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Do physical therapists follow evidence-based guidelines when managing musculoskeletal conditions? A systematic review

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ABSTRACT

Objectives: Physicians often refer patients with musculoskeletal conditions to physical therapy. However, it is unclear to what extent physical therapists' treatment choices align with the evidence. The aim of this systematic review was to determine what percentage of physical therapy treatment choices for musculoskeletal conditions agree with management recommendations in evidence-based guidelines and systematic reviews.

Design: Systematic review

Setting: We performed searches in MEDLINE, EMBASE, CINAHL, CENTRAL, AMED, Scopus and Web of Science combining terms synonymous with "practice patterns" and "physical therapy" from the earliest record to April 2018.

Participants: Studies that quantified physical therapy treatment choices for musculoskeletal conditions through surveys of physical therapists, audits of clinical notes, and other methods were eligible for inclusion.

Primary and secondary outcomes: Using medians and interquartile ranges, we summarised the percentage of physical therapists who chose treatments that were recommended, not-recommended and had no recommendation, and summarised the percentage of physical therapy treatments provided for various musculoskeletal conditions within the categories of recommended, not-recommended and no recommendation. Results were stratified by condition and how treatment choices were assessed (surveys of physical therapists vs. audits of clinical notes).

Results: We included 94 studies. The median percentage of physical therapists who chose recommended treatments for musculoskeletal conditions ranged from 54% (n=23 studies; surveys) to 63% (n=8 studies; audits). For treatments not-recommended, the range was 27% (n=20; audits) to 43% (n=37; surveys). For treatments with no recommendation, the range was 45% (n=31; audits) to 81% (n=37; surveys).

Conclusions: Many physical therapists seem not to follow evidence-based guidelines when managing musculoskeletal conditions. There is considerable scope to increase use of recommended treatments and reduce use of treatments that are not recommended.

Keywords: Non-pharmacological; musculoskeletal; physical therapy; treatment choices; systematic review; high-value care; low-value care.

Strengths and limitations of this study

- This is the first study to summarise the proportion of physical therapy treatment choices for musculoskeletal conditions that agree with management recommendations in evidence-based guidelines and systematic reviews
- We used a systematic approach to identify studies on physical therapy treatment choices and classified recommendations for physical therapy treatments according to evidence-based guidelines and systematic reviews
- Experts provided feedback to help refine our classification, and a second reviewer double-checked all the extracted data to ensure accuracy
- The main weakness is that primary studies only reported treatment choices for individual treatments and not combinations of treatments. As a result, we could not determine the percentage of physical therapists that provided only recommended treatments, only not-recommended treatments, only treatments with no recommendation, or other treatment combinations
- Recommended treatments such as advice and reassurance might not have been documented in clinical notes or listed in a survey because they are viewed as a routine part of physical therapy. This could have underestimated the proportion of physical therapists that provided recommended treatments

1. Introduction

Musculoskeletal conditions (such as back and neck pain) have remained the leading cause of disability worldwide over the past two decades and the burden is increasing (1). Concerns about the harms of medicines such as opioids, and new evidence on the lack of effectiveness of common surgical procedures have shifted guideline recommendations for musculoskeletal conditions so there is now more explicit recommendation of non-pharmacological treatments such as those provided by physical therapists. For example, the Center for Disease Control and Prevention (CDC) recommends exercise therapy instead of opioids in the management of chronic pain (2). Similarly, the 2018 Royal Australian College of General Practitioners (RACGP) guideline for the management of hip and knee osteoarthritis discourages opioids and arthroscopy for knee osteoarthritis and recommends aquatic and land-based exercise (3).

Physicians often refer patients with musculoskeletal conditions to physical therapy for non-pharmacological care. In the United States, there are nearly 250,000 physical therapists (4) and in Australia there are now more practising physical therapists than general practitioners (5, 6). It is important to appreciate however that there are a range of non-pharmacological treatments that physical therapists can provide; some such as exercise are recommended in guidelines for musculoskeletal conditions while others such as electrotherapy are recommended against (7).

While there has been considerable attention in medicine on whether physicians are providing recommended care, there has been less attention on whether health services that physicians refer for involve recommended care (8). Determining whether physical therapists are providing treatments recommended in evidence-based guidelines when they manage musculoskeletal conditions is an important step towards ensuring evidence-based care across all health care settings.

