or imaging	LBP, radicular pain	Hybrid – Stratified/ stepped	PHC, Community Services, Secondary Care and Specialist Pain Management Services	GPs, PTs, chiropractors, osteopaths, pharmacists, TTPs, specialist spinal surgeon, multidisciplinary staffing	NHS; The implementation of the National Pathway is a decision of the Clinical Commissioning Groups, considering services and provision within their commissioning area; TTPs play a core role in the pathway.
	North(47)			Not reported	PHC (outpatient PT service)	GPs and TTPs (specialised nurses and PTs)	NHS (Community Trust); Part of the national pathway (UK Low Back and Radicular Pain Pathway); Clinical manifestation of the NICE guidelines for LBP (2009)
	North East (48,49)			Hybrid – Stratified/ stepped	PHC, primary/secondary care interface services and secondary care		Clinical manifestation of the NICE guidelines for LBP (2009)
Beating Back Pain Service	(50)	Promote EBP and/or guideline-concordant care; Reduce wait times for care, imaging and/or specialist review	LBP	Hybrid - Stepped/ Stratified (by patient preference)	PHC and community care	GPs, occupational therapists, acupuncturists, psychotherapists	NHS (Primary Care Trust); Clinical manifestation of the NICE guidelines for LBP (2009)
North East Essex PCT service	(51)	Improve care effectiveness; Promote timely and/or equitable access to care; Reduce wait times for care, imaging and/or specialist review; Optimise referral behaviour for care and/or imaging; Reduce healthcare resources use	Back or neck pain	Hybrid - Stepped/ Stratified (by patient preference)	PHC and community care (chiropractic, osteopathic and PT clinics)	GPs, chiropractors, osteopaths and PTs	NHS (North East Essex Primary Care Trust); Clinical manifestation of the NICE guidelines for LBP (2009)
ISAEC	(52)	Promote EBP and/or guideline-concordant care; Reduce wait times for care, imaging and/or specialist review; Optimise referral behaviour for care and/or imaging; Promote integrated care	LBP	Stratified (by pattern diagnosis)	PHC and ISAEC clinics	Doctors, nurse practitioners, PTs, chiropractors, surgeons, pain specialists and rheumatologists	Funded by the Ontario Ministry of Health and Long-Term Care to enable shared-care management of LBP; Implemented in rural, urban and metropolitan settings.
Saskatchewan Spine Pathway	(53,54)	Promote EBP and/or guideline-concordant care; Promote integrated care; Improve care effectiveness and efficiency; Reduce variations in practice patterns; Reduce wait times for care, imaging and/or specialist review; Optimise referral behaviour for care and/or imaging	LBP, radicular pain	Stratified (by pattern diagnosis)	PHC and SSP clinics	Physicians, spine surgeons and specialised PTs	Pathway developed by spine surgeons; It uses a multidisciplinary triage process and treatment algorithms based on the SSP classification; The SSP classification defines 4 clinical patterns of symptoms and signs determined by history and physical examination.
Back pain Assessment Clinic	(55)	Promote EBP and/or guideline-concordant care; Promote integrated care; Optimise referral behaviour for care and/or imaging; Reduce wait times for care, imaging and/or specialist review	LBP or neck pain	Stepped	PHC, tertiary neurosurgery and orthopaedic referral centre	Practice PTs, rheumatology registrars, rheumatologists, neurosurgeons, orthopaedic spinal surgeons	BAC is a community-based specialist service for assessing and managing neck and LBP; Pathway developed by health professionals of the Royal Melbourne Hospital (RMH), which serves as a tertiary neurosurgery and orthopaedic referral centre; Rheumatologist coordinate BAC care.

Abbreviatures: BAC – Back pain Assessment Clinic; EBP – Evidence-Based Practice; GPs – General Practitioner; ISAEC – Inter-professional Spine Assessment and Education Clinics; LBP – Low Back Pain; MoC – Model of Care; NERBPP – North East Low Back and Radicular Pain Pathway; NICE - National Institute of Health and Care Excellence; NHS – National Health System; PHC – Primary Healthcare; PT – Physiotherapy; PTs – Physiotherapists; SSP – Saskatchewan Spine Pathway; TTPs - Triage and Treat practitioners;

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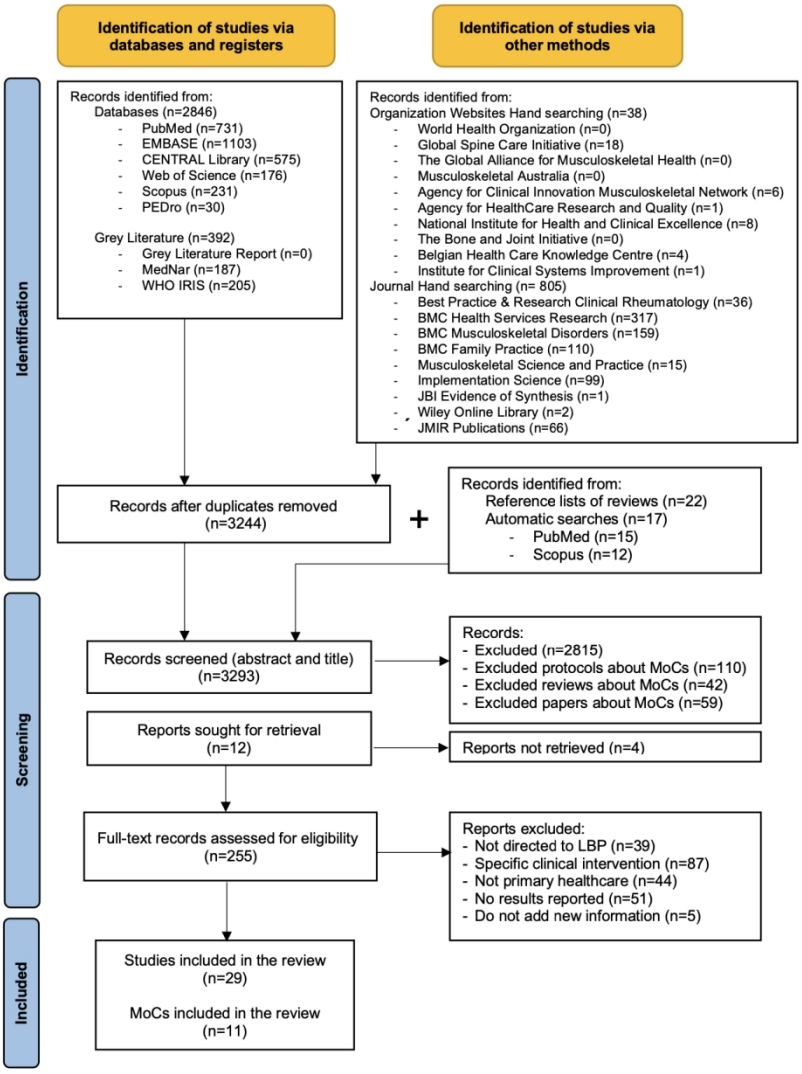

Figure 1. PRISMA flow diagram showing the identification, screening, eligibility and inclusion process of the articles.

133x144mm (300 x 300 DPI)

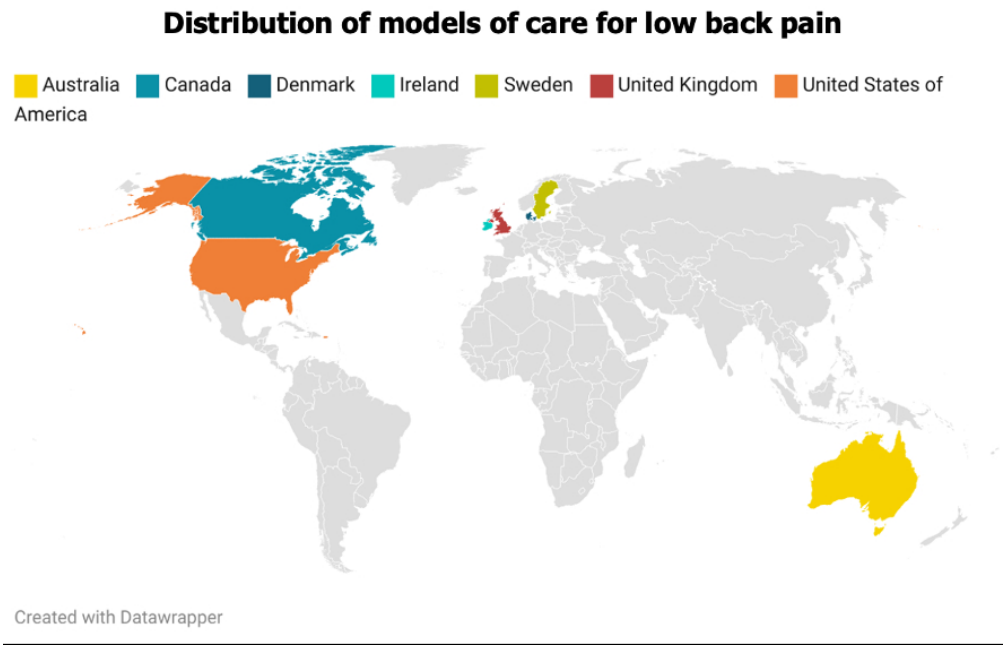

Figure 2. Geographical representation of the MoCs implemented for LBP in primary healthcare worldwide

47x30mm (472 x 472 DPI)

