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REVIEW ARTICLE

Clinical pathways for the management of low back pain from primary to specialised care: a systematic review

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Abstract

Purpose Clinical pathways for low back pain (LBP) have potential to improve clinical outcomes and health service efficiency. This systematic review aimed to synthesise the evidence for clinical pathways for LBP and/or radicular leg pain from primary to specialised care and to describe key pathway components.

Methods Electronic database searches (CINAHL, MEDLINE, Cochrane Library, EMBASE) from 2006 onwards were conducted with further manual and citation searching. Two independent reviewers conducted eligibility assessment, data extraction and quality appraisal. A narrative synthesis of findings is presented.

Results From 18,443 identified studies, 28 papers met inclusion criteria. Pathways were developed primarily to address overburdened secondary care services in high-income countries and almost universally used interface services with a triage remit at the primary-secondary care boundary. Accordingly, evaluation of healthcare resource use and patient flow predominated, with interface services associated with enhanced service efficiency through decreased wait times and appropriate use of consultant appointments. Low quality study designs, heterogeneous outcomes and insufficient comparative data precluded definitive conclusions regarding clinical- and cost-effectiveness. Pathways demonstrated basic levels of care integration across the primary-secondary care boundary.

Conclusions The limited volume of research evaluating clinical pathways for LBP/radicular leg pain and spanning primary and specialised care predominantly used interface services to ensure appropriate specialised care referrals with associated increased efficiency of care delivery. Pathways demonstrated basic levels of care integration across healthcare boundaries. Well-designed randomised controlled trials to explore the potential of clinical pathways to improve clinical outcomes, deliver cost-effective, guideline-concordant care and enhance care integration are required.

Keywords Back pain · Radicular leg pain · Clinical pathway · Systematic review · Integrated care

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Introduction

Low back pain (LBP) is a leading cause of disability globally [1] and exerts a considerable burden on the individual, healthcare systems and the wider socio-economic milieu. As worldwide health expenditure continues to grow [2], healthcare systems are challenged with containing costs whilst ensuring quality of care. Despite numerous clinical guidelines for LBP that synthesise the best available scientific evidence with generally consistent recommendations, the evidence-practice gap remains. A demedicalised approach that emphasises self-management, physical and psychological therapies in primary or community care settings, with a minority of patients requiring referral to specialised services, where management may include injections or surgery, is generally recognised as optimal [3, 4].

LBP accompanied by radicular leg symptoms is considered to have a favourable natural course, with most people also responding to conservative management in primary care [5]. Despite the consistency of numerous guideline recommendations, implementation remains problematic with many patients receiving guideline discordant care [3, 4]. Clinical pathways have the potential to enhance both quality of care by facilitating translation of research into practice and cost-effectiveness through optimisation of resource use [6]. They are structured multidisciplinary care plans describing essential steps in care provision to patients with a specific condition and endeavour to optimise clinical outcomes and efficiency through linking clinical practice and best evidence [7]. In 2018, the Lancet Low Back Pain Series highlighted clinical pathway redesign from first contact through to specialised care as a potential measure to support healthcare systems and organisations in best-practice implementation with improved outcomes for patients and service providers [3]. Such care integration across the primary-secondary care continuum aims to address care fragmentation, reduce duplication, and improve clinical and cost effectiveness [8].

A previous systematic review completed ten years ago outlined examples of clinical pathways in LBP management and the evidence for their success; pathways that did not include all types of mechanical LBP were excluded and only two studies provided effectiveness data [9]. Given the growth in research regarding LBP clinical pathways and integrated care, a further systematic review is now warranted and will include all studies with outcome data of clinical pathways for LBP and/or radicular leg pain that captured the patient journey from first contact through to specialised care. This review, therefore, aims to: (1) identify and describe pathway components; (2) determine how LBP care is managed and coordinated across different levels and traditional boundaries of healthcare provision; (3) summarise and evaluate the evidence for the identified pathways.

Methodology

This review was reported in accordance with Preferred Reporting Information for Systematic reviews and Meta-Analyses (PRISMA) guidelines [10]. The protocol was prospectively registered in PROSPERO (CRD42021237824). Four databases, CINAHL (via EBSCO), MEDLINE (via Pubmed), Cochrane Library, and EMBASE, were searched to identify all relevant publications between January 2006 and February 2021, a timeframe considered adequate to reflect international LBP guideline publication as circa 15 primary care clinical LBP guidelines were published between 2008 and 2017 [11] and the European Guidelines for the Management of LBP were published in 2006 [12, 13].

The search strategy used three groups of keywords, 'clinical care pathway', 'low back pain' and 'lower limb radicular pain' (Online Resource 1). Additional publications were identified through manual searching of reference lists and electronic searching for citations associated with included studies. Search results were exported to Covidence (systematic review software). All full-text studies published in English pertaining to evaluation of clinical pathways for LBP and/or radicular leg pain for adults ≥ 18 years that address health care provision from first contact in primary care through to specialised care were included. Studies describing more general musculoskeletal pathways were excluded.

Titles and abstracts were considered against inclusion/exclusion criteria by two review authors (CM/CC), followed by full-text screening by two independent review authors (CM and CC/HF). Methodological quality of included studies was independently evaluated by two review authors (CM and CC/HF) using the Effective Public Health Practice Project (EPHPP) Quality Assessment Tool for Quantitative Studies [14] or the Critical Appraisal Skills Programme (CASP) qualitative studies checklist [15]. A bespoke data extraction template was devised by the authors based on identified outcome domains in clinical pathway literature: (1) healthcare resource use, (2) patient flow, (3) clinical outcomes, (4) patient and clinician satisfaction and experience, with an additional section for any outcomes outside of these domains. Data were extracted using this template by one review author (CM) and subsequently verified for accuracy by a second review author (CC/HF). At all stages, between-author discrepancies were resolved initially by discussion, and if required, by consultation with a third author (GM). Extracted data were collated in summary tables to facilitate analysis. A narrative synthesis of findings is presented as meta-analysis was precluded by the heterogeneity of the research.

Results

Literature Search

The PRISMA flow diagram (Fig. 1) shows that initial database searching yielded 18,443 studies, with 13 studies identified through hand and citation searching. Following removal of duplicates and application of inclusion/exclusion criteria, 27 full text published papers and one service evaluation report were included in the final analysis. Three publications related to the same research study [16–18], including a Health Technology Assessment (HTA) report [16], RCT [17] and a qualitative study [18].

