

BMJ Open Musculoskeletal care pathways for adults with hip and knee pain referred for specialist opinion: a systematic review

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ABSTRACT

Objective Musculoskeletal care pathways are variable and inconsistent. The aim of this systematic review was to evaluate the evidence for the clinical and/or cost effectiveness of current care pathways for adults with hip and/or knee pain referred for specialist opinion.

Design Systematic review.

Data sources Electronic database searches were carried out in MEDLINE, MEDLINE In-Process, Cumulative Index of Nursing and Allied Health Literature, Embase, PEDro, PubMed, Web of Science, Cochrane Central and Health Management Information Consortium without language restriction from 1990 onwards. Websites were reviewed for grey literature.

Eligibility criteria All study designs and documents that considered care pathways for adults with musculoskeletal hip and/or knee pain referred for specialist opinion were screened by two reviewers. Risk of bias was assessed using The Critical Appraisal Skills Programme checklist for randomised controlled trials and the Joanna Briggs Institute checklists.

Data extraction and synthesis Data extraction and quality assessment were performed by one reviewer and checked by a second. Findings are reported narratively.

Results The titles and abstracts of 1248 articles were screened and 140 full-text articles retrieved. 19 papers reporting 17 studies met the study inclusion criteria. Quality was low due to study design and methodological flaws. Most of the outcomes relate to organisational process at the 'meso' level of a whole systems approach.

Conclusion It can be concluded that the pathway is not linear, containing variations and activity loops. The available evidence suggests that, from the point of referral for specialist opinion, a model is required that integrates the skills of all the different healthcare professionals and streamlining is required to ensure that individuals are seen by the healthcare professional that best meets their needs. There is very limited evidence of patient experience informing knee and hip care pathways.

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INTRODUCTION

The incidence of musculoskeletal pain is known to be high globally, and to be a significant factor in causing disability through reduced functioning and lower levels of general well-being. In 2016, musculoskeletal problems were the second most common

Strengths and limitations of this study

- Designed and reported using Preferred Reporting Items for Systematic Reviews and Meta-Analyses.
- Robust search strategy designed by the Specialist Unit for Review Evidence.
- Two reviewers checked eligibility of manuscripts.
- Two reviewers checked study quality.
- Insufficient randomised control trials for a meta-analysis.

cause of work-related absence in the UK, with an estimated 30.8 million days lost.¹ The impact on concurrently existing long-term conditions, health resource utilisation and societal impacts such as work disability are considerable.^{2–4} Worldwide, musculoskeletal conditions account for 21.3% of the total years lived with disability within the general population,⁵ but this is even higher in older populations; reaching a high point of 28.5% in the 50–69-year-old age group and 23.4% in the 70-year plus age group.⁶ As a result, individuals may not be able to be physically active with a possible knock-on effect on the prevention and treatment of other non-communicable diseases.⁷

Hip and knee osteoarthritis (OA) is one of the most common musculoskeletal conditions and causes chronic joint pain after non-specific low back pain. It has a prevalence of 3.7% in the population, affecting approximately 268 million individuals worldwide. This increases to 14% in individuals over 65 years.^{6,8} A number of evidence-based guidelines exist detailing what treatment should be delivered. These centre on the delivery of self-management, education, exercise and joint replacement surgery when needed or at the end stage of OA.^{9–11}

What is less frequently considered in both research and guidelines is the organisation of care: where it is carried out, how it is done and the complex inter-relationships between these factors and the type of treatment given.

For example, the first point of contact for most individuals seeking help for a musculoskeletal condition is usually a general practitioner (GP) in a primary care setting.^{9,12-14} If treatment fails or assessment for surgery is required, then a 'specialist' opinion will be sought, which may occur in primary or secondary care.⁹ The 'specialist' could be from any one of several healthcare professionals: a physiotherapist, a GP with a specialist interest in musculoskeletal conditions, an advanced nurse practitioner or an orthopaedic surgeon.^{15,16} Understanding the variation and interrelationships between how and where treatment is delivered is required in order^{6,12,17,18} to optimise care around patient outcomes and efficiency in a multilevel whole systems approach.⁶ At a macro level, there needs to be consideration of the scope and functionality of healthcare policy, healthcare systems and socioeconomic factors. At a 'meso' level, considerations relate to health services, clinical workforce, competencies, education and infrastructure. Finally, at a 'micro' level, considerations relate to the involvement of an individual in their own care.⁶ Applying this to care pathway research helps to identify where the evidence already exists and enables more effective research planning.

This review will focus on the care pathway for chronic hip and knee pain for adults referred for specialist opinion. The joint-specific focus at this point in the care pathway recognises the rising demand for both care and joint replacement surgery in this group, which is associated with rising healthcare costs.¹⁹ Thus, the following are the aims of this review:

1. to understand the evidence for the clinical and/or cost effectiveness of current care pathways for adults with chronic hip/knee pain patients accessing care for specialist opinion.
2. to identify the key information required to inform effective referral decisions for specialist opinion.

METHODS

This systematic review is reported in accordance with Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidance.²⁰ A protocol with full details of the methodology for this systematic review, including the search terms used has been published, so only a brief overview is provided here.²¹

Search strategy

Searches were undertaken without language restrictions for both published and grey literature that considered models of service delivery and care pathways. All sources were searched for evidence published between 1 January 1990 and 20 December 2017. The following databases were searched: Medline, Medline in Process, Cumulative Index of Nursing and Allied Health Literature, Embase, Pedro, PubMed, Web of Science, Cochrane Central Register of Controlled Trials and Health Management Information Consortium. In addition, websites were searched for grey literature, care pathways and policy documents. Finally,

reference lists were checked and citations tracked for included evidence. Full details of the search, including the Medline search strategy are provided in the published protocol.²¹ Details of searches for other databases are available on request from the authors.