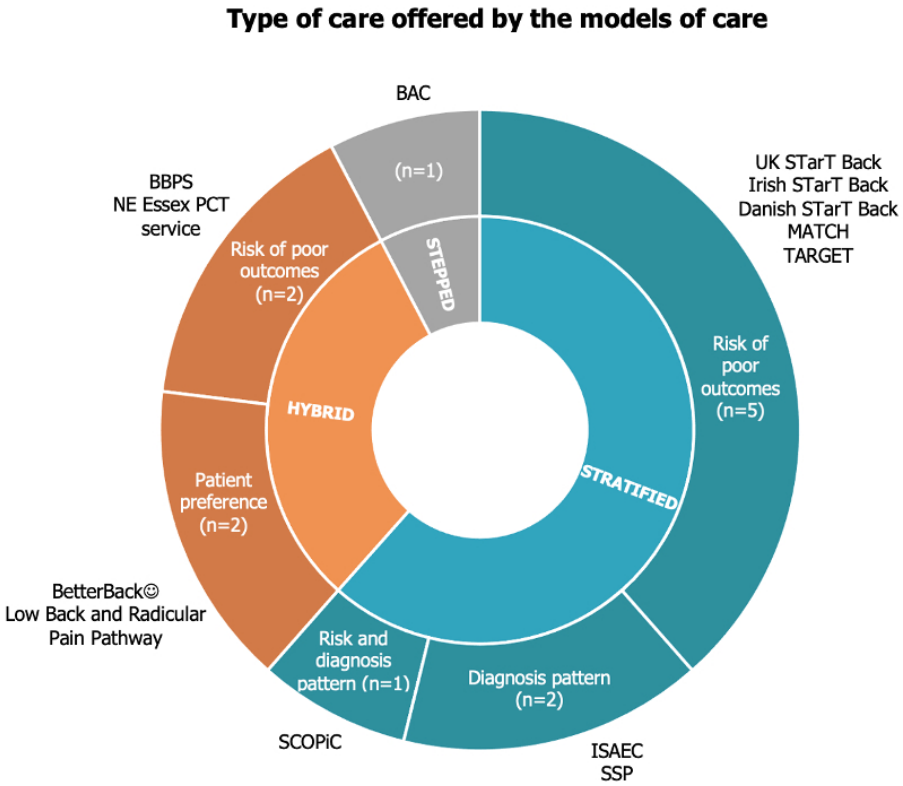

Figure 3. Sunburst chart representing the different approaches of care delivered by the MoCs implemented for LBP in primary healthcare

47x38mm (472 x 472 DPI)

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
TITLE			
Title	1	Identify the report as a scoping review.	Title page – page 1
ABSTRACT			
Structured summary	2	Provide a structured summary that includes (as applicable): background, objectives, eligibility criteria, sources of evidence, charting methods, results, and conclusions that relate to the review questions and objectives.	Abstract – page 2
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known. Explain why the review questions/objectives lend themselves to a scoping review approach.	Pages 4 and 5
Objectives	4	Provide an explicit statement of the questions and objectives being addressed with reference to their key elements (e.g., population or participants, concepts, and context) or other relevant key elements used to conceptualize the review questions and/or objectives.	Research question and aims – Page 6 line 161
METHODS			
Protocol and registration	5	Indicate whether a review protocol exists; state if and where it can be accessed (e.g., a Web address); and if available, provide registration information, including the registration number.	Page 5 line 152
Eligibility criteria	6	Specify characteristics of the sources of evidence used as eligibility criteria (e.g., years considered, language, and publication status), and provide a rationale.	Inclusion criteria and Search Strategy (page 6)
Information sources*	7	Describe all information sources in the search (e.g., databases with dates of coverage and contact with authors to identify additional sources), as well as the date the most recent search was executed.	Search strategy (page 6)
Search	8	Present the full electronic search strategy for at least 1 database, including any limits used, such that it could be repeated.	Supplementary File 2
Selection of sources of evidence†	9	State the process for selecting sources of evidence (i.e., screening and eligibility) included in the scoping review.	Study selection (page 6 and 7)
Data charting process‡	10	Describe the methods of charting data from the included sources of evidence (e.g., calibrated forms or forms that have been tested by the team before their use, and whether data charting was done independently or in duplicate) and	Data charting (page 7); Additional File 3

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SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
		any processes for obtaining and confirming data from investigators.	
Data items	11	List and define all variables for which data were sought and any assumptions and simplifications made.	Data charting (page 7); Additional File 3
Critical appraisal of individual sources of evidence	12	If done, provide a rationale for conducting a critical appraisal of included sources of evidence; describe the methods used and how this information was used in any data synthesis (if appropriate).	Not applicable
Synthesis of results	13	Describe the methods of handling and summarizing the data that were charted.	Synthesis and presentation of results (page 7)
RESULTS			
Selection of sources of evidence	14	Give numbers of sources of evidence screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally using a flow diagram.	Literature search (page 7); Figure 1
Characteristics of sources of evidence	15	For each source of evidence, present characteristics for which data were charted and provide the citations.	Page 8; Table 1
Critical appraisal within sources of evidence	16	If done, present data on critical appraisal of included sources of evidence (see item 12).	Not applicable
Results of individual sources of evidence	17	For each included source of evidence, present the relevant data that were charted that relate to the review questions and objectives.	Pages 8 to 12
Synthesis of results	18	Summarize and/or present the charting results as they relate to the review questions and objectives.	Pages 8 to 12
DISCUSSION			
Summary of evidence	19	Summarize the main results (including an overview of concepts, themes, and types of evidence available), link to the review questions and objectives, and consider the relevance to key groups.	Page 12 - First paragraph
Limitations	20	Discuss the limitations of the scoping review process.	Page 13
Conclusions	21	Provide a general interpretation of the results with respect to the review questions and objectives, as well as potential implications and/or next steps.	Page 14
FUNDING			
Funding	22	Describe sources of funding for the included sources of evidence, as well as sources of funding for the scoping review. Describe the role of the funders of the scoping review.	Page 14

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MEDLINE (Pubmed) – January 13th, 2022

Search	Query	Records retrieved
#1	((“back pain” [MesH]) OR (“back pain” [tiab]) OR (“low-back pain” [MesH]) OR (“low back pain” [tiab]) OR (“sciatica” [MesH]) OR (“sciatica neuropathy” [MesH]) OR (“sciatica” [tiab]) OR (“backache” [tiab]) OR (“back ache” [tiab]) OR (“lumb* pain” [tiab]) OR (“lumbago” [tiab]) OR (“spinal pain” [tiab]) OR (“spondylosis” [tiab]) OR (“back disorder” [tiab]))	91 347
#2	((“Models, Organizational”[MesH]) OR ((theor*[tiab] OR concept*[tiab] OR framework*[tiab] OR model*[tiab] OR program*[tiab] OR approach*[tiab])) **AND** ((“critical pathways”[MeSH] OR “model of care”[tiab] OR “care model”[tiab] OR “functional integration”[tiab] OR “clinical integration”[tiab] OR “case management”[MeSH] OR “delivery of health care, integrated”[MeSH] OR “disease management”[MeSH] OR “patient care management”[MeSH] OR “patient-centered care”[MeSH] OR “continuity of patient care”[MeSH] OR “comprehensive health care”[MeSH] OR “managed care program*”[tiab] OR “multidisciplinary care”[tiab] OR “interdisciplinary care”[tiab] OR “inter-disciplinary care”[tiab] OR “cross disciplinary care”[tiab] OR “cross-disciplinary care”[tiab] OR “multiple interventions”[tiab] OR “care chain”[tiab] OR “care chains”[tiab] OR “care continuity”[tiab] OR “care continuation”[tiab] OR “care transition*”[tiab] OR “chain of care”[tiab] OR “continuity of care”[tiab] OR “cross sectoral care”[tiab] OR “integrated health care”[tiab] OR “integrated medicine”[tiab] OR “integrated social network*”[tiab] OR “integration of care”[tiab] OR “intersectoral care”[tiab] OR “linked care”[tiab] OR “management model”[tiab] OR “service network*”[tiab] OR “transition of care”[tiab] OR “transitional care”[tiab] OR “transmural care”[tiab] OR “holistic care”[tiab])))	384 556
#3	("primary health care"[MeSH] OR (("primary"[tiab] AND "health"[tiab]) AND "care"[tiab])) OR ("primary health care"[tiab] OR ("primary"[tiab] AND "care"[tiab]) OR "primary care”[tiab])) **OR** (("general practice"[MeSH] OR ("general"[tiab] AND "practice"[tiab]) OR "general practice"[tiab])) OR ("general"[tiab] AND "medicine"[tiab]) OR "general medicine”[tiab]) **OR** ("family practice"[MeSH] OR ("family"[tiab] AND "practice"[tiab]) OR "family practice"[tiab])) OR ("family"[tiab] AND "medicine"[tiab])) OR "family medicine”[tiab]) **OR** (("primaries"[tiab] OR "primary"[tiab]) AND "servic*"[tiab])	597 247
#4	#1 AND #2 AND #3	854
Limited to: since 2000, English, Portuguese and Spanish		731

EMBASE – December 3rd 2022

Search	Query	Records retrieved
#1	('backache'/exp OR 'sciatica'/exp OR 'spondylosis'/exp) AND ('nonbiological model'/exp OR 'disease management'/exp OR 'holistic care'/exp OR 'patient care'/exp OR 'transitional care'/exp OR 'interdisciplinary care'/exp OR 'case management'/exp OR 'multidisciplinary care'/exp OR 'disease management program'/exp) AND ('primary health care'/exp OR 'general practice'/exp) AND ([english]/lim OR [portuguese]/lim OR [spanish]/lim) AND [2000-2022]/py AND ([article]/lim OR [article in press]/lim OR [data papers]/lim OR [editorial]/lim OR [erratum]/lim OR [letter]/lim OR [note]/lim OR [review]/lim OR [short survey]/lim OR [preprint]/lim) **OR**	1103