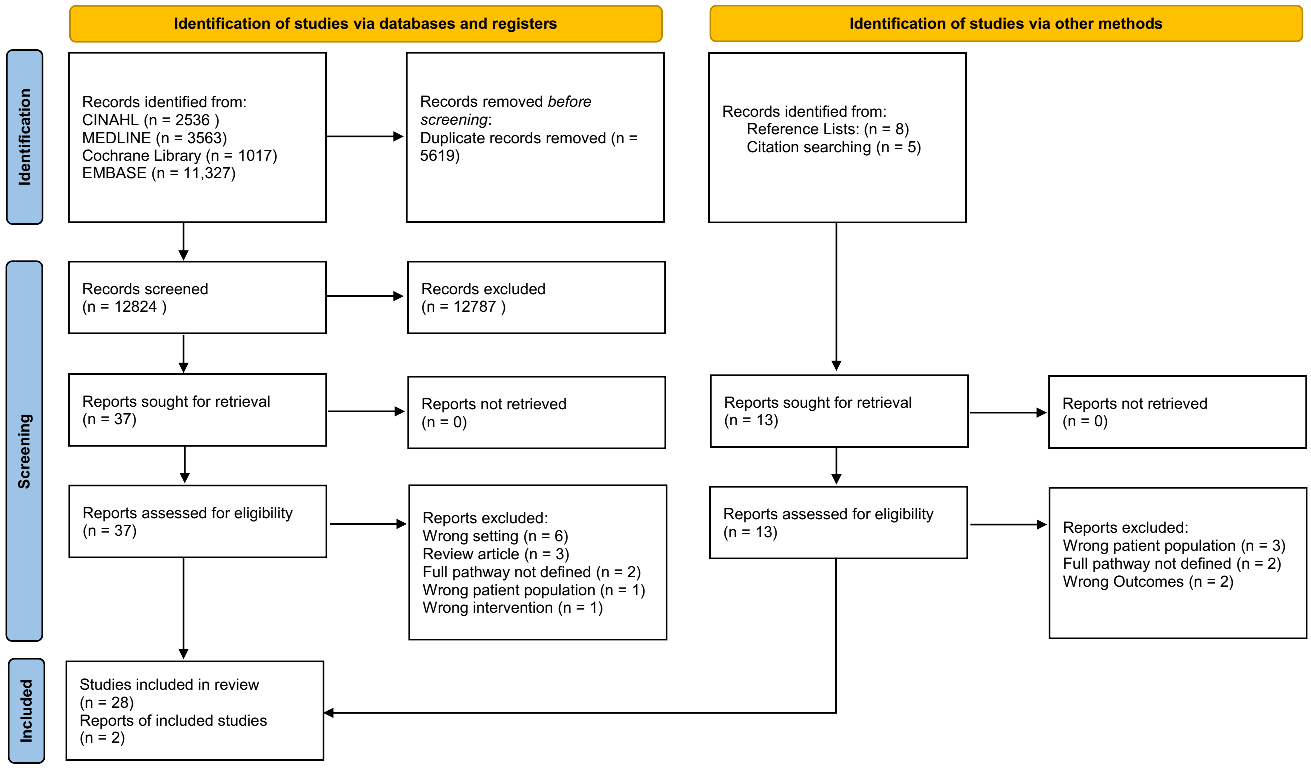

Fig. 1 Prisma flow diagram

Overview of Studies

All studies were from six western, high-income countries (Table 1). Of the 11 studies and service evaluation report from the UK, five studies were local manifestations of the NHS England National Low Back and Radicular Pain Pathway (NELBPP) [19–23], with three from the same regional implementation site, the North East of England (NERP) [19–21]. Seven Canadian studies related to three separate pathways [24–30]. Four American studies included two from one centre regarding a telehealth-assisted pathway [31, 32]. Four pathways were described as regional, namely the Integrated Spine Assessment and Education Clinics (ISAEC) [30], the Saskatchewan Spine Pathway (SSP) [27–29], the NERP [19–21] and that of Fleuren et al. [33]. Eleven papers considered lumbar related conditions [19–21, 24–26, 30, 34–37], eight were specific to radicular leg pain [17, 18, 22, 23, 27–29, 33], and eight studies included more general spine conditions [31, 32, 38–43], although half of these stated that most participants had lumbar complaints [38, 40, 41, 43].

Design and Quality

Study designs varied with 18 observational cohort designs [19, 20, 22, 24, 25, 27–32, 34–36, 40–43], two audits [38, 39], two pre-test post-test designs [26, 33], one RCT [17], one mixed methods study [21], one clinical case series [37], and two qualitative studies [18, 23] included in the review (Table 1). On quality assessment (EPHPP), the quantitative studies were typically rated as weak evidence; one was rated strong overall [17] and six studies were rated moderate [19, 20, 22, 26, 29, 35]. Using the CASP checklist, both of the standalone qualitative studies [18, 23] were considered to have appropriate methodological quality to address the stated aims, whereas the qualitative methods of the mixed methods service evaluation report [21] were not adequately described. Table 2 summarises the main limitations of the individual studies.

Pathway Features

Table 2 outlines the key features of each pathway, whilst Fig. 2 graphically illustrates the key patient contact points. The reasons stated for pathway introduction are outlined in Table 3. Pathways were commonly accessed via the patient's GP, although all Canadian pathways began with a more overarching 'primary care provider' category of health professional and Whedon et al. [42] used a primary spine practitioner, in this instance a chiropractor, as the first point of contact. Whilst a substantial number of studies provided minimal detail regarding primary care management, others

Table 1 Characteristics of the included studies

Country	Pathway name	Reference	Study design	Study population	Study aim(s)
United Kingdom	North East of England low back and radicular pain pathway (NERP)	[19]	Longitudinal observational	Pathway pts from May 2015 to Jan 2017; (complete cases $n=667$)	Are clinical outcomes at discharge associated with baseline pain duration (triage & treat pathway portion)? 4 groups with pain durations: <3 months; ≥ 3 to <6 months; ≥ 6 to <12 months; ≥ 12 months
		[20]	Longitudinal observational	Pathway pts from May 2015 to Dec 2019; ($n=552$ 6 month FU; $n=786$ 12 month FU)	Extends previous work. Explores association between baseline pain duration and medium-to-long term clinical outcomes at 6 & 12 months
		[21] Data here not included in [19, 20]	Mixed methods: (1) and (2) Longitudinal observational (3) Observational case–control (4) Qualitative	(1) Same cohort as [19] (2)Completed combined Physical & psychological programme (CPPP) ($n=100$) (3) Subjects in (1) above compared with 267 people from non-pathway service provider (4) 9 key decision makers, 9 triage and treat practitioners, 3 HCPs, 3 GPs, 10 pts	(1) Determines return rate to pathway post discharge from triage & treat (2) Evaluates clinical outcomes of CPPP (3) Compares clinical outcomes at discharge of triage and treat with non-pathway service (4) Analyses opinions of clinicians, commissioners and pts
	SCiatica outcomes in primary care (SCOPiC)[a]	[17]	RCT	Pts with clinical diagnosis of sciatica recruited from GP practices ($n=476$)	Investigates if stratified care (SC) led to faster resolution of sciatica symptoms compared with usual care (UC), and cost-effectiveness
		[18]	Qualitative	Clinicians: 9 GPs, 7 spinal specialist physiotherapists, 4 spinal surgeons. Pts: 20 on 'fast-track' pathway, purposively sampled	Explores clinicians' and pts' views towards & experience of 'fast-tracking' pts with severe sciatica for early investigation and specialist opinion
	Local manifestation of NHS England low back & radicular pain pathway (NELBPP)	[22]	Retrospective observational	Pts with radicular pain between 6 and 52 weeks duration and correlating disc prolapse on MRI scan ($n=75$)	Reports on outcomes of pathway for lumbar disc herniation causing radiculopathy
	Local manifestation of NHS England low back and radicular pain pathway (NELBPP)	[23]	Qualitative	Pts who failed conservative sciatica management, had investigations, and discussed next step with specialist physiotherapist ($n=14$)	To address the question 'what are pts' experiences of being managed within an NHS sciatica pathway?"
	Sheffield spinal pathway	[39]	Audit	Consecutive paper referrals for spinal complaints to orthopaedics, neurosurgery and spinal specialist teams (SSTs); (2011: $n=821$; 2012: $n=604$)	To understand how pathway influenced referral patterns to SSTs and to specialised care with reaudit following specific changes to pathway
	Nil	[40]	Observational	Consecutive GP referrals to orthopaedic spinal triage clinic ($n=100$)	Determines proportion of independent management of triage clinic and consultant intervention conversion rate
	Nil	[36]	Retrospective observational	Pts with back pain seen in spinal assessment clinic (SAC) ($n=50$–178)	Reports on a number of research projects evaluating the nurse-led SAC
	Nil	[43]	Retrospective observational	All pts with chronic LBP with or without radicular signs/symptoms seen by extended scope practitioner (ESP) physiotherapist over 2 years; neck, thoracic and radicular neck pain included for final 3 months ($n=2651$)	Reviews rate of independent management and surgical conversion by spinal ESPs