Eligibility

All study designs and documents that considered care pathways for musculoskeletal hip and/or knee pain for adults from the point of referral for specialist opinion meeting the European Pathway Association definition of a care pathway²² were included. No diagnostic criteria were specified as musculoskeletal pathways accept all hip/knee pain without such criteria. Publications were excluded if their primary focus was generalised inflammatory arthropathy, stroke, postsurgical care or musculoskeletal care pathways that did not include hip and knee joint-specific data.

Data selection

After duplicate results were removed, two reviewers (KB and Cheryl Cleary, FM) independently considered citations against inclusion/exclusion criteria. At both title/abstract and full-text stages, disagreement was resolved by discussion with a third reviewer.

Quality assessment

Studies were appraised using validated checklists for specific research designs: The Critical Appraisal Skills Programme checklist for randomised controlled trials (RCTs)²³ and the Joanna Briggs Institute checklists for qualitative studies, cross-sectional surveys, longitudinal studies and case series.²⁴ After a sample of studies had been piloted to ensure a baseline of understanding and agreement between reviewers, papers were assessed by one reviewer (KB) and checked by a second (FM).

Data extraction and synthesis

Data were extracted into a standardised form. After piloting, data extraction was completed by one reviewer (KB) and checked for accuracy by another (FM). The protocol²¹ specified the utilisation of a mixed-methods approach to data synthesis. However, only one qualitative study was identified. This combined with the low quality and heterogeneity of the evidence precluded any mixed-methods synthesis or meta-analysis. Consequently, the results are presented narratively by primary outcome type reported. These categories were identified inductively from the data: patient flow (the movement of patients between healthcare professionals, services and organisations),²⁵ professional competency (the level of agreement in diagnosis and treatment between Advanced Physiotherapy Practitioners and orthopaedic surgeon or expert physicians), resource use including clinical and cost effectiveness, time (changes in patient waiting times experienced as a direct result of the way the pathway was delivered), patient satisfaction and patient experience. These outcomes are organised according to where they

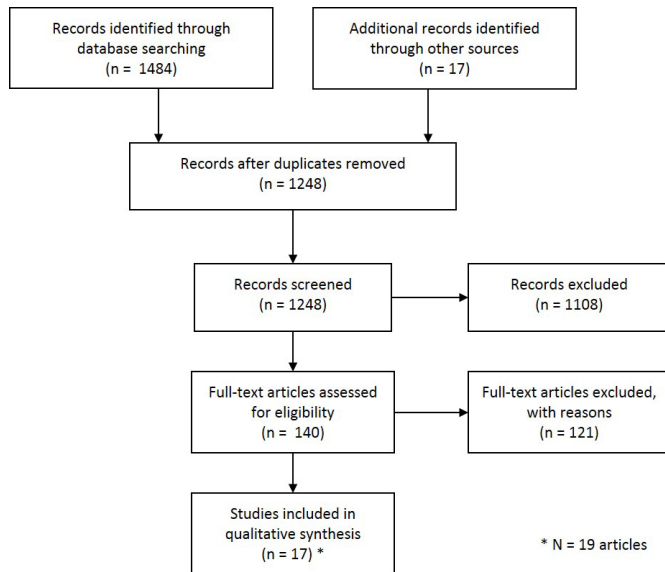


Figure 1 Preferred Reporting Items for Systematic Review and Meta-Analysis Protocols flow chart for study selection.

apply in a multilevel, whole systems approach, that is, macro, meso or micro level.⁶

Patient and public involvement

A patient representative was involved at the planning stages and helped to formulate the aims of this systematic review.

RESULTS

Pathways for the delivery of care for hip and knee pain after referral for specialist opinion have not been widely researched. Although 1248 citations were identified, most of the primary research in this area has looked at generalised pathways for musculoskeletal conditions that are not specific to body regions. In most instances, findings were not disaggregated and therefore were excluded. Thus, of the 140 full-text articles assessed for eligibility, 121 were excluded and only 19 articles reporting the results of 17 studies were included in the analysis (see figure 1).

All the included studies were from high income, developed countries: eight from the UK,^{16 26–32} five from Canada,^{33–37} two from New Zealand^{15 38} and one each from Australia³⁹ and the Netherlands.⁴⁰ There were some differences in the patient population being evaluated across the studies: seven studies included patients with a knee condition only,^{26 27 30–33 37} two studies with a hip condition only^{16 29} and eight studies had patients with hip or knee pain.^{15 28 34–36 38–40} Specific characteristics of each study are described in table 1.

Thirteen of the studies were based on healthcare activity in hospitals within secondary care,^{27–39} with consultation led by a physiotherapist in three studies,^{15 30 34} physiotherapist and orthopaedic surgeon/expert physician in seven,^{27 28 31 33 35 37 39} orthopaedic surgeon-led in two^{29 38} and GP led care in the remaining studies.^{16 26 32 40} Only

three studies had a clinic that was located in primary care.^{32 35 38} Each of these also had a subset of patients that were assessed in a hospital-based secondary care clinic. These studies were not set up to allow comparison between the primary and secondary care clinics.

The study designs of the articles in the analysis included: one RCT,^{26 41 42} four cohort studies,^{16 28 38 40} one qualitative interview study,³² one case report,³⁹ five cross-sectional designs,^{15 27 33 35 36} two case series,^{29 34} one prospective diagnostic study³⁷ and two audits.^{30 31} Using the hierarchy of evidence proposed by the Oxford Centre for Research Evidence,⁴³ the overall level of evidence from the included studies is low. The limitations of the studies included in this systematic review are described in table 2. The most common weaknesses in the study designs related to incomplete reporting of the outcomes for cost and resources use^{16 34} and clinical outcomes^{16 30 31}; low external validity and generalisability due to sample size,³³ population studied^{36 38} or number of assessors^{28 37}; insufficient length of follow-up^{34 35}; reporting bias^{29 32 34 36 38 39}; selection bias due to sampling.^{16 27 34} Overall, the RCT was reasonably well designed, but there was no blinding and allocation to group was not concealed.^{26 41 42}

The outcome types and study-specific outcomes are described in table 2 along with the numerical data reported. Variations in care pathways in terms of where and who delivers the different pathways are displayed in figure 2 along with the types of outcome that have been evaluated in each study and the study reference. If there were two arms to the pathway, then the associated outcome types are aligned between the arms.