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	('back pain' OR 'low-back pain' OR 'low back pain' OR 'sciatica neuropathy' OR 'sciatica' OR 'backache' OR 'back ache' OR 'lumb* pain' OR 'lumbago' OR 'spinal pain' OR 'spondylosis' OR 'back disorder') **AND** ('models,organizational' OR theor* OR concept* OR framework* OR model* OR progra m* OR approach*) AND ('critical pathways' OR 'model of care' OR 'care model' OR 'functional integration' OR 'clinical integration' OR 'case management' OR 'delivery of health care, integrated' OR 'disease management' OR 'patient care management' OR 'patient-centered care' OR 'continuity of patient care' OR 'comprehensive health care' OR 'managed care program*' OR 'multidisciplinary care' OR 'interdisciplinary care' OR 'inter-disciplinary care' OR 'cross disciplinary care' OR 'cross-disciplinary care' OR 'multiple interventions' OR 'care chain' OR 'care chains' OR 'care continuity' OR 'care continuation' OR 'care transition*' OR 'chain of care' OR 'continuity of care' OR 'cross sectoral care' OR 'integrated health care' OR 'integrated medicine' OR 'integrated social network*' OR 'integration of care' OR 'intersectoral care' OR 'linked care' OR 'management model' OR 'service network*' OR 'transition of care' OR 'transitional care' OR 'transmural care' OR 'holistic care') **AND** (((((primary AND health AND care OR primary) AND care OR general) AND practice OR general) AND medicine OR family) AND practice OR family) AND medicine **AND** [2000-2022]/py AND ([english]/lim OR [portuguese]/lim OR [spanish]/lim)

Cochrane Central Register of Controlled Trials (CENTRAL) – December 3rd 2022

Search	Query	Records retrieved
#1	MeSH low back pain - explode all	4317
#2	MeSH back pain - explode all	5503
#3	MeSH lumbosacral region - explode all	513
#4	(back pain):ti,ab OR (low-back pain):ti,ab OR (low back pain):ti,ab OR sciatica:ti,ab OR (sciatic neuropathy):ti,ab OR backache:ti,ab OR (back ache):ti,ab OR (lumbar pain):ti,ab OR lumbago:ti,ab OR (spinal pain):ti,ab OR spondylosis:ti,ab OR (back disorder):ti,ab	28822
#5	{OR #1-#4}	**29452**
#6	MeSH models, organizational - explode all	180
#7	(theor*):ti,ab OR (concept*):ti,ab OR (framework*):ti,ab OR (model*):ti,ab OR (approach*):ti,ab	238742
#8	#6 OR #7	**238768**
#9	MeSH critical pathways – explode all	205
#10	MeSH case management – explode all	718
#11	MeSH delivery of health care - explode all	48924
#12	MeSH disease management - explode all	5229
#13	MeSH patient care management - explode all	26892
#14	MeSH patient-centered care - explode all	818
#15	MeSH continuity of patient care - explode all	27999
#16	MeSH comprehensive health care - explode all	11355
#17	{OR #9-#16}	**84746**
#18	(model of care):ti,ab OR (care model):ti,ab OR (multidisciplinary care):ti,ab OR (interdisciplinary care):ti,ab OR (inter-disciplinary care):ti,ab OR (cross disciplinary care):ti,ab OR (cross-disciplinary care):ti,ab OR (multiple interventions):ti,ab OR (care chain):ti,ab OR (care continuity):ti,ab OR (care continuation):ti,ab OR (care transition):ti,ab OR (chain* of care):ti,ab OR (continuity of care):ti,ab OR (cross sectoral care):ti,ab OR (integrated health care):ti,ab OR (integrated medicine):ti,ab OR (integrated social network):ti,ab OR (integration of care):ti,ab OR (intersectoral care):ti,ab OR (linked care):ti,ab OR (management model):ti,ab OR (service network) OR (transition of care):ti,ab OR (transitional care):ti,ab OR (transmural care):ti,ab OR (holistic care):ti,ab OR (functional integration):ti,ab OR (clinical integration):ti,ab OR (managed care program):ti,ab	48372

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#19	#6 OR (#7 AND (#17 OR #18))	**107093**
#20	MeSH primary health care - explode all	8157
#21	MeSH general practice - explode all	2494
#22	MeSH family practice - explode all	1980
#23	(primary health care):ti,ab OR (primary healthcare):ti,ab OR (primary care):ti,ab OR (general practice):ti,ab OR (general medicine):ti,ab OR (family practice):ti,ab OR (family medicine):ti,ab OR (primar* AND servic*):ti,ab	10793
#24	{OR #20-#23}	**110252**
#25	#5 AND #19 AND #24	590
Limits to: Jan 2000 – Dec 2022		**575**

PEDro – December 2nd 2022

Search	Query	Records retrieved
#1	Abstract & Title= (primary care model of care) Problem= (pain) Body Part= (lumbar spine, sacro-iliac joint or pelvis) Subdiscipline= (musculoskeletal) Method= (clinical trial) Published since=2000 When Searching: Match all search terms (AND)	30

SCOPUS – December 3rd 2022

Search	Query	Records retrieved
#1	TITLE-ABS-KEY(("back pain") OR ("back pain") OR ("low-back pain") OR ("low back pain") OR ("sciatica") OR ("sciatic neuropathy") OR ("sciatica") OR ("backache") OR ("back ache") OR ("lumbar pain") OR ("lumbago") OR ("spinal pain") OR ("spondylosis") OR ("back disorder")) AND TITLE-ABS-KEY(("model W/2 care" OR "care model") OR ((theor* OR concept* OR framework* OR model* OR program* OR approach*) AND ("critical path*" OR "care path*" OR "clinical path*" OR (delivery W/2 care) OR "functional integration" OR "clinical integration" OR "case management" OR "managed care" OR "Patient care plan" OR "integrated delivery system*" OR "integrated care" OR "disease N2 management" OR "care management" OR "care management" OR (comprehensive W/2 care) OR (comprehensive W/2 health*care) OR "Patient*Cent*red Care" OR "Patient Focused Care" OR (continuity W/2 care) OR (continuity W/2 *care) OR (continuum W/2 care) OR (multidisciplinary W/2 care) OR (inter*disciplinary W/2 care) OR ("cross*disciplinary" W/2 care) OR "multiple intervention" OR (care W/2 chain*) OR (care W/2 continuity) OR (care W/2 continuation) OR (*care W/2 transition) OR (chain AND w/2*care) OR (continuity W/2 care) OR "cross sectoral care" OR "integrated medicine" OR "integrated social network" OR (integrat* W/2 care) OR "intersectoral care" OR "linked care" OR (management W/2 model) OR (servic* W/2 network*) OR (transition W/2 care) OR (transitional W/2 care) OR (transmural W/2 care) OR (holistic W/2 care)))) AND TITLE-ABS-KEY((primary AND n3 AND care) OR "primary care" OR "primary health*care" OR "general practice" OR "general medicine" OR "family practice" OR "family medicine" OR (("primaries" OR "primary") AND (service* OR servicing))) Limited to: since 2000, English, Portuguese and Spanish	231

Web of Science Core Collection – December 3rd 2022

Search	Query	Records retrieved
#1	((“back pain”) OR (“back pain”) OR (“low-back pain”) OR (“low back pain”) OR (“sciatica”) OR (“sciatica neuropathy”) OR (“sciatica”) OR (“backache”) OR (“back	176

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	ache") OR ("lumb* pain") OR ("lumbago") OR ("spinal pain") OR ("spondylosis") OR ("back disorder")) (Topic) AND (("Models, Organizational") OR ((theor* OR concept* OR framework* OR model* OR program* OR approach*)) AND (("critical pathways" OR "model of care" OR "care model" OR "functional integration" OR "clinical integration" OR "case management" OR "delivery of health care, integrated" OR "disease management" OR "patient care management" OR "patient-centered care" OR "continuity of patient care" OR "comprehensive health care" OR "managed care program*" OR "multidisciplinary care" OR "interdisciplinary care" OR "inter-disciplinary care" OR "cross disciplinary care" OR "cross-disciplinary care" OR "multiple interventions" OR "care chain" OR "care chains" OR "care continuity" OR "care continuation" OR "care transition*" OR "chain of care" OR "continuity of care" OR "cross sectoral care" OR "integrated health care" OR "integrated medicine" OR "integrated social network*" OR "integration of care" OR "intersectoral care" OR "linked care" OR "management model" OR "service network*" OR "transition of care" OR "transitional care" OR "transmural care" OR "holistic care"))) (Topic) AND primary health care OR primary healthcare OR primary care OR general practice OR general medicine OR family practice OR family medicine (Topic)

Grey Literature Report – December 2nd 2022

Search	Query	Records retrieved
#1	("back pain" OR "low back pain" OR "sciatica" OR "lumbago" OR "backache") AND ("model of care" OR "care model" OR "clinical pathway" OR "care pathway" OR "service delivery" OR "integrated care" OR "care management" OR "comprehensive care" OR "care chain") AND ("Primary care" OR "primary healthcare" OR "primary health care" OR "general practice" OR "general medicine" OR "primary service" OR "family practice")	0

MedNar Search Engine – December 2nd 2022

Search	Query	Records retrieved
#1	("back pain" OR "low back pain" OR "sciatica" OR "lumbago" OR "backache") AND ("model of care" OR "care model" OR "clinical pathway" OR "care pathway" OR "service delivery" OR "integrated care" OR "care management" OR "comprehensive care" OR "care chain") AND ("Primary care" OR "primary healthcare" OR "primary health care" OR "general practice" OR "general medicine" OR "primary service" OR "family practice") / From: 2000 / To: 2022	187