Table 1 (continued)

Country	Pathway name	Reference	Study design	Study population	Study aim(s)
Canada	Integrated spine assessment & education clinics (ISAEC)	[30]	Retrospective observational	Consecutive pts referred for surgical consultation from ISAEC pathway clinic ($n=422$)	Examines pathway effect on surgical referral, MRI use, surgeon wait times, and referral appropriateness compared with historical practices in rural, urban and metropolitan settings
	Wall street spinal assessment service (SAS)[b]	[24]	Retrospective observational	All pts in 3 year period; ($n=336$–672; complete data set for $n=299$)	To describe physiotherapy spinal triage management outcomes and surgical conversion
		[25]	Observational	SAS triage pts ($n=115$) and referring primary care providers ($n=115$)	Evaluates patient and referrer satisfaction with spinal triage service
		[26]	Quasi-experimental one-group pretest post-test design	SAS triage pts ($n=115$)	Evaluates short-term (4 weeks) changes in PROMs of pts assessed in spinal triage service
	Saskatchewan spine pathway (SSP)[c]	[27]	Retrospective observational	Pts with LBP/leg pain on surgeon waiting list and new non-emergency referrals redirected to SSP ($n=87$)	Determines surgical yield of elective referrals to spine surgeon post SSP assessment; effects of SSP on MRI use, and 'red flag' detection
		[28]	Retrospective observational	New elective LBP/leg pain referrals to 2 neurosurgeons June 2011–12; (Referred via SSP clinic: $n=66$; conventional referrals: $n=149$)	Compares surgical yield and wait times for MRI and surgeon assessment of SSP clinic and conventional referrals to spine surgeon
		[29]	Prospective non-randomised matched cohort comparison	Adults undergoing elective spine surgery; (referred via SSP: $n=75$; referred from PC in conventional manner: $n=75$)	Evaluates impact of SSP on surgical pts, including impact on surgical outcomes
USA	West Virginia University Spine Centre	[31]	Retrospective observational	New pts to spine centre and referring physicians; ($n=100$ for patient & physician satisfaction)	Reports on the introduction of software-assisted spine patient triage
		[32]	Retrospective observational	All ambulatory spine referrals electronically triaged (E-triaged) from 2011 to 2014; ($n=10{,}832$)	Evaluates cost savings of telemedicine/E-triage
	Jordan spine program	[37]	Clinical case series	Consecutive new pts with LBP in spine centre ($n=518$)	Describe patient satisfaction, clinical outcome and cost of pts managed conservatively in community-based hospital
	Primary spine care (PSC) Model	[42]	Retrospective observational	Pts presenting with a spine related disorder (SRD) to any of the 3 study sites ($n=10{,}348$)	Evaluate outcomes and costs associated with primary spine care model compared with usual care
Australia	SAC-T (spinal assessment clinic telehealth)	[38]	Audit (prospective)	Convenience sample from non-urgent GP referrals on hospital orthopaedic spinal service waiting list; (Telehealth Clinic $n=22$; Outreach Clinic $n=19$)	Examines feasibility, appropriateness and access to telehealth clinic compared to outreach clinic for non-urgent spinal pts
	BAC (back pain assessment clinic)	[41]	Observational	New spinal pain referrals triaged to BAC and appropriate referrals already on outpatient surgical waiting lists redirected to BAC ($n=522$)	Reports on design, implementation and initial evaluation of BAC, a pathway providing community-based specialist review of neck & LBP

Table 1 (continued)

Country	Pathway name	Reference	Study design	Study population	Study aim(s)
	Nil	[34]	Retrospective observational	New LBP pts in triage clinic ($n = 105$). Referring GPs to orthopaedic clinic ($n = 30$) and to triage ($n = 30$)	Evaluates triage clinic (audit wait time, discharge destination, clinical outcomes from physiotherapy, surgical conversion) and GP satisfaction
Ireland	Nil	[35]	Retrospective observational	Consecutive LBP referrals to spinal triage clinic ($n = 1532$)	Examines spinal triage clinic triage destinations and physiotherapist competence to allocate pts into 3 diagnostic categories
The Netherlands	Dutch college of general practitioners guideline lumbosacral radicular syndrome	[33]	Pre-test-post-test design	GP lumbosacral radicular pain referrals to neurologists in 6 month period; (Pre-test $n = 178$; 1st post-test $n = 224$; 2nd post-test $n = 321$)	Examines if shared care guideline improved adherence with national guideline, reduced % of unnecessary early referrals and expedited care. Assessed implementation costs

FU, Follow-up; GP, General practitioner; HCP, Health care professional; MRI, Magnetic resonance imaging; NHS, National Health Service; PC, Primary care; pts, patients

[a]additional information from Foster et al. [16]

[b]additional pathway information from Bath [48]

[c]additional pathway information from Fourney et al. [9]

referred to the use of stratification or subclassification in primary care or provided some detail on treatment/onward referral guidelines [17–21, 23, 27–30, 33, 39].

All but one study [33] used non-consultant clinics with a triage remit between first contact in primary care and consultant-led clinics in secondary care. These clinics are consistent with the NHS definition of 'interface services', namely 'any service, excluding consultant-led services, that incorporates any intermediate levels of triage, assessment and treatment between traditional Primary Care and Secondary Care' [44]. Physiotherapists were the most common professional group in these interface services, working independently [17, 18, 22–29, 35, 38, 40], or alongside other professionals [19–21, 30, 34, 37, 41, 43]. Figure 2 illustrates that interface services were community-based [23–26, 30, 39–42] or hospital-based [19–21, 34–37, 43], although the location was not always clear, and three studies used hospital-led telehealth-assisted triage [31, 32, 38]. Interface services were principally accessed via direct referral from primary care, although in a small number of pathways the referral was first sent to a secondary care consultant service and subsequently triaged to an interface clinic [31, 32, 34, 36, 38, 41, 43] or both direct and indirect referral was available [24–26, 35]. Twelve pathways (17 studies) [17–21, 23, 27–30, 34, 35, 37–39, 41, 43] provided guidance regarding referrals appropriate for interface assessment, but this guidance varied considerably from detailed criteria [41] to broad statements, such as 'non-urgent' referrals [38]. Subclassification, guiding interface service management, featured in four pathways [27–30, 37, 39]. Interface services differed in the reported clinical management options available, although most had access to advanced imaging (Table 2). The delineation between primary care and interface services was blurred in two pathways [37, 42]; for example, the primary spine practitioner was a first contact practitioner but also accepted referrals from other primary care providers in an interface capacity [42].