The aim of this systematic review was to summarise the proportion of physical therapy treatment choices for musculoskeletal conditions that agree with management recommendations in evidence-based guidelines and systematic reviews.

2. Methods

This review was conducted in accordance with the "Preferred reporting items for systematic reviews and meta-analyses" (PRISMA) statement (9) and was prospectively registered on PROSPERO (CRD42018094979). Due to the size of the review, other research questions in our registered protocol (including physical therapy treatment choices for cardiorespiratory and neurological conditions) will be addressed in separate manuscripts.

2.1. Data Sources and Searches

We conducted a comprehensive keyword search in MEDLINE, EMBASE, Cumulative Index to Nursing and Allied Health Literature, Cochrane Central Register of Controlled Trials, Allied and Complementary Medicine, Scopus and Web of Science, from the earliest record until April 2018. Our search strategy combined terms relating to "practice patterns" and "physical therapy" (Supplementary Table 1) and was designed to capture studies investigating physical therapy treatment choices for any condition (as per our registered protocol). We performed citation tracking and reviewed the reference lists of included studies to identify those missed by our initial database search.

Two independent reviewers (JZ and MO) performed the selection of studies by subsequently screening the title, abstract and full-text of studies retrieved through our electronic database search. Any disagreements between the two reviewers were resolved through discussion.

2.2. Study Selection

We included any study that reported physical therapy treatment choices for musculoskeletal conditions through surveys of physical therapists (with or without vignettes), audits of

clinical notes and other methods (e.g. surveys of patients). We only included full-text studies in English. There was no restriction on the musculoskeletal condition treated (e.g. neck pain, rehabilitation post-knee arthroplasty) or practice setting (e.g. private, public), but we excluded studies that reported treatment choices for conditions where there were no known effective or ineffective physical therapist-delivered treatments. We also excluded studies that only quantified physical therapists' use of assessment procedures, outcome measures, referrals, treatments without specifying a target condition, pharmacological treatments (e.g. recommending paracetamol) or treatments outside the usual scope of physical therapy practice (e.g. injections); and studies where physical therapy treatment choices were unable to be separated from other healthcare providers.

2.3. Data Extraction and Quality Assessment

One reviewer (JZ) independently extracted individual study characteristics (e.g. condition, country, participant demographics) and proportions that quantified physical therapy treatment choices. A second reviewer (MO) double-checked the extracted data to ensure accuracy. Discrepancies were resolved by discussion between the two reviewers and re-checking data against the original citation. We contacted authors when it appeared relevant data were not reported.

The methodological quality of included studies was assessed independently by two reviewers (JZ and MO) using a modified version of the 'Downs and Black' checklist. Any disagreements between the two reviewers were resolved through discussion. We modified the original 27-item 'Downs and Black' checklist (10) and selected eight items that were relevant to studies on treatment choices (Supplementary Table 2). For item eight, we considered the following assessments of treatment choices as 'accurate': observation, audits of clinical notes, audits of billing codes, treatment recording forms and validated surveys.

2.4. Data Synthesis

The following definitions were used to classify treatments as recommended, not-recommended and no recommendation:

- **Recommended treatments** included physical therapy treatments endorsed in well-recognised evidence-based clinical practice guidelines (e.g. guidelines from the National Institute for Health and Care Excellence, NICE) or found to be effective in recent systematic reviews. Treatments recommended in guidelines were further categorised as those that 'must be provided' ('core' treatments) and those that 'should be considered'. When guidelines specified 'core' treatments, only these treatments were considered 'recommended' in our primary analysis (see 2.5.1). Otherwise, treatments that 'should be considered' were accepted as 'recommended'.
- **Not-recommended treatments** included physical therapy treatments not recommended in guidelines or found to be ineffective in recent systematic reviews
- **Treatments with no recommendation** included physical therapy treatments where guideline recommendations and evidence from systematic reviews was inconclusive; or where treatments had not been investigated in a systematic review.