World Health Organization Institutional Repository for Information Sharing (WHO-IRIS) – December 2nd 2022

Search	Query	Records retrieved
#1	("model of care" OR "care model" OR "clinical pathway" OR "care pathway" OR "service delivery" OR "integrated care" OR "care management" OR "comprehensive care" OR "care chain") AND ("Primary care" OR "primary healthcare" OR "primary health care" OR "general practice" OR "general medicine" OR "primary service" OR "family practice") AND ("back pain" OR "low back pain" OR "sciatica" OR "lumbago" OR "backache") / Date: 2000 - 2022	205

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SUMMARY OF THE PAPER	
Title	
Authors	
Year of publication	
Source of information *(Peer review or grey literature)*	
Study design *(Define intervention vs control group, if applicable)*	
Objectives	
Population *(Include inclusion and exclusion criteria)*	
Sample size *(Intervention vs control group, if applicable)*	
IDENTIFICATION OF THE MoC	
Name or Acronym *(if applicable)*	
Country	
Other references *(Protocol, other studies, if applicable)*	
Goals of the MoC	
Funding *(How the MoC is funded and how is it sustained at long-term)*	E.g., research funding or funding at a system level
CORE COMPONENTS OF THE MoC[1–3]	
Underlying theories, models or frameworks[2] **Process models/frameworks**	**Process models/frameworks** *(e.g., CIHR Model of Knowledge Translation, ACE Star Model of Knowledge Transformation, Knowledge-to-Action Model, Ottawa Model, Quality Implementation Framework).*

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Definition: Describe or guide the process of translating research into practice, including the implementation and use of research. Provide practical guidance in the planning and execution of implementation endeavors and/or implementation strategies to facilitate implementation. **Determinant frameworks** *Definition: Frameworks that identify determinants, which act as barriers and enablers (independent variables) that influence implementation outcomes (dependent variables), such as predicting outcomes or interpreting outcomes retrospectively. Some frameworks also specify relationships between some types of determinants.* **Classic theories** *Definition: Theories that originate from fields external to implementation science, such as psychology, sociology and organizational theory, which can be applied to provide understanding and/or explanation of aspects of implementation.* **Implementation theories/frameworks** *Definition: Theories/frameworks that have been developed by implementation researchers to provide understanding and/or explanation of aspects of implementation.* **Evaluation frameworks** *Definition: Identify aspects of implementation that could be evaluated to determine implementation success.*	**Determinant frameworks, classic theories or implementation frameworks** *Definition: Understand and explain what influences implementation outcomes.* • **Determinant frameworks** *(e.g., Theoretical Domains Framework, PARIHS, CFIR, Active Implementation Framework, Understanding-User-Context Framework).* • **Classic theories** *(e.g., Theory of Diffusion, social cognitive theories, theories concerning cognitive processes and decision making, social networks theories, communities of practice, professional theories, organizational theories).* • **Implementation theories/frameworks** *(e.g., COM-B, Implementation Climate, Absorptive Capacity, Organizational Readiness, Normalization Process Theory)* **Evaluation frameworks** *(e.g., RE-AIM, PRECEDE-PROCEED, framework by Proctor et al.)*
Setting *(Describe the settings where assessment/care/other is provided)*	E.g., Assessment – Primary care; Delivery of care – private outpatient clinic
Care pathway *(Summary description of the care pathway)*	E.g., Community pharmacist consultation [evaluation, education and medication review] – GP referral and PT referral – PT guided exercise program (only if approved by the GP), re-assessed in 3-6 weeks
Characteristics of the intervention	E.g., Education + exercise: two patient education sessions and a supervised exercise program twice a week for 6 weeks in a group setting.

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(Describe the interventions - what care is provided, by who and for how long)	Education: encourage the patients to actively engage in the management of LBP – group sessions – first about LBP, treatment options (including exercise). Exercise: 6 weeks, twice a week of supervised, targeted and individualized exercise in a group setting; home exercises were encouraged as individuals developed quality movement and participants were encouraged to increase their engagement in enjoyable physical activities.
Care Coordination[3] *Definition: Care coordination is the deliberate organization of patient care activities between two or more participants (including the patient) involved in a patient's care to facilitate the appropriate delivery of health care services. Organizing care involves the marshalling of personnel and other resources needed to carry out all required patient care activities, and is often managed by the exchange of information among participants responsible for different aspects of care.*	**Health professionals involved** **Care Coordination** *(Summary description of who is involved in providing care and how care is coordinated)* **Exchange of clinical information** *(e.g., tools to record clinical data, meetings, case manager)*
IMPLEMENTATION STRATEGY	
Duration	
Implementation Strategies[4] *Definition: methods or techniques used to enhance the adoption, implementation, and sustainability of a clinical program or practice*	
Workforce capacity *(Description of the training for health professionals, staff or other team members)*	
Barriers and Facilitators to Implementation	
CONTEXT SPECIFIC COMPONENTS OF THE MoC(5,6)	
Micro/Patient level factors *Patients' preferences, expectancies, attitudes, knowledge, needs and resources that can influence implementation; specific geographic areas with different access to health services, sub-populations with special socio-demographic and clinical characteristics.*	
Meso/Organizational level factors **Organizational culture and climate**	

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Shared visions, norms, values, assumptions and expectations in an organization that can influence implementation (i.e., organizational culture) and surface perceptions and attitudes concerning the observable, surface-level aspects of culture (i.e. climate). **Organizational readiness to change** *Influences on implementation related to an organization's tension, commitment or preparation to implement change, the presence of a receptive or absorptive context for change, the organization's prioritization of implementing change, the organization's efficacy or ability to implement change, practicality and the organization's flexibility and innovativeness.* **Organizational Support** *Various forms of support that can influence implementation, including administration, planning and organization of work, availability of staff, staff workload, staff training, material resources, information and decision-support systems, consultant support and structures for learning.* **Organizational structures** *Influences on implementation related to structural characteristics of the organization in which implementation occurs, including size, complexity, specialization, differentiation and decentralization of the organization.*	
Macro/External level factors *Exogeneous influences on implementation in health care organizations, including policies, guidelines, research findings, evidence, regulation, legislation, mandates, directives, recommendations, political stability, public reporting, benchmarking and organizational networks.*	
Multiple level factors **Social relations and support** *Interpersonal processes, including communication, collaboration and learning in groups, teams and networks, visions, conformity, identity and norms in groups, opinion of colleagues, homophily (tendency of individuals to associate and bond with similar others) and alienation.*	

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Financial resources *Funding, reimbursement, incentives, rewards, costs and other economic factors that can influence implementation.* **Leadership** *Influences on implementation related to formal and informal leaders, including managers, key individuals, change agents, opinion leaders, champions, etc.* **Time availability** *Time restrictions that can influence implementation.* **Feedback** *Evaluation, assessment and various forms of mechanisms that can monitor and feedback results concerning the implementation, which can influence implementation.* **Physical environment** *Features of the physical environment that can influence implementation (e.g., equipment, facilities and supplies).*		
OUTCOMES(1,7) **AND RESULTS**		
Patient level outcomes *Definition: impact of the model of care on patients (e.g., pain, function or quality of life, satisfaction, collected with self-reported questionnaires or interview questionnaires or performance measures, at baseline and 3-month follow-up)*	**Outcomes** **Outcome measures** **Follow-ups**	**Results**
Organizational level outcomes *Definition: impact on health services, providers or on health-system (e.g., rate of referral or prescription for exercise, rate of prescribed exams, healthcare costs, waiting times – collected with administrative/clinical databases, quality indicators, questionnaires or interviews with providers)*	**Outcomes** **Outcome measures** **Follow-ups**	**Results**
Implementation level outcomes *Definition: Effects of deliberate and purposive actions to implement new treatments, practices, and services. Implementation outcomes serve as indicators of the implementation success and are key intermediate outcomes in relation to service system or clinical outcomes in treatment*	**Outcomes** **Outcome measures** **Follow-ups**	**Results**

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effectiveness and quality of care research – Acceptability; Adoption; Appropriateness; Costs; Feasibility; Fidelity; Penetration; Sustainability		

References

1. Briggs AM, Jordan JE, Jennings M, Speerin R, Chua J, Bragge P, et al. A Framework to Evaluate Musculoskeletal Models of Care [Internet]. Cornwall, UK; 2016.
2. Nilsen P. Making sense of implementation theories, models and frameworks. Implement Sci. 2015;10(1):1–13. doi: 10.1186/s13012-015-0242-0
3. Schultz EM, McDonald KM. What is care coordination? Int J Care Coord [Internet]. 2014;17(1–2):5–24.
4. Powell BJ, Waltz TJ, Chinman MJ, Damschroder LJ, Smith JL, Matthieu MM, et al. A refined compilation of implementation strategies: Results from the Expert Recommendations for Implementing Change (ERIC) project. Implement Sci [Internet]. 2015;10(1):1–14.
5. Nilsen P, Bernhardsson S. Context matters in implementation science: A scoping review of determinant frameworks that describe contextual determinants for implementation outcomes. BMC Health Serv Res [Internet]. 2019;19(1):1–21.
6. Lau R, Stevenson F, Ong BN, Dziedzic K, Treweek S, Eldridge S, et al. Achieving change in primary care-causes of the evidence to practice gap: Systematic reviews of reviews. Implement Sci. 2016;11(1). doi: 10.1186/s13012-016-0396-4
7. Proctor E, Silmere H, Raghavan R, Hovmand P, Aarons G, Bunger A, et al. Outcomes for implementation research: Conceptual distinctions, measurement challenges, and research agenda. Adm Policy Ment Heal Ment Heal Serv Res [Internet]. 2011;38(2):65–76.