The detail provided regarding guidance for appropriate referral for consultant opinion varied across studies; some studies cited ill-defined criteria, such as clinical judgement, urgent referrals or patients potentially requiring surgery [35, 36, 38, 43], whilst others provided more specific guidance [22, 23, 27–30, 33, 34, 37, 39, 41]. In one study all routine referrals to consultant secondary care clinics had first to be reviewed by a community-based spine specialist team [39]. The sole study without an interface service used a fast-track consultant appointment pathway if referral from GPs was preceded by reported adherence with conservative care guidelines [33]. The management of 'red flag' presentations was not documented by all studies. Some authors described direct referral pathways for patients presenting in primary care with red flag symptoms to urgent/emergency specialised review [27–29, 33, 39], or on referral triage in secondary

Table 2 Main findings and limitations of included studies

Reference	Key pathway features	Outcome domain	Summary of main findings	Study limitations
[19]	GPs stratify LB P patients (STarT Back). Moderate to high risk referred to triage and treat practitioner (TTP; nurses and physiotherapists). TTP options include: refer for investigations, core therapies, residential combined physical and psychological therapies programme (CPPP) or secondary care. Option to refer to pain management ser vices and specialist spinal surgical options	Clinical outcomes; pt. & clinician experience and satisfaction	Each group improved > MCID for each measure. Pain NRS, ODI, EQ-5D, GAD-7, PHQ-9 improved more in < 3 months group than ≥ 12 months group; $p < 0.05$. Similar satisfaction with service regardless of pain duration	Complete data for 32% raising risk of reporting bias
[20]		Clinical outcomes; pt. & clinician experience and satisfaction	Significantly better outcomes for < 3 months than ≥ 12 months group for ODI, EQ-5D, GSOS at 6 and 12 months; $p < 0.05$, $t < 0.05$. Functional improvements in ≥ 12 months group not clinically relevant. Similar readiness to self-manage (12 months) & satisfaction with service regardless of pain duration	Risk of reporting bias from low % of pts with follow up data (6%) and high non-response rate at 6 (58%) and 12 (64%) month follow ups
[21]; Data here not included in [19, 20]		Healthcare resource use; clinical outcomes; pt. & clinician experience & satisfaction	(1) 5% return rate to pathway post triage & treat discharge (2) Significant improvements ($p < 0.001$) from baseline to discharge in pain NRS, EQ-5D, GAD-7, PHQ-9 and above MCID maintained at 6 and 12 months (3) Greater improvement in EQ-5D in pathway pts than non-pathway ($p < 0.01$) (iv) Qualitative findings highlighted key areas: timing of pathway implementation; single point of access to pathway; local champions vital in implementation; robust monitoring and switching off non-pathway compliant activities for sustainability; clear communication of roles and responsibilities	Risk of reporting bias from low % of participants with follow up data. Qualitative methodology lacked detail. Specific to NHS, UK. No follow up period given for return rate to pathway

Table 2 (continued)

Reference	Key pathway features	Outcome domain	Summary of main findings	Study limitations
[17]	Stratified care: group 1 (≤ 3 STarT back): brief self-management support. group 2 (> 3 STarT back and ≤ 3 psychological subscale score and ≤ 3 clinical characteristics score): up to 6 sessions physiotherapy. group 3 (> 3 STarT back and ≥ 4 psychological subscale score and ≥ 3 clinical characteristics score): MRI and seen in spinal interface clinic by specialist physiotherapist. Usual care: management at discretion of physiotherapist in consultation with patient	Clinical outcomes; healthcare resource use	No significant difference in time to 1st symptom resolution between SC & UC. SC and UC participants improved over time with no significant between-arm differences in PROMs. SC slightly less effective (QALYs -0.011: 95% CI -0.035–0.013) and more costly (£46.21; 95%CI -110.60 to 187.06) than UC	Not powered to detect differences at sciatica subgroup level. UC given may not be typical
[18]		Pt. & clinician experience and satisfaction	Both pts and clinicians found 'fast-track' pathway acceptable. Some clinicians concerned acute cases 'fast-tracked' too soon. Pts perceived benefit from earlier reassurance from MRI scan. Pathway limited as it did not shorten wait time for treatments beyond spinal specialist consultation	Possibility of assessor bias. Interviews with medics commonly hypothetical discussions about pts rather than concrete experiences of specific pts
[22]	Routine referral from GP to integrated clinical assessment and treatment service (physiotherapists). MRI and guided nerve root injection if pain duration 6–52 weeks and disc prolapse on MRI correlates with symptoms. Review 3 months post injection; refer spine surgeon if poor response	Patient flow; clinical outcomes; healthcare resource use	Pts waited 15.5 weeks (mean) for assessment with specialist physiotherapist V. 109 weeks for spine surgeon. Significant improvement post injection in leg pain VAS ($p < 0.001$), ODI ($p = 0.024$), EQ-5D-5 ($p < 0.001$). Mean pain relief duration: 33.8 weeks. At 1 year: 43% discharged, 16% for spine surgeon assessment, 8% lumbar discectomy, 24% pain management, 9% for consideration of further injection	A single centre study with small sample size limits external validity. No control group so improvements may reflect natural progression of sciatica
[23]	Sciatica: initial primary care management (medication and/or physiotherapy) and 2-week review. Severe pain, not improving: seen by triage physiotherapist at 2–6 weeks. Investigations, if likely to change management, completed within 4 weeks; results within 2 weeks. Onward referral options: spinal injection, surgery, or combined physical and psychological therapies programme	Pt. & clinician experience and satisfaction	Themes presented: pathway problems, required agency and burden of agency. Pathway problems identified made it difficult for pts to access care perceived necessary. Perceived requirement to be proactive was difficult to achieve (due to impact of sciatica and lack of necessary skills, funds and support) and with pathway issues negated capability to manage sciatica	Some participants had not completed management. Iterative theoretical sampling during analysis and interviews not undertaken. Relationship between researcher & participants inadequately considered

Table 2 (continued)

Reference	Key pathway features	Outcome domain	Summary of main findings	Study limitations
[39]	Routine GP referrals to secondary care must be via community spinal specialist teams (SST). Non-compliant referrals redirected from secondary care to SST; incomplete referrals returned to referrer. GPs & SST use stratified approach (STarT Back). SST have full access to appropriate investigations	Healthcare resource use	Pathway adherence of routine GP referrals to orthopaedics increased from 31% (17/54) to 77% (24/31) and to neurosurgery from 0 to 28% (6/21). Improved recording of required referral details	Small numbers referred to secondary care limits findings from this aspect of pathway
[40]	GP referral to community orthopaedic spinal triage service (clinical specialist physiotherapist). Triage options: discharge to GP or to therapies, refer for investigations or for consultant opinion	Healthcare resource use	38% discharged at first triage appointment, 61% for investigation; 69% independently managed by physiotherapist. 30% referred for consultant opinion with 40% conversion rate from consultant clinic	Small sample size and single-hospital location limits external validity
[36]	GP referral to orthopaedic back pain service re-directed to nurse-led spinal assessment clinic (SAC). Triage nurse can order MRI. Potential surgical candidates 'fast-tracked' to consultant	Clinical Outcomes; Pt. & Clinician Experience and Satisfaction; healthcare resource use	LBOS improved from 29 at triage to 35 on review ($p<0.01$; $n=200$; RR > 80%). In 2 cohorts of 100 pts in consecutive years, GPs reported less medication prescribed in 48% and 45% (no RR given) and SAC rated 'very good' by 76% and 87% of pts (RR > 80%). GPs reported 82% of pts visited GP less often in year after attending SAC ($n=100$; no RR)	Limited external validity as pertains to triage by one nurse in single site. Presented as outcomes of several different service evaluations that lacked methodological detail
[43]	GP referral to hospital spine service. Paper triage by extended scope practitioner (ESP) physiotherapist and nurse practitioner to expedite referrals for urgent consultant appointment and direct appropriate referrals to ESP clinic. ESP independently refers for diagnostic imaging, spinal injection and to other providers. Potential to list directly for surgery from discussion with consultant	Healthcare resource use; pt. & clinician experience and satisfaction	7.8% of triage pts required consultant input; 92% independently managed. 35% new pts had further investigation, 18% injection, 8% discharged. Of 171 pts (6.5%) referred to/discussed with surgeon, 80.7% offered surgery. In 5 years, 3 less spinal clinics/month, saving 12 h of consultant time. Almost all feedback in 139 questionnaires (RR 5.2%) positive	Low RR for patient satisfaction questionnaire raises risk of reporting bias