Meso level: patient flow

Johnson *et al*²⁹ evaluated an orthopaedic-led fast-tracking pathway for hip replacement. Physiotherapists assessed patients on the orthopaedic waiting list that an orthopaedic surgeon had screened off for physiotherapist management. The fast-track pathway resulted in 23/25 patients being given a total hip replacement, but a further 15 patients from the routine route were also listed for joint replacement surgery.

A study by Pearse *et al*³⁰ benchmarked the ability of advanced practice physiotherapists to independently assess 85% of patients on an orthopaedic waiting list, following strict criteria set out by a surgeon. Fifty patients with knee pain had been screened by a surgeon and deemed appropriate for physiotherapy assessment and non-surgical management. Physiotherapists failed to meet the benchmark; only independently assessing 66% of patients. Of the patients they were not able to manage, 17 (34%) were referred to a consultant, with only 11 being listed for surgery. The authors concluded that physiotherapists did not efficiently manage patients on the orthopaedic waiting list. However, the benchmark set was not underpinned by research.

The Damask Study Group^{26 41 42} conducted a RCT to assess the effectiveness and cost effectiveness of GP referral to MRI and provisional orthopaedic appointment,

Table 1 Characteristics of included studies

First author	Country	Design	Description and aims	Population	Pathway characteristics
Alken and McCol ³³	Canada	Cross-sectional	Diagnostic accuracy, diagnostic and treatment concordance between physiotherapist and two orthopaedic surgeons	24 patients aged 16–75 years with knee or shoulder pain (no other demographic info provided). Excluded if lumps or other complex diagnostic problems	Outpatient orthopaedic clinic: one physiotherapist and one surgeon
Aiken <i>et al</i> ³⁴	Canada	Case series	Impact of advanced physiotherapist practitioner in outpatient orthopaedic clinics on (a) hip and knee replacement wait times and (b) reduction of surgeon time in clinic	107/147 knee and hip OA patients (no demographic info provided) referred for arthroplasty assessment	Singular tertiary care hospital: one physiotherapist
Damask TEAM ²⁶ (primary paper) Damask ⁴¹ Damask ⁴²	UK	Randomised trial	To assess the effectiveness, cost effectiveness and effect of GP referral to MRI and a provisional orthopaedic appointment compared with referral to an orthopaedic specialist without prior MRI for patients with knee problems	533 patients with knee problems consulting GP in primary care	Referral direct to orthopaedic clinic compared with imaging and referral to orthopaedic clinic
Decary <i>et al</i> ³⁷	Canada	Prospective diagnostic study	To evaluate diagnostic and surgical triage concordance between a physiotherapist and expert physicians assessing the diagnostic validity of the physiotherapist musculoskeletal examination without imaging	Physiotherapist and physicians	Orthopaedic and primary care family medicine clinic
Desmeules <i>et al</i> ³⁵	Canada	Cross-sectional	Level of agreement between advanced physiotherapy practitioner (APP) and orthopaedic consultants for diagnosis, triage, treatment recommendations and imaging	120 patients, 18+ years with hip (9/120) or knee pain (97/120). Of knees 41 OA, 12 Anterior Cruciate Ligament, 18 meniscal, 12 Patello femoral joint pain. Age mean 54.7 years, 54% female, 55% male, BMI 29.1. Number of comorbidities mean 0.78	Orthopaedic waiting list: one APP, three surgeons
Dickens <i>et al</i> ²⁷	UK	Cross-sectional	To investigate the physiotherapist diagnostic accuracy of acute knee injuries compared with a surgeon	One surgeon, two physiotherapists, 50 consecutive patients referred to a orthopaedic knee clinic	Point of referral into surgeon led outpatient clinic for acute knee injuries
Doerr <i>et al</i> ³⁹	Australia	Case report	Describes benefits of a service redesign and reports on outcomes of the redesign	Hip and knee arthritis (no details given)	General hospital orthopaedic unit. New service model included improved referral and triage systems; dedicated orthopaedic surgeon-led clinics; additional physiotherapist-led assessment clinics; patient education and tailored counselling, rehabilitation and discharge planning and surgical waiting list management
Farrar <i>et al</i> ²⁸	UK	Retrospective cohort	Compares referral to a musculoskeletal assessment service (MCATS) with direct referral to an orthopaedic clinic for hip and knee complaints. Differences in expediency of diagnosis and treatment and appropriateness of triage determined	Review of electronic records for 432 adult patients (median age 67, 52% male) referred for hip and knee conditions from one medical practice over 5 years. 226 seen in MCATS and 206 in orthopaedic clinic	Orthopaedic clinic surgeon-led. MCATS staffed by one orthopaedic surgeon and one APP
Gwynne-Jones <i>et al</i> ¹⁵	New Zealand	Prospective cohort	To assess the effectiveness of the Joint Clinic in prioritisation of those patients deemed most in need of First Specialist Assessment (FSA) and optimising non-operative management for those who may not need surgical assessment	358 new patients referred with hip and knee OA	Hip and knee OA patients referred by GP to nurse or physiotherapists led 'Joint clinic'. Assessment carried out by nurse or physiotherapist. Surgeon assessment only if surgical opinion required. Triage according to referral letter and imaging. 18 days from referral to assessment
Inglis <i>et al</i> ³⁸	New Zealand	Prospective cohort	To determine the number of patients that miss out on a FSA and assess the unmet need in the community	Referrals, 838/1733 for hip and 895/1733 for knee from GP to orthopaedic department. 90% were for arthritis	Consultant led triaging of referrals to streamline those that are most likely to benefit/need TKR or THR. The outcomes from referral letter triage were list for surgery, refer to FSA, insufficient capacity for FSA despite patient meeting criteria, low priority, return to GP