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Additional File 4 – Description of the included studies

MoC design ation	Study	Population	Sample Size	Outcome Domains (Follow-ups)	Outcomes (outcome measures)
START BACK – Subgroups for Targeted Treatment	Hill et al. (2011)(1)	- Inclusion: LBP of any duration, ≥18 years-old, with or without radiculopathy. - Exclusion: serious illness or spinal pathology, serious comorbidity (including mental disorders), surgery in the last 6 months, pregnancy, currently receiving back treatment.	N=851 patients - Intervention: n=568 - Control: n=283	Patient (4 and 12 mo)	**4 and 12 months** - Primary outcome: Disability [Roland Morris Disability Questionnaire (RMDQ)] at 12 months; Back pain intensity (NRS); Catastrophizing [Pain Catastrophizing Scale (PCS)]; Fear-avoidance beliefs [Tampa Scale of Kinesiophobia (TSK)]; Anxiety and depression [Hospital Anxiety and Depression Scale (HADS)]; Health-related quality of life [EuroQol EQ-5D; Short Form 12 (SF-12)]; Risk subgroup reduction [STarT Back Screening Tool (SBST)]; Global change (single question); Adverse events **12 Months** - Work loss (one question)
				Organizational (4 and 12 mo)	**Process of care [Case Report Forms (CRFs)]** - Referral for further PT; Number of PT sessions; Attendance at initial PT **4 months** - Patient satisfaction (self-reported questionnaire) **12 months** - Healthcare resource use (self-reported questionnaire); cost-utility (QALYs estimates using the EuroQol EQ-5D)
	Whitehurst et al. (2012)(2)			Patient (4 and 12 mo)	**4 and 12 months** - Health-related quality of life [EQ-5D] **12 months** - Work-related outcomes - Employment status (self-reported questionnaire)
				Organizational (4 and 12 mo)	**12 months** - Number of PT sessions (CRF); Healthcare resource use (self-reported questionnaire) – PHC consultations (GPs and practice nurses), consultations with other healthcare professionals (NHS and private), hospital-based procedures (diagnostic tests, epidural injections, inpatient episodes) and prescribed medication; Healthcare costs - Out of pocket expenditures on treatments and/or aids (self-reported questionnaire) and QALYs estimates (EuroQol EQ-5D)
	Foster et al. (2014)(3)	- Inclusion: ≥18 years-old, LBP patients of any duration, with or without leg pain, identified through diagnostic codes.	N=922 patients - Phase 1 (usual care): n=368 - Phase 3 (stratified care): n=554	Patient (2 and 6 mo)	**2 and 6 months** - Primary outcome: Disability (RMDQ) at 6 months; Back pain intensity (NRS); Catastrophizing [Coping Strategies Questionnaire – Catastrophizing subscale (CSQ-CAT)]; Pain self-efficacy [Pain Self-efficacy Questionnaire (PSEQ)]; Health-related quality of life (SF-12); Global change (single question) **6 months** - Fear-avoidance beliefs (TSK); Anxiety and depression (HADS); Pain self-efficacy (PSEQ); Risk group (STarT Back Screening Tool); Work loss (one question); Adverse events
				Organizational (2 and 6 mo)	**Process of care (medical records and CRF)** - Numbers of referrals to PT or other services; Ordered diagnostic tests (radiographs, magnetic resonance Imaging and computed tomography scans, blood tests); Prescribed medications; Reconsultations with the physician; Sickness certifications; Risk-appropriate use of PT (CRF). **2 and 6 months** - Patient satisfaction (self-reported questionnaire) **6 months** - Healthcare resource use (self-reported questionnaire) – Inpatient stays, outpatient visits, other health care appointments including those in private practice and over-the-counter medications and treatments; Healthcare costs (QALYs estimates)

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	Whitehurst et al. (2015)(4)			Patient (2 and 6 mo)	**2 and 6 months** - Disability (RMDQ); Health-related quality of life (EQ-5D-3L) **6 Months** - Work-related – Employment status (self-reported questionnaire) and work loss (self-reported questionnaire)
				Organizational (2 and 6 mo)	**6 months** - Healthcare resource use (self-reported questionnaire) – PHC consultations (GPs and practice nurses), consultations with other healthcare professionals (NHS and private), hospital-based procedures (diagnostic tests, epidural injections, inpatient episodes), prescribed medication and out of pocket expenditure on treatments and/or aids; Cost-utility (QALYs estimates using the EQ-5D-3L).
	Murphy et al. (2016)(5)	- Inclusion: ≥18 years old, LBP > 3 months, with or without leg symptoms. - Exclusion: serious illness or spinal pathology, surgery, pregnancy.	N=583 - Intervention: n=251 - Control: n=332	Patient (3 mo)	**3 months** - Primary outcome: Disability (RMDQ); LBP intensity [Visual Analog Scale (VAS)]; Back beliefs [Back Beliefs Questionnaire (BBQ)]; Distress [Distress and Risk Assessment Method (DRAM)]; Depression (Modified Zung Depression Index); Anxiety [Modified Somatic Perception Questionnaire (MSPQ)]; Benefit (6-point self-rated scale).
	Morsø et al. (2021)(6)	- Inclusion: ≥18 years, non-specific LBP of any duration, with or without leg pain, referred to PT by the GP. - Exclusion: serious illness or spinal pathology, psychiatric illness, spinal surgery in the last 6 months, pregnancy, currently receiving PT.	N=333 - Intervention: n=169 - Control: n=164	Patient (3 and 12 mo)	**3 and 12 months** - Primary outcome: Disability (RMDQ); Primary outcome: Time off work (days/weeks) [patient self-report and Danish National Register of Public Transfer Payments (DREAM)]; Primary outcome: Patient reported global change (7-point Likert scale); Pain intensity (NRS); Well-being [World Health Organization Well-Being Index (WHO5)]
				Organizational (3 and 12 mo)	**3 and 12 months** - Satisfaction with improvement (single-item rating) **12 months** - Healthcare resource use (Danish Nationwide Patient Registry - DNPR) – Number of PT sessions, PHC consultations, secondary care (imaging and other contacts) and medication; Healthcare costs use (Danish Nationwide Patient Registry - DNPR) – PHC consultations, secondary care (imaging and other contacts), medication and total costs; QALYs estimates (EQ-5D-5L).
SCOPiC – SCiatica Outcomes in Primary Care	Konstantinou et al. (2020)(7)	- Inclusion: ≥18 years, with mobile phone or landline, consulted in GP with back and/or leg symptoms, with diagnosis of sciatica confirmed with at least 70% diagnostic confidence by a PT. - Exclusion: serious spinal pathology or red flags, previous lumbar spine surgery, receiving ongoing care from or had been in consultation with a secondary care doctor or PT for the same problem in the previous 3 months, serious physical or mental comorbidities, pregnancy, taking part simultaneously in another study related to sciatica.	RCT: N=476 - Intervention: n=238 - Control: n=238 Qualitative study: N=40 - 20 patients - 7 spinal PTs - 9 GPs - 4 spinal surgeons	Patient (Weekly for the first 4 mo, 4 and 12 mo)	**Weekly for the first 4 months, 4 weeks between 4 and 12 months, or until "stable resolution" of symptoms** - Primary outcome: time to first resolution of sciatica symptoms (6-point ordinal scale) **4 and 12 months** - Global Perceived Change (6-point ordinal scale); Physical Function (Modified RMDQ); Impact of sciatica symptoms [Sciatica Bothersomeness Index (SBI)]; Back and leg pain intensity (NRS); Sleep disturbance [Jenkins Sleep Questionnaire (JSQ)]; Fear of movement (TSK); Anxiety and depression (HADS); Health-related quality of life (EQ-5D-5L); General health [Short-form 1 (SF1)]; Neuropathic pain symptoms [Self-report Leeds Assessment of Neuropathic Symptoms and Signs (S-LANSS)]; Work and productivity loss (self-reported questionnaire); Serious adverse events.
				Organizational (4 and 12 mo)	**12 months** - Healthcare resource use (self-reported questionnaire and medical records) – Number of PT sessions, duration of PT treatments, timing of referral and treatment, spinal injections and spinal surgery; Healthcare costs (self-reported questionnaire and medical records) – Total costs and QALYs estimates (EQ-5D-5L)
	Fost			Patient	**Weekly for the first 4 months, 4 weeks between 4 and 12 months, or until "stable resolution" of symptoms**