Table 2 (continued)

Reference	Key pathway features	Outcome domain	Summary of main findings	Study limitations
[30]	Primary care providers undergo pathway education; can order MRI based on guidelines and refer to pathway clinic (advanced practice physical therapists and chiropractors) if patients have unmanageable, persistent LBP 6–52, or recurrent, unmanageable LBP of any duration. Pathway clinic uses subclassification and criteria for surgical assessment referral	Healthcare resource use; patient flow	ISAEC clinic pts ($n = 4059$): 10% referred to surgeon. 90–97% of referrals from ISAEC clinics deemed surgical candidates by surgeon. Decreased MRI usage (31%) with saving of $87,000. Wait times for ISAEC clinic (weeks): 5.4 Toronto, 4.3 Hamilton, 2.4 Thunder Bay. Pre-ISAEC elective wait times (months): 1–19 Toronto, 8–18 Hamilton, 12–24 Thunder Bay	Costs were estimated only in respect to MRI utilisation rather than total costs of shared-care model
[24]	Triage clinic (physiotherapist) receives referrals from Primary Care Provider or rerouted from surgeon. Triage options: advanced imaging, refer to other health care providers or surgeon	Healthcare resource use	16.7% of pts referred to surgeon. Surgical yield: 80% reduced sample; 70% total sample	Reporting bias as complete data for 27% of cohort. Low external validity for surgery outcome as low numbers
[25]		Pt. & clinician experience and satisfaction	Pts: 76.9% very/somewhat satisfied; RR 93.9%. Referrers: 90.5% very satisfied; RR 18.3%. Positive themes: understanding diagnosis, communication and empathy, customer service, efficiency of care, & direction for care pathway. Negative themes: lack of detail, time to follow-up, & access issues	Reporting bias from low referrer response rate. Qualitative analysis done on ad hoc basis
[26]		Healthcare resource use; clinical outcomes	20% of pts referred to surgeon. Physical Component Summary of SF-36v2® only measure significantly improved ($p < 0.001$)	No control group

Table 2 (continued)

Reference	Key pathway features	Outcome domain	Summary of main findings	Study limitations
[27]	Primary care providers (physicians, nurse practitioners, physiotherapists, chiropractors) assess patients using pattern diagnosis and treatment algorithm and refer to spine pathway clinic (SPC) run by specialist physiotherapists if fail primary care treatment. SPC options: additional mechanical therapies, imaging studies and/or assessment by spine surgeon	Healthcare resource use; clinical outcomes	71.3% discharged from SSP (Group A); 28.7% refer to surgeon (Group B) with surgical yield 44%. MRI use in Group A (25.8%) lower than Group B (92%); $p<0.0001$. No red flags detected by surgeon and not triage physio	Small sample size of pts from waiting list of one surgeon infers low external validity
[28]		Patient flow; healthcare resource use	Significantly shorter wait for SSP than conventional referrals for surgeon assessment (69.1 d ± 73.7 d Vs. 129.6 d ± 109.1 d, $p<0.0001$) and MRI (27.4 d ± 23 d Vs. 63.5 d ± 42.4 d, $p<0.0001$) and they were more likely to be surgical candidates (59.1% Vs. 37.6%; $p=0.003$)	Only 2 spine surgeons and relatively low participant numbers, particularly SSP group, limits external validity. No evaluation of care costs
[29]		Patient flow; clinical outcomes; pt. & clinician experience and satisfaction; Healthcare resource use	No significant difference between SSP & conventional referrals in wait for surgeon (83 d ± 77.6 d Vs. 100.3 d ± 86.3 d, $p=0.34$), in surgery type, nor in pain or function (ODI; EQ-5D) at 6 weeks, 3, 6 or 12 months post-surgery. No between group differences in post-operative complications and post-surgery satisfaction. SSP group had shorter wait for MRI (16.8 d ± 26.2 d V. 63 d ± 41.3 d; $p<0.001$), were more satisfied with care received before seeing surgeon ($p=0.001$) and used more types of non-surgical treatment ($p<0.05$) before seeing surgeon	Small subject numbers from caseload of 2 surgeons limits external validity

Table 2 (continued)

Reference	Key pathway features	Outcome domain	Summary of main findings	Study limitations
[31]	Family practitioner referral. Phone history (nurse). Imaging, tests, history electronically reviewed by attending level spine surgeon. Triage options: refer spine surgeon, nonoperative spine centre provider (physiatrist or mid-level orthopaedic or nonsurgical spine provider), pain clinic or another provider if non-spinal pathology suspected. Additional testing or treatment can be arranged prior to triage/re-review	Patient flow; pt. & clinician experience and satisfaction	Pre-pathway wait time for 1st available appointment: 2.5–8 months; post-pathway wait: 3 days—12 weeks. High pt satisfaction with service and overall pt satisfaction of 4.42 on scale from 1 (very dissatisfied) to 5 (very satisfied); $n = 100$; RR 29%. Referring physician satisfaction fair to good for comfort with triage (3.47), communication (3.77); $n = 100$; RR 37%	Presented as outcomes of several different service evaluations that lacked methodological detail. Reporting bias from low RR for satisfaction components
[32]		Patient flow; healthcare resource use	10,271 referrals E-triaged by spine surgeons within 10 d (mean) from referral date. For 66% additional workup and/or conservative treatment recommended, 57% triaged to non-surgeon provider, 43% to spine surgeon. Total cost savings to pts: $793,835 in 4 years (mean $325 saved per patient)	Reporting bias risk as analysis limited to data in E-record system and incomplete cases excluded. Possible data errors from human error
[37]	Primary care physician referral and self-referral triaged by medical doctor, chiropractor or physical therapist. Tier 1 triage: immediate medical attention or conservative care. Tier 2 triage: 1 of 5 conservative treatment approaches. Not improving, case review by team, with possible referral for imaging, pain management (± injection), or spine surgeon	Pt. & clinician experience and satisfaction; healthcare resource use; clinical outcomes	Clinical outcomes, patient satisfaction and mean cost per case only for chiropractic pts ($n = 402$). Mean change of 4.2 in NPRS & 23 in Bournemouth questionnaire. Overall satisfaction excellent in > 95% of pts. Mean cost per case $302. Of the total sample ($n = 518$), 7% required MRI/diagnostic imaging and 5% medical referral	Outcomes only provided for chiropractic pts, and no long-term follow up data. No comparator group. Limited detail on cost calculation
[42]	Primary spine care model. First point of contact is primary spine practitioner (PSP), here a chiropractor, but may be physical therapist, or medical or osteopathic physician specially trained to provide primary care for patients with spine related disorders. In this study PSP also received referrals from other primary care clinicians. PSP co-ordinates and follows up for duration of care, and refers, if needed, for additional testing, further rehabilitation, invasive procedures, or to spine or pain clinics	Healthcare resource use	PSP site: mean per-patient SRDs expenditure increased 14% from year 1 ($n = 693$) to year 2 ($n = 980$) but lower than non-PSP sites. Greater decreases in spinal imaging & injection expenditure in PSP V. non-PSP site. Compared to usual care PSP site pts less likely (OR 0.28; CI 0.064–1.227) and control sites more likely (Site II OR 1.586, CI 1.035–2.432; Site III OR 1.625; CI 0.982–2.686) to have diagnostic imaging. No differences in odds for ED visits, hospitalisations, adverse drug events	Limited data regarding baseline patient characteristics. Not all pts at Site I received PSP care; not pure PSP model. Unclear how pts included in analysis were chosen (of 910,000 potentially eligible participants, 10,348 included in analysis)