We used one clinical practice guideline per condition to classify physical therapy treatments (primary guideline) and contacted leading experts to help us select our primary guideline and refine our classification for a number of conditions (see Acknowledgements). If we found a physical therapy treatment that was not mentioned in the primary guideline, we searched in other evidence-based clinical practice guidelines and systematic reviews to inform our classification (Supplementary Table 3). We selected recently published high-quality systematic reviews where possible.

2.4.1. Assessments of treatment choices

Data on physical therapy treatment choices were divided into two main categories (and analysed separately) due to differences in how each category is interpreted:

2.4.2. Treatment choices assessed by surveys completed by physical therapists (with or without vignettes)

Interpretation. Surveys completed by physical therapists' yielded data on the percentage of physical therapists that provide (survey without vignette) or would provide (survey with vignette) a particular treatment for a condition they frequently treat.

Survey without vignette. Physical therapists outlined the treatments they provide for a condition or rated how often they provide a particular treatment for a condition (e.g. "frequently"; "sometimes"; "rarely"; or "never"). When studies reported how often treatments were provided, we extracted the percentage of care that was provided at least 'sometimes'. We combined data when studies separated survey responses by different samples of physical therapists (usually by country or practice setting). Some surveys were completed by a senior physical therapist on behalf of the physical therapy department within a hospital (e.g. management following knee arthroplasty).

Survey with vignette. Physical therapists outlined the treatments they would provide for a particular case (vignette). For studies that included multiple vignettes, we took an average of physical therapists' responses across vignettes of equal sample sizes or used data from the vignette with the highest sample size.

2.4.3. Treatment choices assessed by audits of clinical notes, audits of billing codes, treatment recording forms, clinical observation, or surveys completed by patients

Interpretation. These assessment measures yielded data on the percentage of patients that received a particular physical therapy-delivered treatment in a single treatment session or throughout an episode of care (i.e. from initial consultation to discharge).

Audits of clinical notes and billing codes were performed retrospectively in the included studies. Treatment recording forms provided similar information to clinical notes, except they were often implemented as part of a study or registry on treatment practices (prospective). Within a study, we combined data across samples that presented with the same condition (e.g. physical therapists from different countries treatment low back pain).

2.5. Analysis

We used counts and ranges to summarise study characteristics for each condition. We used medians and interquartile ranges (IQR) to summarise the percentage of physical therapy treatment choices that involved treatments that were recommended, not-recommended and had no recommendation. We provided an overall result for all studies and then separately for individual musculoskeletal conditions (e.g. low back pain). Since physical therapists can provide multiple treatments for the same patient, and treatment choices were summarised across studies, the percentage of treatment choices that involved treatments that were recommended, not-recommended and had no recommendation do not sum to 100%. For example, 70% of physiotherapists might provide recommended treatments for low back pain, but the same percentage might also provide some treatments that are not-recommended or have no recommendation.

2.5.1. Treatment choices that involved treatments that were recommended, not-recommended and had no recommendation

Where possible, recommended treatment was based on treatment choices involving all 'core' treatments recommended in guidelines (i.e. physical therapists 'must' or 'should' provide).

For example, the NICE guidelines for low back pain recommend that all patients receive advice and education to support self-management, reassurance, and advice to keep active (7). Since studies did not report combinations of treatments, we used the lowest value across all 'core' treatments. For example, if 30% of physical therapists provide reassurance and 50% provide advice to stay active, we used 30% as the proportion of treatment choices that involved recommended treatments. This is because no more than 30% of the sample could have provided both reassurance and advice to stay active ('core' treatments). If guidelines did not mention 'core' treatments or if there were no guidelines for a condition, we used data from the most frequently provided recommended treatment that 'should be considered' or was found to be effective in a systematic review. We used data from the most frequently provided treatment that was not recommended and had no recommendation to provide an estimate of the percentage of physical therapists' treatment choices that involve at least one treatment that is not-recommended and had no recommendation. For studies that reported treatment choices stratified by the duration of symptoms (acute vs. chronic) or different settings (inpatient vs. outpatient), we used the highest value of treatments that were recommended, not-recommended and had no recommendation across the strata. We summarised the percentage of physical therapy treatment choices that were recommended, not-recommended and had no recommendation across all musculoskeletal conditions where guidelines recommended 'core' treatments.