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				(Weekly for the first 4 mo, 4 and 12 mo)	- Primary outcome: time to first resolution of sciatica symptoms (6-point ordinal scale) **4 and 12 months** - Global Perceived Change (6-point ordinal scale); Physical Function (Modified RMDQ); Impact of sciatica symptoms (SBI); Back and leg pain intensity (NRS); Sleep disturbance (JSQ); Fear of movement (TSK); Anxiety and depression (HADS); Risk of poor outcome (SBST); Health-related quality of life (EQ-5D-5L); General health (SF1); Neuropathic pain symptoms (S-LANSS); Employment status (self-reported questionnaire); Work loss (self-reported questionnaire); Presenteeism/productivity [single question with NRS response (0–10 scale); Work Production Index]; Adverse events
				Organizational (4 and 12 mo)	**Process of care (CRFs)** - Number of referrals to PT services; Number of PT sessions; Number of referrals to specialist spinal services and/or secondary care; Treatments provided; Timing of referral and treatment **4 and 12 months** - Patient satisfaction (5-point scale) **12 months** - Healthcare resource use (self-reported questionnaire and medical records) – PHC consultations (GPs, nurses and PTs), secondary care consultations, prescriptions, hospital-based tests and procedures, spinal injections and spinal surgery, nature and length of inpatient stays; Healthcare costs (self-reported questionnaire and medical records) – Over-the-counter purchases, out-of-pocket expenses, total costs and QALYs estimates (EQ-5D-5L).
	Saunders et al. (2020)(	- Inclusion: Patients on the 'fast-track' pathway in the stratified care arm of the SCOPiC trial and clinicians		Implementation (4 mo after the follow-up of the RCT and at the end of recruitment)	**4 months after the follow up of the RCT (patients, PTs and surgeons) and at the end of RCT recruitment (GPs)** - Acceptability of the 'fast-track' pathway for patients with severe sciatica symptoms (interviews)
MATCH – Matching Appropriate Treatment to Consumers' Healthcare needs	Cherkin et al. (2018)(10)	- Inclusion: Adults receiving primary care, ≥ 18 years, identified in the EHR with a primary diagnosis of non-specific LBP - Exclusion: Specific causes of pain (e.g., pregnancy, disc herniation, vertebral fracture, spinal stenosis) or job injuries.	N=1901 - Intervention: n=756 - Control: n=945	Patient (2 and 6 mo)	**2 and 6 months** - Primary outcome: Physical function (modified RMDQ); Primary outcome: LBP severity in previous week (NRS); Anxiety [Generalized Anxiety Disorder (GAD-7)]; Depression [Patient Health Questionnaire (PHQ-9)]; Self-efficacy (PSEQ); Fear of movement (TSK); Work loss and productivity [2 items of the Work Productivity and Activity Impairment (WPAI)]; Global improvement [Patient Global Impression of Change (PGIC)]
				Organizational (2 and 6 mo)	**2 and 6 months** - Patient satisfaction (10-item instrument) **6 months** - Healthcare resource use (EHR) – Lumbar spine imaging, additional PHC visits, emergency department visits, narcotic analgesics, PT visits, CAM visits, behavioural health visits, spine surgeon visits, injections of lumbar spine and back-related hospitalizations.
	Hsu et al. (2019)(11)	- Inclusion: PTs and PCPs (medical doctors, osteopathic doctors, nurses, physician assistants)	- Questionnaire: N=402 - Interviews: N=22 (PTs and PCPs)	Implementation (post-training)	**Post-training** - Attendance at training sessions (not reported); Perspectives and experiences regarding implementation strategies and experiences using the stratified care model (Ethnography and interviews with PHC team members and PTs)

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TARGET – Targeted Interventions to Prevent Chronic Low Back Pain in High-Risk Patients	Beneciuk et al. (2019)(12)	- Inclusion: Outpatient PTs	N=471	Implementation (post-training and 4 mo)	**Post-training and 4 months** - PTs' attitudes and beliefs about biomedical and biopsychosocial treatment orientations [Pain Attitudes and Beliefs Scale for Physical Therapists (PABS-PT)] **Post-training** - PTs' confidence in implementing PIPT (11-point Likert scale)
	Middleton et al. (2020)(13)	- Inclusion: Adult primary care patients with evidence of acute LBP management in the EHR.	- Quantitative study: N=23,913 (9030 patients stratified by risk) - Qualitative study: N=13 clinics	Organizational (24 mo)	**24 months** (EHR) - Risk stratification rates; Rates of referral of acute high-risk patients; Relationship between risk stratification and referral rates within clinics
				Implementation (24 mo)	**24 months** (ethnography and interviews with clinical staff) - Barriers and facilitators of the risk stratification and referral processes
	Delitto et al. (2021)(14)	- Inclusion: ≥18 years with a primary complaint of LBP. - Exclusion: Chronic symptoms based on a 2-item LBP Questionnaire derived from the NIH Chronic LBP task force; serious spinal pathology.	N=2300 - Intervention: n=1207 - Control: n=1093	Patient (6 mo)	**6 months** - Primary outcome: transition to chronic LBP [2-item questionnaire adapted from the NIH Task Force]; Primary outcome: back-related disability [Oswestry Disability Index (ODI)]
				Organizational (12 mo)	**12 months** - Process of care (EHR) – Referral to PT or PIPT, referral to medical specialists, diagnostic imaging and orders for opioid prescriptions and other LBP-related pain medications; Healthcare resource use (EHR) – Outpatient visits (PHC and specialists), receipt of diagnostic imaging, interventional pain procedures (e.g., epidural injections), electrodiagnostic tests (e.g., nerve conduction velocity), surgeries, hospitalizations and emergency department visits.
BETTERBACK©	Schröder et al. (2020)(15)	- Inclusion: PTs working with LBP patients who attended the BetterBack© workshop	N=116	Implementation (after, 3 and 12 mo)	**After, 3 and 12 months** - Primary outcome: Self-confidence in managing LBP patients [Practitioner Self-Confidence Scale (PCS)]; Determinants of PT's behaviour [Determinants of Implementation Behaviour Questionnaire (DIBQ)]. **3 and 12 months** - PTs' attitudes and beliefs about biomedical and biopsychosocial treatment orientations (PABS-PT).
	Enthoven et al. (2021)(	- Inclusion: Participants previously treated according to the BetterBack MoC for a first-time or recurrent episode of benign LBP with or without radiculopathy.	N=15	Implementation (4-14 mo)	**4-14 months** - Patients' experiences of receiving care according to the MoC (interviews)
	Schröder et al. (2021)(17)	Patients: - Inclusion: 18–65 years, accessing public primary care due to a first-time or recurrent episode of acute, subacute, or chronic-phase benign LBP, with or without radiculopathy. - Exclusion: current or previous malignancy in the last 5 years, serious spinal pathology, spinal surgery the last 2 years, current or previous pregnancy in the last 3	N=467 - Intervention: n=264 - Control: n=203 PTs: N=104	Patient (3, 6 and 12 mo)	**3, 6 and 12 months** - Primary outcome: Pain intensity (NRS-LBP); Primary outcome: Function and activity limitations (ODI); Risk stratification (SBST); Health-related quality of life (EQ-5D); Cognitive and emotional representations of illness [Brief Illness Perception Questionnaire (BIPQ)]; Ability to understand and cope with LBP [Pain Enablement Instrument (PEI)]; Perceived change (PGIC)
				Organizational (3, 6 and 12 mo)	**Process of care** - Clinical Practice Quality Index – Guideline adherence [(Clinical Reasoning and Process Evaluation tool - CRPE)], number of PT treatments [((Public Healthcare Regional Registry - PHRR)], referral to specialist consultation (PHRR) and medical imaging (PHRR) **3, 6 and 12 months** - Patient satisfaction [Patient Satisfaction (PS)]

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	Schröder et al. (2022)(18)	months, participants who fulfil the criteria for multimodal/multiprofessional rehabilitation for complex long-standing pain and severe psychiatric diagnosis. PTs: - Inclusion: PTs who worked regularly with patients with LBP.	Register cohort - PTs: N=105 - LBP patients: N=500 (intervention n=278; control n=222) CRPE- smaller cohort: - PTs: N=98 (intervention n=44; control n=54) - LBP patients: N=388 (intervention n=223; control n=165)	Organizational	**Process of care** - Adherence to clinical practice guidelines recommendations - Clinical Practice Quality Index (PHRR and CRPE): • Primary outcome: Proportion of patients receiving referral to specialist consultation (PHRR), Proportion of patients receiving medical imaging (PHRR), Proportion of patients receiving stratified number of PT visits (PHRR), Proportion of patients receiving educational interventions (CRPE), Proportion of patients receiving exercise interventions (CRPE), Proportion of patients receiving manual therapy (CRPE), Proportion of patients receiving acupuncture (CRPE) and Proportion of patients receiving non-evidence-based treatments (CRPE).
Low Back and Radicular Pain Pathway	Greenough (2017)(19)	- Inclusion: Patients with LBP with or without leg pain.	Not reported	Patient (discharge)	**Discharge** - Pain intensity (NRS); Disability (ODI); Health-related quality of life (EQ-5D); Anxiety (GAD-7); Depression (PHQ-9); Readiness to self-manage (0–10-point scale).
				Organizational (discharge)	**Process of care** - Percentage of discharges from treatments (pathway database) **Discharge** - Patient satisfaction [Friends and Family Test (FFT)]
	Ryan et al. (2020)(20)	- Inclusion: ≥18 years, with sciatica, who were under the care of a specialist PT, undergone investigations and received the results within the previous 6 weeks. - Exclusion criteria: previous spinal surgery, cauda equina syndrome or sinister pathology, patients unable to communicate or provide consent; or the researcher had treated them in a previous episode of LBP.	N=14	Implementation (6 weeks)	**6 weeks** - Patients' experiences within the NHS pathway (interviews)
	Martin et al. (2018)(21)	- Quantitative study: All patients attending during the evaluation period. No exclusion criteria. - Qualitative study: People engaged in the development, implementation, delivery, or patient of the NERBPP (key decision makers, triage and treat practitioners, healthcare professionals, GPs, patients)	- Quantitative study: N=3834 - Qualitative study: N=35	Patient (Discharge, 6 and 12 mo)	**Discharge, 6 and 12 months** - Pain intensity (NRS); Function (ODI); Health status/quality of life (EQ-5D-5L); Anxiety (GAD-7); Depression (PHQ-9) **Discharge** - Global Subjective Outcome Scale (GSOS); Readiness to self-manage (0–10-point scale)
				Organizational (6 weeks)	**Discharge** - Patient satisfaction (FFT)
				Implementation	**Before, during and after implementation** - Opinions of clinicians, commissioners and patients regarding the implementation of the pathway (interviews and focus groups)
	Jess et al. (2018)(22)	- Inclusion: ≥18 years, patients referred onto the NERBPP by their GP due to acute, new onset, LBP episode or a flare-up of LBP with at least 6 months since their last attack.	N=3834 - Standard discharge: n=2071 - Same-day discharge: n=1147 - Non-Attender: n=616	Patient (discharge)	**Discharge** - Pain intensity (NRS); Functional disability (ODI); Health-related quality of life (EQ-5D-5L); Anxiety (GAD-7); Depression (Patient Health Questionnaire -PHQ-9); Perception of improvement (GSOS); Readiness to self-manage (0–10-point scale).
				Organizational (discharge)	**Discharge** - Patient satisfaction (FFT)
	J e s			Patient	**6 and 12 months**