Continued

Table 1 Continued

First author	Country	Design	Description and aims	Population	Pathway characteristics
Johnson <i>et al</i> ²⁹	UK	Case series	Evaluates a fast-track assessment clinic to identify which GP referrals are most likely to require hip replacement and if it is feasible to streamline patients into a one stop fast-track clinic	Patients referred for hip assessment	A surgeon led fast track outpatient clinic in one district general hospital. Clinical team of consultant, specialist registrar and house officer
MacKay <i>et al</i> ³⁶	Canada	Cross-sectional, reliability	To compare the diagnostic accuracy and clinical recommendations made by APP and an orthopaedic surgeon	Two physiotherapists and three orthopaedic surgeons. Patients with hip and knee arthritis	GP referrals into orthopaedic surgeon led clinic
Parfitt <i>et al</i> ¹⁶	UK	Retrospective cohort	Comparison of waiting times between a primary case-based APP-led service and traditional GP to surgeon route for placing patients directly onto the surgical waiting list	Data review of referrals for 170 patients listed for total hip replacement. 130 referrals from the APP pathway and 40 from the traditional route	Community-based APP service listing to secondary care for THR versus GP referral to the orthopaedic service for assessment
Pearse <i>et al</i> ²⁰	UK	Prospective audit	To prospectively audit the activity of APP's. Benchmark: APP's independently assess 85% patients referred to them, patient satisfaction should be 89%, no patient should be referred to an orthopaedic surgeon with the same complaint	33% of 150 new referrals were for the knee and seen by APP's over 6 months	APP's in secondary care orthopaedic clinics with 5 years postqualification and 3 years of musculoskeletal experience. Surgeons decided who the APP should assess
Rabey <i>et al</i> ³¹	UK	Prospective audit	Series of audits to determine the referral rate and appropriateness of referrals for consultant opinion and imaging	Patient with lumbar spine and knee pain	Hospital-based APP clinics, referrals from GP practice. Referrals indicating need for surgery were seen by the surgeon
Robling <i>et al</i> ²²	UK	Qualitative semi-structured interviews	To conduct a detailed exploration of patient experiences of waits for specialist diagnosis and surgery of knee injuries at one UK site	45 patients with knee injury, 18–65 years with confirmed internal derangement of the knee, or awaiting specialist assessment or on waiting list for imaging	Orthopaedic department
Smink <i>et al</i> ⁴⁰	The Netherlands	Prospective cohort	To describe healthcare use after implementation of a stepped care strategy to reduce underutilisation of non-surgical treatment modalities and use of medication or diagnostic procedures	313 patients with hip and knee OA that had not visited GP for same problem within last 3 months	157 GPs in 70 practices in primary care. The stepped care strategy has three sequential steps for care in terms of treatment modalities and diagnostic procedures. This is based on guidelines

APP, advanced physiotherapy practitioner; BMI, body mass index; GP, general practitioner; OA, osteoarthritis; THR, total hip replacement; TKR, total knee replacement.