2.5.2. Physical therapy treatments provided for various musculoskeletal conditions

We summarised the percentage of physical therapy treatments provided for various conditions within the categories of recommended, not-recommended and no recommendation. Treatments that were procedurally similar and had the same recommendation (i.e. recommended, not-recommended and no recommendation) were grouped together. For example, according to the NICE low back pain guidelines,

mobilisation, manipulation and massage should all be 'considered' (7). Hence, these were grouped as 'manual therapy'. Studies rarely reported combinations of physical therapy treatments, so we used data from the most frequently provided treatment where appropriate. For example, if 67% of physical therapists provide massage for acute low back pain and 20% provide mobilisation, we used 67% as the best estimate for the percentage of physical therapists that provide manual therapy.

2.6. Patient or Public Involvement

Patients and members of the public were not involved in the design of this study

3. Results

After removing duplicates and screening 8,567 titles and abstracts and 254 full-texts reports, 94 studies were included (Fig 1). Physical therapy treatment choices were investigated for low back pain (n=48 studies) (11-58), knee pain (n=10) (32, 34, 57, 59-65), neck pain or whiplash (n=11) (15, 18, 32, 34, 51, 66-71), foot or ankle pain (n=5) (72-76), shoulder pain (n=7) (15, 51, 77-81), pre or post knee arthroplasty (n=6) (46, 82-86) (including one study of hip and knee arthroplasty (86)), and other musculoskeletal or orthopaedic conditions (where treatment choices were only reported in one study or where one of either recommended or not-recommended treatments could not be inferred from guidelines or systematic reviews) (n=18) (87-104). We contacted 15 authors for data (regarding 18 studies); 12 responded and five were able to provide the data we requested (regarding six studies) (15, 16, 22, 64, 89, 100). A summary of study characteristics across conditions is in Table 1. Characteristics of included studies is in Supplementary Table 4.

Seven studies investigated treatment choices for shoulder pain; four (15, 78, 80, 81) focused on subacromial pain syndrome (the most common form of shoulder pain (105)), two (77, 79)

included patients with various diagnoses (including subacromial pain syndrome) and one (51) did not specify a diagnosis (Supplementary Table 4). Evidence on the management of subacromial pain syndrome was used to categorise treatment choices for all studies on shoulder pain. Similarly, evidence on the management of lateral ankle sprains was used to categorise treatment choices for all studies on acute ankle injuries (n=2/3 studies on lateral ankle sprains (75, 76)) and evidence on the management of knee osteoarthritis for all studies on knee pain (excluding one study on acute knee injuries (57) and another on a mixed sample of hip and knee osteoarthritis (60) – see Supplementary Table 5).

3.1. Methodological quality

Individual study scores ranged from 4-8 (out of a possible 8) with a mean score of 6.0 (median=6) (Supplementary Table 6). The most common methodological limitations included failing to report that people who were prepared to participate were representative of the population from which they were drawn (n=88/94) and not using an accurate assessment of treatment choices (n=55/94). All studies clearly described their main findings and used appropriate statistical tests, and most scored positive on the remaining checklist items (Supplementary Table 6).

3.2. Treatment choices that involved treatments that were recommended, not-recommended and had no recommendation (all studies)

3.2.1. Treatment choices assessed by surveys completed by physical therapists (with or without vignettes)

The median percentage of physical therapists that provide (or would provide) treatments that were recommended, not-recommended and had no recommendation was 54%, 43% and 81% for all musculoskeletal conditions, respectively; 35%, 44% and 72% for low back pain; 85%, 38% and 97% for neck pain and whiplash; 93%, 90% and 79% for shoulder pain; 58%, 45% and 98% for knee pain; 39%, 14% and 7% for lateral ankle sprains; 29%,43% and 98% for

plantar fasciitis; and 93%, 52% and 62% following knee or hip arthroplasty (Table 2) (Figure 2).

3.2.2. Treatment choices assessed by audits of clinical notes, audits of billing codes, treatment recording forms, clinical observation, or surveys completed by patients

The median percentage of patients that received physical therapy-delivered treatments that were recommended, not-recommended and had no recommendation was 63%, 27% and 45% for all musculoskeletal conditions, respectively; 50%, 18% and 43% for low back pain; 79% (not-recommended) and 57% (no recommendation) for neck pain and whiplash; 76%, 8% and 62% for shoulder pain; 65%, 21% and 53% for knee pain; 45% (no recommendation) for lateral ankle sprains; 87% (recommended) and 90% (no recommendation) for plantar fasciitis; and 65%, 43% and 2% following knee or hip arthroplasty (Table 2) (Figure 2).