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			- 6-month follow-up: N=786 - 6-month follow-up: N=552	(6 and 12 mo)	- Pain intensity (NRS); Functional disability (ODI); Health-related quality of life (EQ-5D-5L); Anxiety (GAD-7); Depression (Patient Health Questionnaire -PHQ-9); Perception of improvement (GSOS)
				Organizational (6 and 12 mo)	**6 and 12 months** - Patient satisfaction (FFT)
Beating Back Pain Service	Cheshire et al. (2013)(24)	- Inclusion criteria: non-specific LBP, >6 weeks duration, ≥18 years. - Exclusion: presence of red flags, inability to communicate in English, mental health problems and substance abuse.	N=80	Patient (discharge and 3 mo)	**Discharge and 3 months** - Musculoskeletal pain [Bournemouth Questionnaire (BQ)]; Health-related quality of life (EQ-5D); Self-efficacy (PSEQ); Positive well-being [5 questions on a 0–10-point scale]; Physical activity levels (0–10-point scale); Analgesic use (single question); Work status (single question).
				Implementation (post-treatment)	**Post-treatment** - Benefits, improvements, comments or suggestions regarding the service [open-ended questions at the end of the self-reported questionnaire]
NE Essex PCT service	Gurden et al. (2012)(25)	- Inclusion: Adults, consulting GP for at least 4 weeks for back or neck pain, suitable for manual therapy. - Exclusion: serious pathology or red flags and serious comorbidity.	N=696	Patient (discharge)	**Discharge** - Back and neck pain (BQ); Impact of symptoms (Bothersomeness Questionnaire); Global improvement scale (7-point scale); Work status (self-reported questionnaire); Medication use (self-reported questionnaire)
				Organizational (discharge)	**Discharge** - Patient satisfaction (5-point scale); Healthcare resource use (self-reported questionnaire) – Number of treatments, referrals to secondary care, referrals to GP/other health professionals and discharges.
ISAEC	Zarrabian et al. (2017)(26)	- Inclusion: Potential surgical candidates with unmanageable, persistent LBP for more than 6 weeks but less than 52 weeks or recurrent LBP. - Exclusion criteria: pain disorder, narcotic dependency, pregnancy or postpartum less than a year, red flags.	N=422	Patient (after assessment)	**At the initial assessment and after the surgeons' assessment** - Presenting pain pattern (medical records)
				Organizational (after assessment)	**At the initial assessment and after the surgeons' assessment** - Number and type of imaging (medical records); Referral appropriateness for surgery (medical records); Wait time from PCP referral to assessment at ISAEC (medical records).
Saskatchewan Spine Pathway	Kindrachuk & Fourney (2014)(27)	- Inclusion: Nonemergency referrals of LBP and leg pain. - Exclusion: option of refusing the SSP visit.	N=87 - Group A: n=62 - Group B: n=25	Patient (7 mo)	**7 months (May 2011 – November 2011)** - Disability (ODI); Back and leg pain (VAS); Health-related quality of life (EQ-5D); Presence of clinical "red flags" (not reported); SSP clinical classification (not reported).
				Organizational (7 mo)	**7 months (May 2011 – November 2011)** - Surgery rate (not reported); MRI utilization (not reported).
	Wilgenbusch et al. (2014)(28)	- Inclusion; New elective outpatient surgeon referrals for LBP and leg pain seen by 2 neurosurgeons. - Exclusion: red flags.	N= 215 - Group A: n=66 - Group B: n=149	Patient (12 mo)	**1 year (June 2011 – May 2012)** - Disability (ODI); Back and leg pain (VAS); Number of patients with SSPc patterns; Health-related quality of life (EQ-5D-5L).
				Organizational (12 mo)	**1 year (June 2011 – May 2012)** - Number of referrals to surgery; Wait time for surgeon assessment; Wait time for MRI.
Back pain Assessment Clinic	Moi et al. (2018)(29)	- **Inclusion:** ≥18 years, referrals for neck or LBP, with or without limb symptoms, already on outpatient spinal surgical waiting lists, triaged as 'non-urgent' or assigned a 'next available' appointment by neurosurgery and orthopaedic spinal units. Low likelihood of surgical intervention. - **Exclusion:** red flags, spinal surgery within the last 2 years, radiculopathy	N=522 - Qualitative study: N=94 (Patients n=54; Health professionals and managers n=14; and referrers n=26)	Patient (12 weeks)	**After a 12-week rehabilitation programme** - Pain [Brief Pain Inventory (BPI) short form]; Disability [(ODI) or Neck Disability Index (NDI)]; Overall well-being [Global Improvement Scale].
				Organizational (12 weeks)	**After a 12-week rehabilitation programme** - Patient satisfaction (survey); Waiting times (survey) - time from referral to initial consultation, patients redirected from neurosurgery waiting lists, patients redirected from orthopaedic waiting lists; Appropriate and safe care (survey) – medication adjustments, spinal injections, MRI utilization, referrals to community-based spinal rehabilitation, referrals to specialist services, discharges, GP satisfaction; Efficiency and sustainability (survey) – Costs/patient, cost-savings.
				Implementation	**1 year (July 2014 – June 2015)**

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		accompanied by limb weakness, moderate-to-severe scoliosis, peripheral entrapment neuropathies, high likelihood of need for surgical intervention, comorbidities, referred for medicolegal opinions or compensable claims.		(12 mo)	- Victorian Innovation Reform Impact Assessment Framework domains (BAC activity audit, patient surveys and stakeholders' interviews) – Access to care, Appropriate and safe care, Workforce optimization and integration and Efficiency and sustainability.

Abbreviatures:
BAC – Back pain Assessment Clinic; CAM - Complementary and Alternative Medicine; CRPE - Clinical Reasoning and Process Evaluation; EHR – Electronic Health Record; GP – General Practitioner; ISAEC – Inter-professional Spine Assessment and Education Clinics; LBP – Low Back Pain; MoC – Model of Care; MRI – Magnetic Resonance Imaging; NERBPP – North East Low Back and Radicular Pain Pathway; NHS – National Health System; PCP – Primary Care Provider; PHC – Primary Healthcare; PHRR - Public Healthcare Regional Registry; PIPT - Psychologically Informed Physical Therapy; PT – Physiotherapy; PTs – Physiotherapists; QALYs – quality-adjusted life years; RCT – Randomized controlled trial; SBST – Start Back Screening Tool; SSP – Saskatchewan Spine Pathway;

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Additional File 5 – Core components of the MoCs

MoC	Study	Referral	Assessment	Health Interventions	Follow-up	Discharge
START BACK	(1,2) STarT Back	GP, practice nurse or the local Physiotherapy Direct Access service (Physio Direct) referral to PT	PT assessment and risk stratification (SBST)	PTs deliver risk-matched group care: - All risk groups: Education + booklet The Back Book + video "Get Back Active"; - Low risk: Single session (30 minutes) of minimal intervention (education + advice + reassurance); - Medium risk: 30-minute session of education + standardized PT (exercise + manual therapy); - High risk: Education + PIPT (CBT with traditional PT)	- Patients are advised to access their GP for ongoing care in the usual way or if their condition worsens.	- Low risk: after the initial education session; - Medium risk: after a maximum of 6 sessions; - High risk: after a maximum of 12 sessions.
	(3,4) IMPaCT Back	GPs referral to PT	GP risk stratification (SBST) + PT assessment of medium and high-risk patients	GPs deliver care to: - Low risk: Single session of minimal intervention (education + reassurance + information on self-management). Pain medication if appropriate; PTs deliver risk-matched group care: - Medium risk: education + standardized PT (exercise + manual therapy); - High risk: education + PIPT (CBT with traditional PT)	- If needed, medium and high-risk patients referred for further investigations or secondary care.	- Low risk: after the initial education session; - Medium risk: after a maximum of 6 sessions; - High risk: after a maximum of 12 sessions.
	(5) Ireland	GP or PT team refer to the Back Pain Clinic	PT assessment and risk stratification (SBST)	PTs deliver risk-matched group care: - Low risk: 1.5-hour small group session of education + exercise to promote active self-management; - Medium risk: Four 90-minute group sessions (8-10 patients) of education + generic exercise over 4 weeks; - High risk: Four 120-minute group sessions (4-6 patients) of exercise (as medium risk group) + problem solving approach + CBT to promote self-management	Not reported	- Low risk: after the initial education session; - Medium risk: after 12 weeks; - High risk: after 12 weeks.
	(6) Denmark	GPs referral to PT	GPs assessment + PT assessment and risk stratification (SBST)	PTs deliver risk-matched group care: - All risk groups: Education (education + advice + reassurance + booklet similar to *The Back Book*) - Low-risk: minimal intervention (education + advice + reassurance) - Medium risk: individualized PT treatment + intervention focusing prevention of new LBP episodes - High risk: individualized PIPT (CBT and/or behavioural techniques with traditional PT)	Not reported	Not reported
SCOPiC	(7–9)	GP or other HCP refer to the SCOPiC sciatica clinic	PT assessment and risk stratification (SBST)	PTs deliver risk-matched group care: - Subgroup 1 (low risk): 30-minute sessions (advice + education + self-management support + sciatica booklet) - Subgroup 2 (medium risk with score ≤3 or high risk with score ≤2): one 45-minute session + 30-minute sessions of individualised treatment (advice + reassurance + education + exercise + manual therapy + acupuncture + sciatica booklet) - Subgroup 3 (medium risk with score =4 or high risk with score ≥3): Referral to a fast-track care pathway at the primary/secondary care interface services.	- Subgroups 1 and 2: Patients are able to access other care via their GP. - Subgroup 3: specialist spinal PT assessment + referral to imaging (MRI or alternative) + referral to specialist clinics services (orthopaedics, neurosurgery or pain clinic).	- Subgroup 1: after up to 2 sessions within 4 weeks; - Medium risk: after up to 6 sessions within 6 to 12 weeks; - High risk: not reported