Table 2 Key findings from the reviewed papers

Authors	Outcome type	Summary of findings	Study limitations
Alken and McCol ³³	Professional competency	Diagnostic concordance between physiotherapist and surgeon: k=80% agreement for knee diagnoses, agreed 21 out of 24 times.	Low subject numbers and only two clinicians so low external validity/generalisability of findings. Diagnostic accuracy and treatment concordance not reported, as no specific knee data.
Alken <i>et al</i> ⁶⁴	Waiting time, patient satisfaction	Physiotherapist deemed 36/107 (34%) as non-surgical cases. All 36 were offered conservative treatment and so were 64/71 (90%) that were sent to see surgeon. Referral to consultation waiting time reduced from average of 140 to 40 days. Numbers on surgical waiting list went from 200 to 59. Satisfaction reported as being high or very high (services and skill). Nobody requested a consultation with consultant, 80% response rate.	More than one time point needed to evaluate longer term success. Only one physiotherapist, so low generalisability. Patient satisfaction survey not referenced and no definition of 'high satisfaction' given. Potential for reporting bias through unreturned questionnaires Resource implications of adding the physiotherapist to clinic and cost effectiveness were not evaluated. Rest of data about joint replacement care.
Damask TEAM ²⁵ (primary paper) Damask ⁴¹ Damask ⁴²	Clinical and cost effectiveness	No significant difference between MRI and orthopaedic groups for changes in diagnosis (p=0.79) or treatment plans (p=0.059). Significant increase in diagnostic (p<0.0001) and therapeutic confidence in the MRI group. Compared with controls, patients in MRI group improved mean SF-36 physical functioning score by 2.81 (95% CI: -0.26 to 5.89) (p=0.072). Patients randomised to MRI improved mean Knee QoL-26 physical functioning scores by 3.65 (95% CI=1.03 to 6.28) (p=0.007). At a cost per quality adjusted life year threshold of £20 000, there is a 0.81 probability that early MRI is a cost-effective use of National Health Service (NHS) resources.	Pragmatic RCT with no allocation concealment or blinding.
Decary <i>et al</i> ⁸⁷	Professional and patient flow	High diagnostic inter-rater agreement between the physiotherapist and physicians (k=0.89; 95% CI: 0.83 to 0.94). Good inter-rater agreement for triage recommendations of surgical candidates (k=0.73; 95% CI: 0.60 to 0.86).	Variation in experience between the physiotherapists and physicians 1–2 vs 20 years. Only one physiotherapist and four physicians and interperson comparison varied. Low external validity
Desmeules <i>et al</i> ⁸⁵	Professional competency, resource use and patient satisfaction	Physiotherapist vs consultant: very high diagnostic agreement (88%); k=0.86; 95% CI: 0.80 to 0.93 and triage (surgical vs conservative) agreement k=0.77; 95% CI: 0.65 to 0.88. No difference in imaging requested: physiotherapist vs consultant: X-ray 42% vs 50%, MRI 13% vs 16%, CT 17% vs 20%. Conservative treatments: physiotherapist referred for more advice and education (98% vs 81%); more NSAIDs (47% vs 24%); more joint infiltrations (43% vs 11%); more supervised physio (62% vs 16%) and more home exercises (84% vs cons. 10%) (p<0.05). No difference between clinicians for non-prescription analgesics, walking aids and orthosis. Visit length for physiotherapists significantly longer (13.0min vs 11.2min) (p<0.05). Patients significantly more satisfied with physiotherapist 93.2 vs 86.1 (p<0.001).	The design would have been strengthened by repeating data collection over more than one time point to re-evaluate satisfaction after trying out the intervention/course of treatment the patients were referred for. Longer term should collect data on referral rates. Cost and cost-benefit of the physiotherapist pathway are not discussed. Of note, there were no referrals for weight management.
Dickens <i>et al</i> ²⁷	Professional competency	Correct diagnosis by surgeon 92% cases, physiotherapists 80%–84%	Potential for bias, all treatment based on consultant assessment only. Bias relating to improvement at arthroscopy assumed to confirm diagnosis made by surgeon. No statistical analysis (kappa).
Doerr <i>et al</i> ⁶⁹	Time	Reduced waiting time for initial orthopaedic assessment from 10 to 3 months. Improved equity of access through service redesign	Reporting bias as high level of patient satisfaction in terms of wait time for assessment, but no data presented from experience surveys or interviews. Cost of this redesign is not discussed. Most of the findings are not relevant as report on surgical/post-surgical care.
Farrar <i>et al</i> ²⁸	Resource use and time	1588 referrals over 5 years, 432/1588 hip or knee referrals. 206 referred to orthopaedic clinic and 226 to MCATS. Groups were similar for gender, and joint affected. Orthopaedic patients significantly older (mean of 8 years) (p=0.01). Orthopaedic clinic longer wait for initial consultation (4 days) (p=0.05). MCATS had longer time from referral to diagnosis (11 days) (p<0.001), had more consultations before diagnosis (p<0.001). Those who were reviewed by a surgeon had more consultations than those seen by APP (p=0.03). Cross-sectional imaging used more in MCATS (p=0.04). Surgical management more common for orthopaedic patients (36% vs 16%) and joint injection (19% vs 12%) p<0.001. Higher use of non-surgical treatment in MCATS (67% vs 44%) p<0.001. 5% MCAT patients referred for orthopaedic opinion.	Only one GP surgery. Follow-up over more than one time point would allow evaluation of referral rates. Cost effectiveness needs to be evaluated.

Continued

Table 2 Continued

Authors	Outcome type	Summary of findings	Study limitations
Gwynne-Jones <i>et al</i> ¹⁵	Patient flow and resource use	Referrals: 150 (44%) hip OA, 189 (56%) knee OA. 54 patients referred directly for FSA (mean Oxford knee score 13), and 89 after subsequent review. Oxford knee score for those in FSA slightly worse than those managed in joint clinic ($p < 0.001$). Of 143 referred for FSA, 115 triaged to surgical route, 18 recommended surgery but did not meet the prioritisation score, 10 not recommended surgery. Oxford knee score of those managed conservatively improved from 22 to 25 ($p = 0.0013$).	It is assumed that the patients were consecutive
Inglis <i>et al</i> ³⁸	Patient flow and resource use	HIPs: 87 (10%) referrals from surgeons so directly listed for arthroplasty. 393 (47%) accepted for FSA. 66 (8%) declined as insufficient referral info. 134 (16%) not seen as lower priority condition. 158 (19%) not seen due to insufficient capacity for FSA/op KNEES: 113 (13%) surgeon referrals and patients directly listed. 295 (33%) referrals accepted into FSA. 84 (9%) declined due to insufficient referral information. 173 (19%) low priority condition so not give n FSA. 230 (26%) no capacity in service to be given an FSA appointment.	Mainly arthritis population as other types of conditions and traumatic conditions seen via another pathway/healthcare route. Therefore, generalisability less clear. Potential selection bias as unclear who ended up in the no capacity group.
Johnson <i>et al</i> ³⁹	Resource use	Fast-track screening criteria correctly predicted the outcome of the treatment offered at the orthopaedic clinic in 38/52 patients. Of those fulfilling the criteria for the fast-track screening clinic, 23/25 had a THR. Of the 28 who did not fulfil the criteria, 15 had a THR.	Reporting bias, the high conversion in the group who did not fulfil the criteria for the fast-track service is not acknowledged. This new service could create inequality in care. Better design required to evaluate predictive value of screening tool using regression analysis in a larger sample size.
MacKay <i>et al</i> ³⁶	Patient flow and professional competency	Good agreement on recommendation for orthopaedic consultation surgeon 82% vs physiotherapist 86.9%, $k = 0.69$. Good agreement on recommendation for arthroplasty surgeon 43.5%, physio 32.3%, $k = 0.70$. Surgeon and physio agreed on type of knee complaint in 69% of cases. There was variation in the conservative treatment given. Surgeon more frequently referred for rehabilitation services. Physiotherapists more frequently followed up patients and gave exercise and education advice in clinic.	No kappa values for clinical diagnostic accuracy or nonsurgical management recommendations. Testing order in clinic not clear.
Parfitt <i>et al</i> ¹⁶	Clinical competency Resource use	Over 2 years APP's listed 130 patients for THR, 127/130 had a THR. This was compared with traditional route of referral by GP to orthopaedics. Waiting time for surgery APP vs GP route 21.4 weeks vs 24.7 weeks. Potential cost saving of £145 for those directly listed.	Reporting bias, numbers receiving THR from traditional referral route not reported. Unclear if groups matched at baseline. It is not clear how a potential saving of £145 for the APP route was calculated. Not consecutive cases.
Pearse <i>et al</i> ³⁰	Patient flow and resource use	150 cases, 33% (50) knees, of these 43% (17) were referred to a consultant. The outcome of the consultant review was arthroscopy 11 cases, advice five cases and injection one case. This means that for the knee the APP's did not meet the benchmark of independently assessing 85% of cases.	Most of the data collected is not split by joint, and therefore cannot be reported. Although a referenced protocol for triage was used the referrals were also checked by a consultant as to who should see APP.
Rabey <i>et al</i> ³¹	Patient flow and resource use	9% of all new referrals seen by APP's referred for surgical opinion. Of these, 42% were knee conditions with 84% going on to have surgery. Of patients seen by APPs 36% referred for a knee X-ray and 23% for knee MRI.	Not all data broken down per joint so cannot be reported. No numbers given just percentages. Unsure if patients consecutive so potential selection bias.
Robling <i>et al</i> ³²	Patient experience	Four themes identified: 1. Inadequate information. 2. Social and psychosocial cost of waiting. 3. Varying ability to cope, both passive and proactive strategies demonstrated. 4. Reported variation in clinician effectiveness in managing the condition and ability to provide support. A care pathway with improved information provision may help improve patient well-being.	Unclear if there was more than one researcher analysing the manuscripts (selection bias). Good reported, credible data. Low generalisability