3.3. Physical therapy treatment choices for various musculoskeletal conditions

The results summarising the percentage of physical therapy treatments provided for various musculoskeletal conditions that were recommended, not-recommended and had no recommendation can be found in Table 3. For example, as assessed by surveys of physical therapists, the most frequently provided recommended treatment for acute low back pain that physical therapists 'must provide' was advice to stay active (median=32%, IQR: 13% to 55%, n=7 studies). The most frequently provided not-recommended treatment for acute low back pain was McKenzie therapy (median=36%, IQR: 24% to 37%, n=6) (Table 3). Treatment choices for conditions that were only reported in one study or where one of either recommended or not-recommended treatments could not be inferred from guidelines or systematic reviews can be found in Supplementary Table 5.

4. Discussion

Many physical therapists seem not to follow evidence-based guidelines when managing musculoskeletal conditions. Our review highlights that there is considerable scope to increase the frequency with which physical therapists provide recommended care for musculoskeletal conditions and reduce the use of care that is not-recommendation or has no recommendation to guide its use. Across all musculoskeletal conditions, 54% to 63% of physical therapy treatment choices involve recommended care, while 27% to 43% involve at least one treatment that is not recommended and 45% to 81% at least one treatment that has no recommendation.

4.1. Strengths and weaknesses of the study

The primary strength of this review is that we used a systematic approach to identify studies on physical therapy treatment choices and classified recommendations for physical therapy treatments according to evidence-based guidelines and systematic reviews (Supplementary Table 3). Experts provided feedback to help refine our classification, and a second reviewer double-checked all the extracted data to ensure accuracy.

The main weakness of this review is that primary studies only reported treatment choices for individual treatments and not combinations of treatments. As a result, we could not determine the percentage of physical therapists that provided only recommended treatments, only not-recommended treatments, only treatments with no recommendation, or other combinations of treatments. Another possible limitation is that recommended treatments such as advice and reassurance were not documented in clinical notes or listed in a survey because they are viewed as a routine part of physical therapy. For example, only 12 out of the 48 studies on low back pain reported that physical therapists provide advice to stay active, while even less

reported reassurance (n=2) or advice and education to support self-management (n=2). This could have underestimated the proportion of recommended treatment choices.

4.2. Strengths and weaknesses in relation to other studies

Our finding that approximately half of treatment choices involved recommended treatments is similar to previous studies of healthcare. For example, the CareTrack study in Australia found that 57% of healthcare provided by general practitioners, specialists, physiotherapists, chiropractors, psychologists and counsellors was high-value (106), while the earlier CareTrack study in the United States found a figure of 55% (107). The percentage of recommended treatment choices for low back pain however was lower in our review (35-50%) when compared to estimates from the Australian (72%) (106) and United States (69%) CareTrack studies (107). One difference to our study is that the CareTrack studies used consensus of experts to judge the value of care; whereas we based this decision upon evidence-based practice guidelines and systematic reviews. Another difference is that the CareTrack studies only assessed healthcare decisions through audits of clinical notes; we used audit of clinical notes, surveys, vignettes, and clinical observation.

4.3. Meaning of the study

Our results suggest that physical therapy treatment choices for musculoskeletal conditions are often not based upon research evidence. There was extensive use of not-recommended treatments and treatments without recommendations; for some conditions treatments that were not-recommended or had no recommendation were more common choices than recommended treatments (Figure 2). As there are now over 42,000 clinical practice guidelines, systematic reviews and clinical trials to guide physical therapy practice, the challenge in physical therapy is applying this evidence to practice. Professional associations have a potential role to play in this area. Unfortunately, recent marketing from professional associations, popular social media handles and leading journals have emphasised the

importance of early referral to physical therapy (108) rather than the nature of physical therapy care provided. The high percentage of non-evidence-based treatment choices in our review suggests that referring patients with musculoskeletal conditions for early physical therapy – without emphasising the importance of the type of non-pharmacological care they receive – may be unwise.