Table 2 (continued)

Reference	Key pathway features	Outcome domain	Summary of main findings	Study limitations
[38]	Telehealth: GP paper referral to orthopaedics triaged as urgent, semi-urgent or non-urgent. Video consultation for non-urgent patient from remote area with lead hospital physiotherapist and local physiotherapist, who has completed initial screen. Potential outcomes: discharged to GP with plan, additional interventions/investigations with telehealth review, or expedited consultant review. Outreach clinic: lead physiotherapist in-person consultation in remote location	Healthcare resource use; patient flow; clinical outcomes	23% reduction in costs in favour of telehealth clinic. Greatest savings in staff travel costs. Telehealth clinic wait less than outreach: 4.5 months ± 2.1 SD V. 15.3 months ± 4.4 SD. No adverse clinical outcomes & no changes to patient care needed after consultant audit of telehealth pts	Small sample size and study location in one rural region limit external validity
[41]	GP referral to surgeon triaged by multidisciplinary team to community BAC (advanced physiotherapist & rheumatology registrar) or specialty clinic using consensus criteria. BAC within 10 weeks of referral. Patients for exercise seen within 2–4 weeks in community programme. Speciality clinic (orthopaedics, neurosurgery, pain, rheumatology) within 12 weeks with investigations arranged	Patient flow; healthcare resource use; clinical outcomes; pt. & clinician experience and satisfaction	Mean (SD) wait for BAC: 9.8 (4.3) weeks, with care received 90 weeks earlier (mean). 73.7% of new referrals triaged to BAC. From BAC: refer to surgeon 1.1%; pain services 3.2%, rheumatology 1.1%. BAC ordered less MRI scans than surgical clinics (6.4% V. 89.8%) with 1 year saving of $52,560. Most (94.4% of 54) pts 'very satisfied' or 'satisfied' with BAC; 57.7% of 26 GPs satisfied. Pts completing community rehabilitation programme post-BAC reported improvements in ODI or NDI, BPI-SF and GIS; significance not stated; ($n = 18$–53)	Satisfaction questionnaires RR not provided. No data from patient/referrer/stakeholder interviews presented. No explanation for small sample size for clinical outcomes. Limited economic analysis
[34]	GP referral to orthopaedics, triaged by surgeon. Triage Clinic (physiotherapist) co-located with consultant clinics. Consultant discussion required for investigations other than X-ray, and for injections	Patient flow; healthcare resource use; pt. & clinician experience and satisfaction	9 week wait for triage, 26 weeks for general orthopaedic clinic, 23 weeks for spinal orthopaedic clinic. 71% of triage pts discharged; 16% referred to surgeon with 53% surgical yield within 8 weeks of triage date. GPs at least as satisfied with triage clinic as with general orthopaedic clinic (RR 40%)	Low GP RR introduces reporting bias. Unclear if surgical conversion rate only refers to conversion within 8 weeks of triage appointment

Table 2 (continued)

Reference	Key pathway features	Outcome domain	Summary of main findings	Study limitations
[35]	Referrals from GPs, physiotherapists, hospital consultants to hospital spinal triage clinic run by clinical specialist physiotherapist. Triage options: conservative management (10-week group education/exercise or individual physiotherapy), refer for specialist opinion (orthopaedic, rheumatology, pain specialist) or discharged. Refer for specialist opinion if further investigation needed	Healthcare resource use	1% of triage pts referred to consultant, 14% discharged, 85% conservative management. Of 16 pts seen by consultant, 25% had surgery, 50% further investigations. A significant difference ($p < 0.001$) in baseline pain, disability, psychological distress and function found between triage groups	Small numbers referred to secondary care limits findings from this aspect of pathway
[33]	Primary care conservative management for lumbosacral radicular syndrome for first 6 weeks unless criteria for instant referral or referral within 6 weeks met. GP referrals to neurologists after 6 weeks conservative management marked 'fast track', receive MRI and priority appointment slots	Healthcare resource use; patient flow	% unnecessary referrals fell from 15 to 9% in year 1 (aOR, 95% CI: 0.52, 0.28–0.96) & 8% in year 2 (0.48, 0.27–0.86). Total diagnostic procedure duration fell significantly in long & short terms for full cohort and 'fast-track' ($\alpha = 0.05$); increased significantly in short term in 1 hospital, and in short and long term in other for standard referrals ($\alpha < 0.05$)	Use of a control region would have improved internal validity of results. Risk of reporting bias due to incomplete data

aOR, adjusted odds ratio; BAC, Back pain assessment clinic; BPI-SF, Brief pain inventory-short form; CI, Confidence interval; d, Days; ED, Emergency Department; GAD, Generalised anxiety disorder; GIS, Global improvement scale; GSOS, Global subjective outcome scale; ISAEC, Integrated spine assessment and education clinics; LBOS, Low back outcome score; MCID, Minimal clinically important difference; MRI, Magnetic resonance imaging; NDI, Neck disability index; NPRS, numeric pain rating scale; NRS, Numeric rating scale; ODI, Oswestry Disability Index; OR, Odds ratio; PHQ, Patient health questionnaire; PROM, Patient-reported outcome measure; PSP, Primary spine practitioner; Pt(s), Patient(s); QALY: Quality-adjusted life year; RR, response rate; SAC, Spinal assessment clinic; SC, Stratified care; SD, Standard deviation; SF-36, Short form 36 health survey questionnaire; SRD, Spine related disorder; SSP, Saskatchewan spine pathway; UC, Usual care; VAS, visual analogue scale