Continued

Table 2 Continued

Authors	Outcome type	Summary of findings	Study limitations
Smink <i>et al</i> ¹⁰	Resource use	<p>Most commonly used treatment modalities were education, paracetamol, lifestyle advice, exercise therapy and non-steroidal anti-inflammatories. Cumulative percentage of users for each modality increased over time.</p> <p>At 2 years, percentage use of modalities for each step in the pathway was:</p> <p>Step 1: education 242 cases (82%), paracetamol 250 cases (83%), lifestyle advice 214 cases (73%) and glucosamine 95 cases (34%).</p> <p>Step 2: exercise therapy 187 cases (63%), NSAID cases 155 (54%), dietician 27 cases (14%).</p> <p>Step 3: intra-articular injections 65 cases (23%), multidisciplinary care 23 cases (8%).</p> <p>Low use of dietetics</p> <p>In 0–6 months, 67 cases (21%) had surgeon consultation. After 2 years, this increased to 129 cases (45%).</p> <p>In 0–6 months, 16 cases (5%) had surgery and at 18 months, this had increased to 39 cases (14%).</p>	<p>Low uptake by patients. Patients were not recruited consecutively. GPs could select.</p>

APP, advanced physiotherapy practitioner; FSA, First Specialist Assessment; GP, general practitioner; MCATS, musculoskeletal assessment service; OA, osteoarthritis; RCT, randomised controlled trial; THR, total hip replacement.

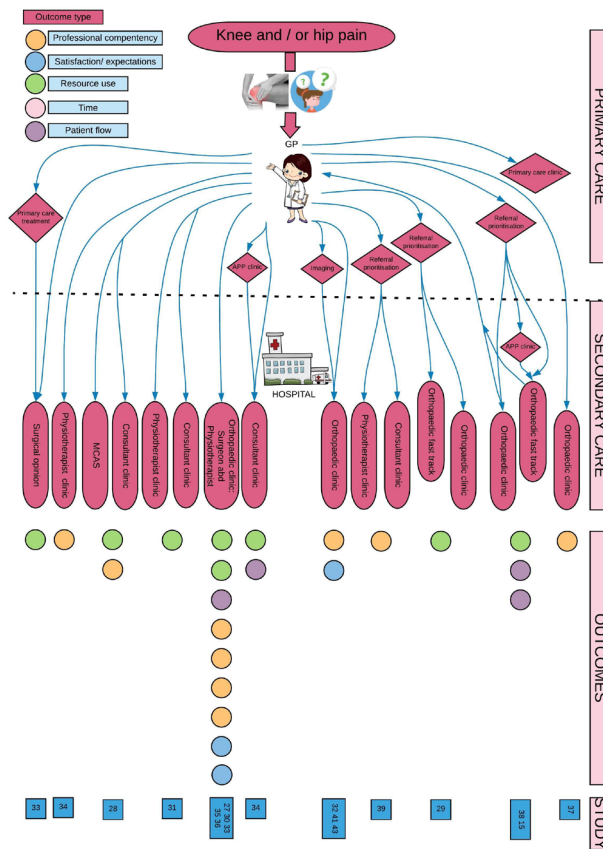


Figure 2 Care pathway and outcome types evaluated in the included studies. APP, advanced physiotherapy practitioner; MCAS, multidisciplinary team assessment clinic.

compared with referral to an orthopaedic specialist only, for knee problems. The study found that having an MRI did not change the diagnosis or the treatment plan, but there was greater treatment and diagnostic confidence among GPs in the MRI group. Patients in this group also reported a statistically significant improvement in their physical functioning and quality of life.

Gwynne-Jones *et al*¹⁵ evaluated the effectiveness of a prioritisation service for assessment of hip and knee OA. A physiotherapist and a nurse assessed patients referred into a joint clinic and surgeons only assessed those identified at referral as requiring specialist opinion, or who were subsequently rereferred from the joint clinic. Of the 339 patients included, 54 were referred directly to the surgeon and a further 89 were referred after the initial assessment. Of the 143 referred to the specialist clinic, 115 were listed for or underwent surgery. The authors concluded that this service freed up valuable surgeon time.