Treatment waste is another important issue highlighted in our review. Even when patients receive recommended treatments they also usually receive not-recommended treatments and treatments that have no recommendation to guide their use. With nearly $100 billion spent on physical therapy, optometry, podiatry, or chiropractic medicine each year in the United States (109), the waste due to non-evidence-based physical therapy is likely enormous. Further, billing patients for physical therapy treatments that are not evidence-based could also be considered unethical; the Vision Statement of the American Physical Therapy Association makes clear that there is an expectation that "*physical therapists and physical therapist assistants will render evidence-based services"* (110).

4.4. Unanswered questions and future research

Understanding what drives poor patterns of physical therapy care is important as it will guide the design of strategies to ensure the use of treatments that are not-recommended for musculoskeletal conditions does not simply shift from medicine to allied health. One possible explanation is the large variation in physical therapists who receive training in evidence-based practice (21-82%) and can critically appraise research papers (48-70%) (systematic review of 12 studies (111)). Physical therapists with a poor understanding of evidence-based practice might be misled into providing treatments with weak supporting evidence. Another explanation is a lack of awareness of, and agreement with, evidence-based clinical practice guidelines. For example, only 12% of physical therapists are aware of clinical practice guidelines for low back pain (survey of 108 physical therapists) (112) and 46% agree that

guidelines should inform the management of low back pain (survey of 274 physical therapists) (113).

A recent initiative that could help physical therapists replace treatments that are not-recommended with recommended treatments is *Choosing Wisely* (114). Over 225 professional societies worldwide endorse *Choosing Wisely* and have published lists of tests and treatments that clinicians and their patients should question. This includes physical therapy associations in Australia, the United States and Italy. Testing strategies to increase adoption of *Choosing Wisely* recommendations among physical therapists is important. However, existing *Choosing Wisely* recommendations are likely not maximising the potential of the campaign to reduce the use of physical therapy treatments that are not-recommended in guidelines and systematic reviews. For example, half of the Australian Physiotherapy Association *Choosing Wisely* recommendations target diagnostic testing that is not-recommended, while other recommendations target treatments not part of routine physical therapy care, such as whirlpools for wound management and bed rest following diagnosis of acute deep vein thrombosis (American Physical Therapy Association). Our review highlighted the most frequently provided not-recommended non-pharmacological physical therapy treatments across a range of musculoskeletal conditions (Table 3) and could be used to enhance the relevance of future *Choosing Wisely* recommendations. Further, in countries where physical therapists bill for specific treatments (e.g. the United States), another approach could be to restrict funding for anything but recommended physical therapy treatments.

5. Conclusion

Our results suggest that that there is considerable scope to increase the contribution physical therapists could make to managing musculoskeletal conditions by increasing the frequency with which they provide treatments that are recommended in guidelines and systematic reviews and reduce their use of treatments that are not-recommended or have no recommendations to guide their use.

Authors' contributions

All authors critically revised the manuscript for important intellectual content and approved the final manuscript. Please find below a detailed description of the role of each author:

- Joshua R Zadro: conception and design, analysis and interpretation of data, drafting and revision of the manuscript, and final approval of the version to be published
- Mary O'Keeffe: conception and design, interpretation of data, drafting and revision of the manuscript and final approval of the version to be published
- Christopher G Maher: conception and design, interpretation of data, drafting and revision of the manuscript and final approval of the version to be published

The Corresponding Author (JZ) attests that all listed authors meet authorship criteria and that no others meeting the criteria have been omitted.

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Table 1. Summary of study characteristics by condition