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MATCH	(10,11)	PCPs referral: - Medium risk patients to PT or CAM - High-risk patients to psychologist and PT	PCP assessment and risk stratification (SBST)	PCPs deliver care to: - Low risk: Reassurance + self-management recommendations + online DVDs PTs or CAM professionals deliver care to: - Moderate risk: Self-management recommendations + PT-led exercise and yoga. For patients not interested these treatments, refer to passive options (acupuncture, chiropractic or massage) PTs and psychologists: - High risk: PIPT and CBT (access to CBT is very limited)	Low and medium risk patients: Not reported High-risk patients: Proactive follow-up within 2 weeks by PCPs	Not reported
TARGET	(12–14)	PCPs referral to PIPT	PCP assessment and risk stratification (2-item Chronic Low Back Pain Questionnaire + SBST for patients in acute stage)	- PCPs deliver education and pain medication to high-risk patients - PTs deliver PIPT (cognitive behavioural training, motivational interviewing, pain-coping skills and activity-based treatments that include graded activity and graded exposure)	Not reported.	Not reported. There are no limits placed on the duration of any therapies or treatments.
BETTERBACK©	(15–18)	- Self-referral to the PHC PT rehabilitation clinics - Referral from the PHC general practices	PT assessment and risk stratification (SBST)	PTs deliver treatment matched to functional impairments based on SBST results (BetterBack part 1): - Individualised information + neuromusculoskeletal mobilisation techniques if indicated + exercise + patient education (brochure): - Low-risk: 1-3 sessions - Medium-risk: ≥4 sessions - High-risk: ≥4 sessions with additional training + education with a behavioural approach.	PT assessment and evaluation of treatment outcomes – if needed PT group based-care (BetterBack part 2): - Group-based education: One 90-minute session (2-10 patients) - Group training (6 weeks, 2x/week): graded training of posture, motor control and, if needed, range of movement exercises	Not reported
Low Back and Radicular Pain Pathway	(19,20) National	GP, self-referral to a chiropractor, osteopath or PT and 111 telephone service	GP, chiropractor, osteopath or PT assessment and risk stratification (SBST)	GP, chiropractor, osteopath or PT initial management: - Advice + information + pain medication + PT core therapies (education + manual therapy + exercise) with a 2-week review. - If no improvement, referral to TTP assessment + referral to imaging (if indicated) within 6 weeks.	- If imaging concordant with structural cause of sciatica, referral to epidural injection or surgery (after 8-12 weeks) - If non-concordant structural cause, referral to CPPP (12-18 weeks) - If no improvement, referral to Specialist Pain Management Services (18 weeks) - Pain management programmes (physical, psychological and behavioural interventions)	Patients can be discharged at any point along the pathway upon improvement of the LBP.
	(21) North	GP referral or other first contact professional	GP or other first contact professional assessment and risk stratification (SBST)	GP or other first contact professional initial management: - Advice on self-management or referral to secondary care or referral to TTP - If referral to TTP: assessment + referral to a combination of core therapies (education + manual therapy + exercise) or intensive CPPP (residential programme of intensive exercise + education + support with long-term self-management)	- If not improved, referral for Pain Management Services and specialist spinal surgical options	- After initial management - After treatments: not reported

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	(22,23) North East	GP referral	GP risk stratification (SBST) + referral to TTP	GP deliver care to low-risk patients: - Low risk: advice + education TTP assessment and delivery of risk-matched group care: - Referral to further investigations if necessary; - Moderate to high risk: Core therapies (PT incorporating exercise, manual therapy or acupuncture) or CPPP (100-hour residential, combined physical and psychological therapies program for a small number of patients)	Not reported	- Low-risk patients: after initial consultation
Beating Back Pain Service	(24)	GP, PT or osteopath referral to BBPS	No assessment before group session	GP and occupational therapist deliver care to all patients - 2h group session of education on pain and self-management + BBPS pack (booklet + CD with information and mobility and strength exercises) + SBST assessment + referral to combination of care according to patient preference (individualized combination of acupuncture, self-management groups and/or BBPS packs): - Acupuncture: Up to 6 weekly sessions (30 minutes) of individualized TCM acupuncture treatment; - Self-management groups: group sessions of education on self-management + goal setting + mindfulness + CBT. - BBPS pack	Not reported	Not reported
North East Essex PCT service	(25)	GP referral to the manual therapy service	GP assessment	- GP deliver usual care (advice + reassurance + analgesia) to all patients for 4-6 weeks + referral to chiropractor/osteopath/PT according to patient preference. - Chiropractor/Osteopath/PT care: Up to 6 sessions of manual therapy or additional treatments with GP approval	If no improvements, referral to psychotherapy/CBT or referral to secondary care via GP recommendation (surgical/ radiological/ pain consultant)	- Discharge and referral back to GP after chiropractor/ Osteopath/PT care with a report of recommendations for further management
ISAEC	(26)	PCP referral to ISAEC (could order MRI)	APC evaluation and stratification by pattern diagnosis	APC deliver care according to clinical presentation patterns: - Back dominant pattern (surgery unlikely): APC education and management (Physiatry/pain clinic, counselling, rheumatology, self-management, allied health management) - Leg dominant (surgery likely): referral to spine surgeon (imaging, blocks, surgery, nonoperative)	- Back dominant pattern (surgery unlikely): recommendations communicated to referring PCP. - Leg dominant (surgery likely): APC education and management (Physiatry/pain clinic, counselling, rheumatology, self-management, alliead health management) + recommendations communicated to referring PCP.	Not reported
Saskatchewan Spine Pathway	(27)	Physician referral to SSP clinic	Patients triage into Group A (non-surgical management) or Group B (spine surgeon assessment)	- Group A: education including self-care instruction, medication advice and/or mechanical therapies - Group B – surgical consultation (imaging and surgery)	- Group A: follow-up by the SSP clinic when required	- Group A: Discharge after care delivery - Group B: Not reported
	(28)	- Group A: Referred by neurosurgeons at the SSP clinic	Physicians (at PHC) or specialized PTs (at SSP clinics) assessment	- Group A (SSP clinic): assessment (directly) or reassessment (from PHC referral) of pattern diagnosis + treatment according to SSP classification (pattern diagnosis). If patient improves, continue treatment in PHC.	Group A: If no improvement: - Pattern 1 e 2 – Refer back to PHC with recommendations for additional mechanical treatment and referral to	Not reported

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		- Group B: Referred by physicians at primary care	If red flags present, referral for emergency (imaging + surgery consultation)	- Group B (PHC referral): treatment according to SSP classification in PHC. Treatment according to SSP classification: - Pattern 1, 2 and 4: Reassurance + Advice and Information + Treatment schedule (position, movement, pharmacology and adjunct therapies) - Pattern 3: Similar, but exclude exercise.	surgery if symptoms persist after 6 months; - Pattern 3 – Urgent referral for imaging + surgery consultation if pain persist after 6 weeks; - Pattern 4 – Non-urgent referral for imaging + surgery consultation. Group B (PHC referral): If no improvement, referral to SSP clinic.	
Back pain Assessment Clinic	(29)	GP referral to Royal Melbourne Hospital + Surgeon's referral to BAC	Rheumatologist, neurosurgeon, orthopaedic spinal surgeon or APP (PTs) assessment	If BAC consultation: - Referral to community treatment services (12-week community-based spinal rehabilitation programme seen within 2–4 weeks) - Referral to rheumatology, orthopaedics, neurosurgery or pain services	- Outpatient specialist clinics consultations (Rheumatology, Orthopaedics, Neurosurgery, Pain services)	- To initial referrer after BAC assessment; - After orthopaedics or neurosurgery consultations - After community treatment services: Not reported

Abbreviatures:
APC - Advanced Practice Clinician; APP - Advanced Practice Physiotherapist; BAC – Back pain Assessment Clinic; BBPS – Beating Back Pain Service; CAM - Complementary and Alternative Medicine; CBT – Cognitive Behavioural Techniques; CCCP - Combined Physical and Psychological Therapies program; EBP – Evidence-Based Practice; GPs – General Practitioner; HCP – Health Care Provider; ISAEC – Inter-professional Spine Assessment and Education Clinics; LBP – Low Back Pain; MoC – Model of Care; NERBPP – North East Low Back and Radicular Pain Pathway; PCP – Primary Care Provider; PHC – Primary Healthcare; PIPT - Psychologically Informed Physical Therapy; PT – Physiotherapy; PTs – Physiotherapists; SBST – Start Back Screening Tool; SSP – Saskatchewan Spine Pathway; TCM – Traditional Chinese Medicine; TTPs - Triage and Treat practitioners;

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