Only one study by Inglis *et al*³⁸ reported outcomes that can be applied at a macro level within a complex multilevel system. This evaluated the effectiveness of consultant-led triage of referrals for patients requiring a fast-track specialist surgical opinion. Of the patients referred, 57% of those with hip pain and 46% of those with knee pain were assessed or directly listed. Others were

sent elsewhere because of insufficient clinic capacity, or they were deemed lower prioritisation based on referral information, or their referral was incomplete.

Meso level: professional competency

Overall, agreement in diagnosis between the professional groups was reported to be high for three studies, with kappa values ranging from 0.80 to 0.89 agreement,^{33 35 37} where 1.0 represents perfect agreement. The study by MacKay *et al*³⁶ reported agreement between physiotherapists and orthopaedic surgeons in 69% of cases. Compared with arthroscopy, physiotherapists were found to identify the correct diagnosis in 80%–84% of cases.²⁷ Agreement on treatment type (surgical vs non-surgical) between physiotherapists and physicians was found to be 77% in one study³⁵ and Decary *et al*³⁷ reported a kappa value of 0.73.

Macro level: resource use

The implementation of a stepped care pathway in primary care was described by Smink *et al*.⁴⁰ The pathway resulted in the increased use of non-surgical treatments for hip and knee OA over 2 years. Dietary interventions were less well used. Of the patients 21% were referred for orthopaedic opinion in the first 6 months and at 2 years, this had risen to 45%.

Meso level: resource use

A number of studies described the resources used at the point of referral for a specialist opinion but there were differences in the type or structure of the pathway being reported on.

Farrar *et al*²⁸ evaluated a multidisciplinary team assessment clinic (MCAS), compared with direct referral to an orthopaedic service. Referral to the MCAS clinic resulted in more appointments before a working diagnosis was achieved compared with the orthopaedic route ($p < 0.001$). However, there was a greater use of non-surgical treatments and lower surgical referrals in the MCAS service (16% vs 36%; $p < 0.001$).

In a study by Rabey *et al*,³¹ 9% of new referrals seen by an Advanced Physiotherapy Practitioner were referred for surgical opinion. Of these, 42% were for knee conditions. Of the patients referred with knee conditions, 84% went on to have surgery.

Only one study¹⁶ described a potential cost saving by using advanced physiotherapy practitioners to directly list patients for total hip replacement surgery rather than going via an orthopaedic clinic. This saving was calculated to be £145 per patient. MacKay *et al*³⁶ found that for ongoing treatment in a clinic, physiotherapists were more likely to give exercise and education at the time of consultation while a surgeon was more likely to refer to rehabilitation services (which would include exercise and education), adding a further step and potential delay in the patient receiving the correct care.

Desmeules *et al*³⁵ did not find any difference in the referral rates for imaging between orthopaedic surgeons

and Advanced Practitioners. Conversely, an MCAS service was reported to result in a greater use of imaging ($p = 0.04$).²⁸ In terms of numbers of imaging referrals made by Advanced Physiotherapy Practitioners, Rabey *et al*³¹ reported that 36% were referred for a knee X-ray and 23% for an MRI.

Meso level: time

Physiotherapy-led triage resulted in a reduced wait for surgery from 140 to 40 days.³⁴ Using physiotherapists to directly list patients for total hip replacement, rather than going via an orthopaedic appointment resulted in a shorter wait for surgery (21.4 weeks vs 24.7 weeks).¹⁶ Conversely an MCAS service resulted in a longer waiting time from referral to diagnosis ($p = 0.05$).²⁸ Doerr *et al*³⁹ described a new referral process and found a reduced patient wait for an initial specialist appointment but the time is not specified. Desmeules *et al*³⁵ found that advanced physiotherapist practitioners had longer consultation times than orthopaedic surgeons.

Micro level: patient satisfaction and patient experience

Two studies^{34 35} evaluated patient satisfaction using questionnaires. Both found a high level of satisfaction with the physiotherapy triage. One³⁵ reported greater patient satisfaction with the care by the physiotherapists than the surgeon and the other³⁴ reported that no patients requested a subsequent appointment with the orthopaedic surgeon.

Only one interview study evaluated patient experience.³² This related to being on a waiting list for specialist diagnosis and surgery. Four themes were identified; inadequate information, the social and psychosocial cost of waiting, coping strategies and the varying effectiveness and support provided by clinicians. The recommendation was to improve information provision to improve patient well-being.

DISCUSSION

This review first aimed to understand the evidence for the effectiveness of current care pathways for adults with chronic hip/knee pain patients accessing care for specialist opinion. The second aim was to identify the key information required to inform effective referral decisions for a 'specialist' assessment.

The complexity and variation of the patient pathway from primary care referral to receiving a specialist opinion is clearly highlighted. Subtle variances were found in the pathway, such as different referral prioritisation,^{15 38 41} fast-tracking systems,²⁹ different models of care⁴⁰ and a varying role for different professional groups.^{16 27 28 31 35–37} Also, despite musculoskeletal conditions being a rising global health concern,⁸ all the research identified was conducted in high-income countries, limiting the generalisability of the findings.

Only a limited number of studies were eligible to be included as most studies did not disaggregate their

findings to report hip-specific and knee-specific data. More joint-specific research is therefore required, as when an individual is referred for a specialist opinion, this is the point in the care pathway where an individual is moving from generalist to a specialist approach. Only one RCT was identified that evaluated the effectiveness of referral pathways for specialist opinion, which means there is insufficient evidence to draw solid conclusions on the effectiveness of current care pathways or the key information required to inform effective referral decisions. However, the findings demonstrate complexity in the care pathway around referral for a specialist opinion and are informative about pathway and organisational processes. Discussion of the findings around a multi-level whole systems approach assists with understanding where the evidence is located and what research needs to happen next.