Condition	**N**	**Countries**	**Age range*;** mean (SD) unless stated otherwise	**Experience*;** mean years (SD) unless stated otherwise **Low:** lowest values from studies **High:** highest values from studies	**Sample size range***	**Assessment measure**
Musculoskeletal						
Low back pain (one study did not contribute data) • Acute (n=18) • Subacute or chronic (n=17) • No duration specified or unable to stratify (n=26)	48	United States (n=9); UK (n=8); Netherlands (n=6); Ireland (n=6); Canada (n=5); New Zealand (n=3); Australia; Brazil; Denmark; Ghana; India; Nigeria Norway; South Africa; Spain; Sweden; Thailand	PTs: 32.6 (7.8) to 47 (9.3) Pts: 34.5 (17) to 53.9 (14.5).	**Low:** 2 (IQR 5) or 77.3% between 1-5y **High:** 24 (9.4) or 50% between 15-24y	PTs: 44-1239 Pts: 42-8714 Treatment sessions: 1151-12387	Survey with vignettes=12 Survey without vignette=11 Treatment recording forms=15 Audit of clinical notes=7 Survey of Pts=1 Audit of billing codes=1 Clinical observation=1
Neck pain and whiplash[a] • Neck pain (n=8) • Whiplash (n=3)	11	United States (n=3); Australia (n=2); various (n=2); Canada; Nigeria; Singapore; Spain; Sweden**	PTs: 32.6 (7.8) or 60% >40y Pts: 35.5 (11.5) to 53.9 (14.5)	**Low:** 8.4 (7.4) or 14.8% <3y **High:** 16 (12)or 38% ≥20y or median (range) 20y (1–47)	PTs: 27-278 Pts: 532-2491	Survey with vignettes=2 Survey without vignette=5 Treatment recording forms=2 Audit of clinical notes =2 Audit of billing codes=1 NB: one study included both a survey without vignette and audit of clinical notes

Subacromial pain or shoulder pain[b]	7	Sweden (n=2); Belgium; India; Netherlands; Nigeria; Spain	PTs: 29.1 (5.4) to 50.6 (26.2) Pts: 50 (13) to 53.9 (14.5)	**Low:** 4.9 (5.1) **High:** 14 (11.8)	PTs: 57-271 Pts: 121-365	Survey with vignettes=2 Survey without vignette=2 Treatment recording forms=1 Audit of clinical notes =1 Audit of billing codes=1
Knee osteoarthritis (one study combined knee and hip osteoarthritis)	7	UK (n=2); Belgium; Canada; Netherlands; Nigeria; Norway	PTs: 45.7 (11.7) to 66.7 (13.2)	**Low:** 8.4 (7.4) or 41.7% between 1-5y **High:** 21 (12) or median (range) 26 (1-45)	Departments: 83 PTs: 123-538 Pts: 870	Survey with vignettes=2 Survey without vignette=3 Survey to department=1 Treatment recording forms=1
Knee pain[c]	3	United States (n=2); Netherlands	PTs: 32.6 (7.8) or 60% <35y Pts: 36.2 (17.6) or 39% between to 41.2 (14.1) or 12% >60y	8.4 (7.4)	PTs: 141-462 Pts: 416-2491	Treatment recording forms=3
Lateral ankle sprains	3	Netherlands (n=3)	PTs: 43 (no SD) to 51 (9) Pts: 34.7% between 0-24y to 5.2% ≥65y or 33 (17)	4 (4) to 8 (15) (within the same study; two separate groups)	PTs: 83-332 Pts: 251-1413	Survey without vignette=1 Treatment recording forms=2
Plantar fascitis	2	UK; United States	Pts: 5.2% <20y to 11.3% ≥60y	5% between 0-2y 11% between 3-5y 27% ≥20y (within the same study)	PTs: 257 Pts: 57800	Survey without vignette=1 Audit of billing codes=1
Lumbar spine stenosis	1	Canada	Pts: 70 (11)	16.8 (no SD)	PTs: 76 Pts: 44	Survey without vignette and survey of Pts=1
Pregnancy-related acute low back pain	1	United Kingdom	No data	21.5 (10)	PTs: 499	Survey with vignettes=1