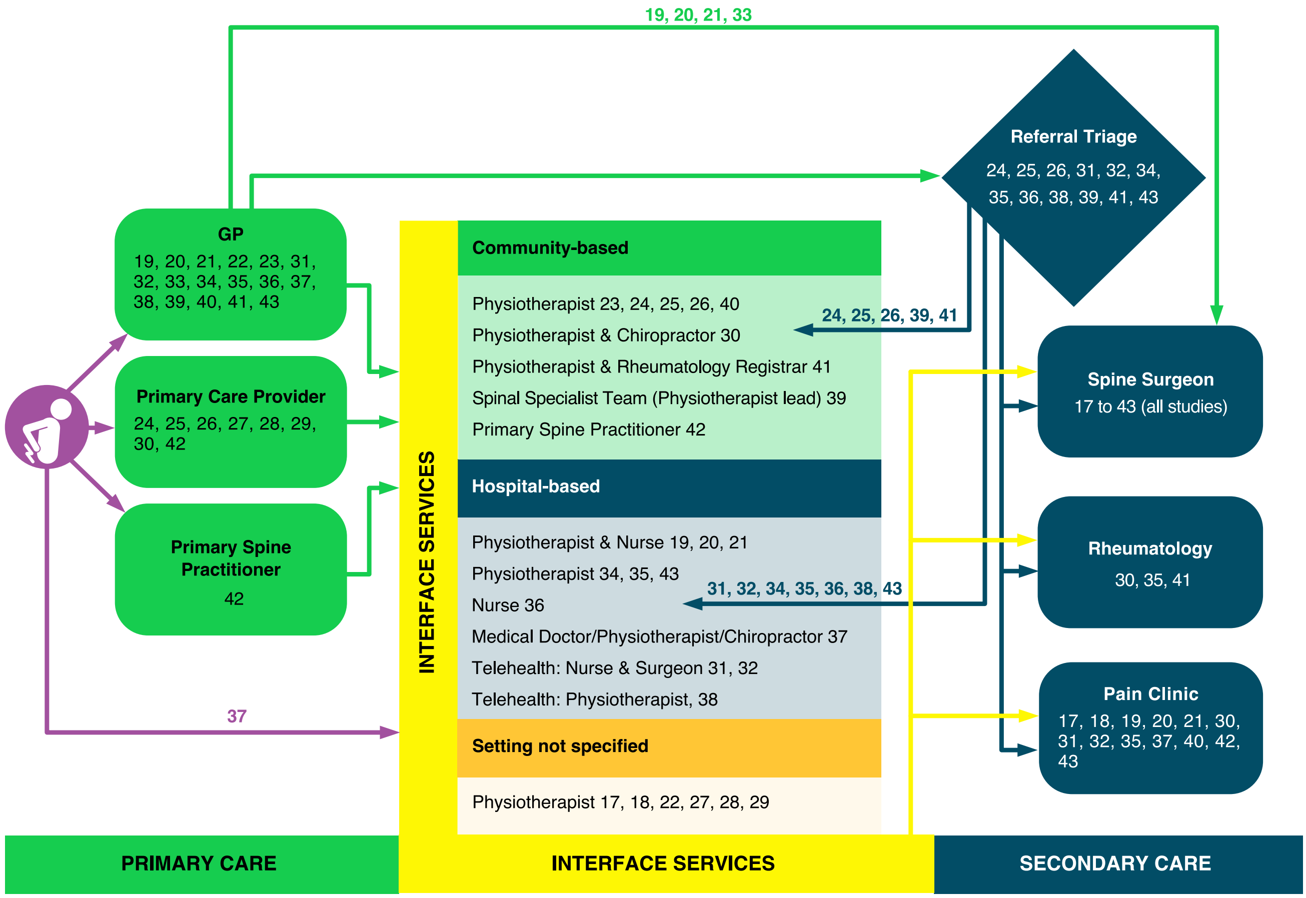

Fig. 2 Key patient contact points for each pathway (by article reference number)

care, these presentations were considered inappropriate for interface assessment [31, 32, 34, 41, 43]. In another study, all triage clinicians were trained in red flag identification and these patients were escalated to an appropriate medical appointment at the first level of triage [37].

Outcome Domains

A narrative synthesis utilising the four pre-specified outcome domains, healthcare resource use, patient flow, clinical outcomes and patient/clinician satisfaction and experience, is presented; Table 2 contains the main results of the individual studies.

1. Healthcare resource use

   Outcomes related to this domain were the most frequently examined, reported in 21 studies. Rates of independent management or discharge from in-person interface services were consistently high (69–92%) [27, 34, 40, 43], with consultant appointments post-triage required in 1–30% of patients [24, 26, 27, 30, 34, 35, 37, 40, 41, 43]. Conversion rates from consultant appointment to an intervention of between 40 and 97% were reported, with conversion rates to surgery most frequently assessed [24, 27, 28, 30, 34, 35, 40, 43]. Few studies provided comparative data, although the higher proportion of surgical candidates amongst patients referred for surgical consultation through SSP triage clinics than the conventional route, supported the use of interface clinics to triage appropriately to surgical clinics [28]. Data regarding investigation use did not provide useful comparisons due to cohort variability; for example, studies reported on investigation use in triage clinics [37, 40, 43], on MRI use in patients referred for surgical consultation [30], in interface service compared to consultant clinic [41], or in primary spine care model compared to usual care [42]. Two studies reported the effect of specific measures on pathway fidelity [33, 39], for example, a 'bounce back' process from secondary care consultants to community interface for referrals not following the local spinal pathway [39]. Six studies considered cost of care with variable methodology, including costs of telehealth triage compared to rural outreach clinic [38]; implementation costs of a shared

Table 3 Stated reasons for introducing pathway

	1	2	3	4	5	6	7	8	9
[24]	✓	✓							
[25]	✓	✓							
[26]	✓	✓							
[38]									✓
[34]	✓	✓				✓			
[31]	✓	✓							
[32]	✓	✓							
[33]	✓	✓			✓				
[39]		✓	✓	✓					
[19]			✓						
[20]			✓						
[40]	✓	✓							
[27]	✓	✓	✓	✓	✓	✓			
[17]	✓		✓			✓		✓	
[22]			✓						
[21]			✓						
[41]	✓	✓		✓					
[35]	✓								
[36]	✓	✓							
[37]			✓				✓		
[23]			✓		✓				
[18]	✓		✓			✓		✓	
[42]		✓	✓				✓		
[28]	✓	✓	✓	✓	✓	✓			
[43]	✓	✓							
[29]	✓	✓	✓	✓	✓	✓			
[30]	✓	✓	✓	✓	✓				

1: Long wait times for surgical review or imaging

2: Ensure referrals to surgical clinics are appropriate

3: Promotion of evidence-based practice, standardised or guideline-concordant care

4: Optimisation of community-based care/specialist review

5: Promote integrated, shared or interprofessional care

6: Improve effectiveness of care

7: Reduce costs

8: Introduce stratified care

9: Address inequity of access

care guideline [33]; patient cost savings from telehealth-assisted triage [32]; MRI costs [41]; per-person primary care expenditure compared with usual care [42]. The SCOPiC RCT presented a comprehensive cost analysis, reporting that stratified care for sciatica was more costly than usual care [17]. Four studies reported use of healthcare services, but in various ways: likelihood for ED visits and hospitalisations [42]; use of non-surgical treatments [29]; percentage of patients having no further treatment after one year [22] and rate of return to pathway following discharge [21] (Table 2).

2. Patient Flow

Outcomes relevant to patient flow primarily concerned wait-times and were reported in eight pathways [22, 28–34, 38, 41] (Table 2). The SSP reported both no difference [29] in wait-times for surgeon appointment for pathway patients and shorter wait-times [28] when compared to conventional referrals; both studies reported significantly shorter wait-time for MRI scan for pathway patients. Five studies compared wait-times before and after the introduction of a pathway, reporting shorter wait-time for interface assessment than pre-pathway wait-time for consultant appointment [22, 30, 41], and decreased wait-times for consultant appointments following introduction of physiotherapy-led triage [34] and telehealth-assisted triage [31]. One study reported that pathway changes may have resulted in care delays for standard referrals but not for 'fast-track' patients [33].