Macro level

The findings from only one study were relevant at the level of healthcare systems and policy. Smink *et al.*⁴⁰ described healthcare utilisation after the implementation of a stepped care strategy in the treatment of hip and knee OA. The authors reported that the pathway resulted in a higher percentage of patients being managed with non-surgical treatment before referral for specialist opinion, but that referral to a dietician for weight management was underutilised. However, the usefulness of this research is limited by the lack of baseline data to compare healthcare utilisation premodel and postmodel implementation. The acceptability of this model to GPs and patients also needs to be questioned. While 157 GPs were recruited from eight practices, healthcare utilisation data were only available for 313 patients. Two patients per GP is a very low number considering how many individuals present with joint pain. Second, patient experience of the pathway does not appear to have been considered. Further research on the effectiveness of the pathway for GPs and patients, along with greater integration of dietician referrals should provide additional answers.

Meso level

Most of the studies included in this systematic review looked at patient flow (fast-track models, referral prioritisation and advanced practice triage) and resource use. The findings suggest that advanced practice physiotherapists are comparable to orthopaedic surgeons in their diagnosis of knee and hip pain^{27 33–37} and triage to surgical or non-surgical treatment. This would suggest that physiotherapists have the skills required to triage patients referred for a specialist opinion about their hip or knee pain.

Despite this finding, there appears to be less consistency in treatment allocation and healthcare resource use when applied in practice across different care pathways. This may be due to differences in staff skill mix, triaging processes and patient referrals. For example, in one study higher conversion rates to surgery are reported from an

orthopaedic clinic, while advanced physiotherapy practitioners have higher referral rates to non-surgical treatment options.²⁸ In addition, practice within orthopaedic clinics can vary with physiotherapists providing more exercise and advice and surgeons having higher referral rates to rehabilitation services.³⁶ Surprisingly, considering the importance of weight management in the treatment of joint pain and OA, no studies have specifically evaluated referral rates to dietician services by these different professional groups.^{9 44 45}

In terms of imaging referrals (X-ray and MRI), there is inconsistency in the referral rates across different clinics or professional groups.^{28 35} A RCT evaluating the clinical and cost effectiveness of GP referral for specialist opinion^{26 41 42} found that clinicians had more diagnostic and treatment confidence when referring for an MRI and that patients on this pathway had a better level of functioning. The concern about the study is that it only considered GPs as the primary referrers. It also failed to take into consideration other treatments recommended within the primary care pathway.⁹

From the evidence, it is clear that, regardless of nuances in the care pathways considered, there will be a proportion of patients assessed in a physiotherapy clinic who will require a surgical opinion and also patients referred to an orthopaedic clinic who will require conservative management.^{15 16 30 38} This occurred despite triaging and referral systems implemented to fast track or direct patients to the most appropriate service.^{15 29 38} Additionally, both the fast-tracking criteria²⁹ and surgeon screening of referrals,³⁰ seem to lack sensitivity and specificity as individuals move between surgical and conservative pathways. The quality of the research means that insufficient evidence exists regarding predictor variables to identify the key variables to inform specialist referral. Thus, the current evidence suggests that an innovative workforce model is required that integrates the skills of the different professionals to meet individual patient needs and tackle these complexities. This would give patients access to clinicians with expert knowledge of both conservative and surgical treatments at the same locality. In addition, better streamlining is required so that only those individuals requiring specialist opinion are referred. Taken together, this may help avoid delays in care, interruptions of patient flow and suboptimal use of resources.^{25 46}

Several studies found pathway steps that reduced waiting times from referral to diagnosis and the number of surgeries.^{16 28 34 39} Unfortunately, they did not evaluate the cost, sustainability or resource implications of these steps. No studies evaluated the demand for the care pathway and the capacity available or needed to meet this demand and achieve target waiting times. Thus, no conclusions can be drawn about the potential cost–benefit or effectiveness of care, regardless of the pathway.

The majority of the available evidence is based on outcomes around professional competency for clinics containing a mixture of professional groups. A better understanding of the roles, learning, communication

and expertise within this clinic structure is required, along with a robust assessment of pathway effectiveness. Although physiotherapists have been found to have high diagnostic accuracy, the complexities and diversity of the pathways presented means that future decisions on pathway design are unlikely to be as simple as replacing a surgeon with a physiotherapist.

Micro level

Measuring patient experience and using this to inform care is a key component of healthcare quality.⁴⁷ Only two papers were identified that considered patient satisfaction^{34 35} and methodological flaws make it difficult to draw meaningful conclusions. There is limited research evidence on patient expectation and experience of hip and knee pain pathways as only one qualitative study was identified.³² The study recommended the development of a pathway with better information provision. This is an important consideration given the potential complexities and variations in care pathways that patients may experience and needs to be addressed in future studies. None of the studies evaluated differences in experience according to the location of the specialist clinic. This is a key area for patient involvement for future pathway design research.

There are some limitations of the review. First, our search for qualitative studies should also have included patient needs regarding the pathway. Second, our interpretation of clinical and cost effectiveness has been limited by a lack of randomised control trials in this area.

CONCLUSION

The evidence base as exists is fragmentary and of low methodological quality. While several pathways have been developed and implemented,^{13 48} the evidence base underpinning them is limited. Only one RCT was identified, so there is insufficient evidence of the clinical and cost effectiveness of the care pathway for individuals accessing care for specialist opinion. What is clear is that the pathway is not linear: there are variations and potential activity loops. Most of the studies report organisational process outcomes, at the 'meso' level of a multisystems model, which focus on the skills and treatment decisions of the different professions. Based on the evidence presented, it is suggested that when an individual is referred for a specialist opinion, a pathway which integrates the skills of all the different professions is required. Additionally, individuals need to be referred to the professional who is most likely to be able to help them address their joint-related problems, for example, a physiotherapist or specialist GP for non-surgical treatment. No key predictor variables were identified in the literature to inform when an individual should be referred for specialist opinion. There is an urgent need for further research that is designed with the involvement of patients to develop and determine effective and cost-effective pathway(s).

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