3. Clinical Outcomes

 Nine pathways reported clinical outcomes, mostly pertaining to interface services and using patient-reported outcome measures (PROMs) [17, 19–22, 26, 27, 29, 36–38, 41] (Table 2). Studies did not provide comparative data [22, 26, 36, 37, 41], and some lacked methodological [21, 36, 37] or statistical detail [37]. NERP associated better clinical outcomes for the 'triage and treat' pathway service at 6 and 12-month follow-up with shorter pain duration [19, 20], and reported greater improvement in quality of life (EQ-5D) than a comparator non-pathway service [21]. The SCOPiC Trial [17] reported no difference in time to first resolution of symptoms nor in PROMs between stratified and usual care, although stratification was slightly less effective on quality-adjusted life-year (QALY) analysis (Table 2). Wu et al. [29] found no difference in surgery type nor outcome between patients referred for surgical assessment via SSP interface clinic and conventional referrals.

4. Service-User Satisfaction and Experience

 Outcomes within this domain were reported by eleven pathways [18–21, 23, 25, 29, 31, 34, 36, 37, 41, 43] (Table 2). Mostly high levels of patient satisfaction with care were reported using ordinal instruments [19, 20, 25, 29, 31, 36, 37, 41, 43]. High referrer satisfaction rates with physiotherapy-led triage [25, 34] and fair to good referrer satisfaction with telehealth-assisted pathway [31] were reported, albeit with low response rates (18–40%). Four studies reported qualitative data [18, 21, 23, 25], and key findings are summarised in Table 2. Martin et al. [21] highlighted key findings from a range of stakeholders for consideration in preparing to implement their pathway in new areas. Ryan et al. [23] explored the experiences of patients with sciatica managed on a NELBPP-consistent pathway and identified common challenges and pathway issues. The SCOPiC trial [18] reported on both patient and clinician experiences of their stratified care pathway.

Discussion

This review identified and reported key features of published clinical pathways for LBP/radicular leg pain, how pathways coordinated care across healthcare boundaries and summarised and evaluated the evidence for the identified pathways.

There were clear similarities across pathways: all originated from high-income, western countries; initial patient access was generally via GP with multiple disciplines contributing to care. Pathways were most commonly developed to address over-burdened health care systems, aiming to address long wait times for surgeon appointments. Interface services, primarily physiotherapist-led, were used almost universally, serving a clear purpose in managing the boundary between primary and secondary care by triaging patients for surgical opinion or conservative management. It follows that the included studies mainly examined outcomes pertaining to the effect of interface services on markers of patient flow and healthcare resource use, such as wait-times and referral rates to surgical clinics. Interface services were associated with improved service efficiency, with high rates of independent management, high conversion rates to intervention from subsequent consultant appointments, reduced wait times for care, and high levels of patient satisfaction (Table 2). The wide ranges of values reported for rates of independent management in interface services and conversion rates from consultant appointment to intervention may reflect differing access criteria for interface services and diverse scopes of practice of triage clinicians in different services.

Interface services were evenly represented across community (seven pathways) and hospital settings (eight pathways), and although clinical guidelines consistently recommend demedicalising LBP, with care provision in community settings for the majority of patients, this was not a commonly stated driver for pathway development. Although integrated care is advocated, pathways demonstrated limited integration, perhaps reflecting that care integration was not a stated priority in pathway development, with only four pathways citing the promotion of integrated, shared or interprofessional care as a motive. Using Ahlgren and Axelsson's model that conceptualises the degree of integration on a five-level continuum ranging from 'full segregation' to 'full integration', the included clinical pathways demonstrated either 'full segregation' or, at best, 'linkage' between primary and secondary care, the two most basic levels of integration [45]. 'Linkage' between primary and secondary care was mainly demonstrated by regional pathways or those considered local manifestations of national pathways, suggesting that higher levels of care co-ordination were achieved by pathways with broader geographic and organisational scopes of implementation. A recent comparative study of LBP care pathways similarly reported that no pathways demonstrated full integration of primary and secondary care [46].

The evidence presented is undermined by the typically low methodological quality of included studies, usually observational service evaluations with retrospective data collection and limited statistical analysis. The pragmatic study designs may reflect challenges in implementing high-quality research in real-world clinical settings, particularly involving clinical pathways where the research intervention crosses different levels of healthcare provision with multiple providers and professions. The cost-effectiveness of clinical pathways in the provision of LBP care has not been adequately evaluated. Future research of economic impact should employ comprehensive cost evaluation pre- and post-pathway implementation and include implementation costs. Despite the clear need to improve clinical outcomes in LBP care to address the associated disability burden, this was seldom a stated motive for pathway development and has not been sufficiently evaluated in the literature. To examine clinical effectiveness, future clinical pathway evaluations require robust methodologies with comparative data and prospective data collection to strengthen findings, and the SCOPiC trial is an excellent example of how high-quality research in this area can be achieved with a well-designed RCT. Improving LBP outcomes has been linked to implementation of best-practice recommendations, one of the most stated reasons for pathway development in the included studies, but the literature did not examine if clinical pathways can bridge the evidence-practice gap in LBP care. Determining the ability of clinical pathways to optimise guideline-concordant care, as well as the most effective strategies to enhance pathway and LBP guideline fidelity should be research priorities. The richness of the findings presented by the qualitative studies emphasises the merit of hearing the patient's voice and experience in pathway development and evaluation, and the need for future research of these complex interventions to move beyond the use of limited ordinal satisfaction questionnaires, which tend to be biased towards eliciting positive ratings [47].

This study benefitted from the robust approach of the systematic review methodology, including the use of independent review authors. The review authors found limitations in using the EPHPP quality assessment tool across the wide range of study designs, but this was offset by the use of independent reviewers to reach consensus. Some studies provided details primarily for the portion of the pathway being evaluated in their paper. Study heterogeneity precluded meta-analysis and the diverse range of outcomes assessed limited comparisons between studies. Recommended outcome measures for the evaluation of spinal clinical pathways, agreed amongst the international spinal research and clinical communities, may facilitate meta-analysis in future systematic reviews with stronger conclusions on effectiveness and guidance for optimal implementation.

Conclusion

A limited volume of research has evaluated clinical pathways for LBP/radicular leg pain that cross the traditional primary-secondary care boundary. Most of the research studies were pragmatic, retrospective evaluations of interface services that were primarily introduced to assist over-burdened secondary care resources in high-income countries. This is reflected in the predominance of outcomes concerning patient flow and healthcare resource use with triage services associated with increased efficiency of care delivery. Pathways demonstrated basic levels of care integration across primary and secondary care. The potential of clinical pathways to enhance LBP clinical outcomes has not been adequately evaluated, nor has their ability to deliver cost-effective or guideline-concordant care or to enhance care integration across the primary-secondary care divide. In addressing these knowledge gaps, future research should prioritise RCTs and be more cognisant of the patient experience.

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Author contribution All authors contributed to the systematic review conception and design. The literature search and title/abstract screen were completed by CM and CC. Full-text screening and evaluation of methodological quality were completed by two independent authors, CM and CC/HF. Data extraction was completed by CM and verified for accuracy by CC/HF. At all stages, GM was available for resolution of between author discrepancies. The first draft of the manuscript was written by CM and all authors contributed to subsequent versions of the manuscript. All authors read and approved the final manuscript.

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Data availability All data generated or analysed during this review are included in this published article and its supplementary information files.

Code availability Not applicable.

Declarations

Conflict of interest The authors have no conflict of interest to declare that are relevant to the content of this article.

Consent to participate Not applicable.

Consent for publication Not applicable.

Ethics approval No ethical approval was required for this systematic review.

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