Pelvic girdle pain	1	Norway; Australia (within the same study)	PTs: 33.5 (9.3) (Norway) 37.9 (11.2) (Australia)	9.3 (9.3) (Norway) 15.4 (11.6) (Australia)	PTs: 142	Survey with vignettes=1
Chronic lateral epicondylitis	1	Sweden	No data	No data	PTs: 47	Survey without vignette=1
Thumb carpometacarpal joint pain	1	United States	No data	Hand therapy experience: 4.6% ≤5y; 13.9% between 6-10y; 64.3% ≥11y	PTs: 547	Survey without vignette=1
Rheumatoid arthritis	2	Canada; Netherlands	PTs: 43 (10.8) Pts: 59.2 (13.8)	**Low:** 19 (SD 10.3) **High:** 22.5 (no SD)	PTs: 26-233	Survey without vignette=1 Treatment recording forms=1
Osteoporosis	2	Canada; United States	No data	13.7 (10.8)	PTs: 67-83	Survey without vignette=2
Sports injuries	3	Greece; Nigeria; United Kingdom	Pts: 29.9 (10.8) to 35 (12.5)	No data	Pts: 171-1399	Treatment recording forms=2 Audit of clinical notes =1
Patella femoral pain syndrome and Achilles tendinopathy	1	United Kingdom	35 (12.5)	No data	Pts: 100	Audit of clinical notes =1
Combined musculoskeletal conditions (low back pain, neck pain, shoulder pain, knee pain and acquired deformities of the spine)	1	Netherlands	Pts: 46.1% ≥45y	No data	Pts: 8714 PTs: 74	Treatment recording forms=1
Orthopaedics						

Knee arthroplasty[d] (one study combined knee and hip arthroplasty)	6	UK (n=3); Australia; Greece; Netherlands	PTs: 40.4 (12.6) Pts: 71.4 (7.7)	**Low:** 34.1% <5y **High:** 37.9% ≥20y	Departments: 16-65 PTs: 132-303 Pts: 63	Survey without vignette=3 Survey to department=2 Audit of clinical notes =1
Lumbar surgery (fusion or discectomy)	2	UK (n=2)	No data	Condition specific experience: 10 (IQR: 3-15)	Departments: 75 PTs: 71	Survey without vignette=1 Survey to department=1
Pelvic surgery	1	Australia	No data	No data	PTs: 84	Survey without vignette=1
Distal radius fracture	1	Australia	PTs: median (IQR) 33.5 (23-40) Pts: 71% >51y	Median (IQR) 7 (0.8-11)	Pts: 70 Treatment sessions: 160	Treatment recording forms=1

N: number of studies; PTs: physical therapists or physiotherapists; Pts: patients; SD: standard deviation; IQR: interquartile range; COPD: chronic obstructive pulmonary disease; ICU: intensive care unit; y: years.

*: single values indicate that only one study provided data for this field

**: one study looked at data from more than one country

[a]: two studies also provided data on physical therapy treatment choices for low back pain and knee pain, two for low back pain and shoulder pain and one for low back pain only.

[b]: two studies also provided data on physical therapy treatment choices for low back pain and neck pain

[c]: two studies also provided data on physical therapy treatment choices for neck pain and low back pain, and one for low back pain only

[d]: one study also provided data on physical therapy treatment choices for low back pain

Table 2. Percentage (median and interquartile range) of physical therapy treatment choices that involved treatments that were recommended, not-recommended or had no recommendation.

	Assessed by surveys of physical therapists*				Assessed by clinical notes			
MUSCULOSKELETAL CONDITIONS[a]	**Median (%[c])**	**Q1**	**Q3**	**N**	**Median (%[d])**	**Q1**	**Q3**	**N**
Recommended	54	25	76	23	63	46	68	8
Not-recommended	43	34	61	37	27	13	45	20
No recommendation	81	49	96	37	45	31	85	31
LOW BACK PAIN	**Median (%[c])**	**Q1**	**Q3**	**N**	**Median (%[d])**	**Q1**	**Q3**	**N**
Recommended	35	16	56	9	50	32	62	5
Not-recommended	44	34	64	24	18	10	36	15
No recommendation	72	45	88	24	43	31	81	23
NECK PAIN AND WHIPLASH	**Median (%[c])**	**Q1**	**Q3**	**N**	**Median (%[d])**	**Q1**	**Q3**	**N**
Recommended	85	82	94	6	-			
Not-recommended	38	35	67	5	79	66	89	4
No recommendation	97	72	98	6	57	26	84	4
SHOULDER PAIN	**Median (%[c])**	**Q1**	**Q3**	**N**	**Median (%[d])**	**Q1**	**Q3**	**N**
Recommended[b]	93	90	94	4	76	68	79	3
Not-recommended	90			1	8			1
No recommendation	79	69	88	4	62	57	77	3
KNEE OSTEOARTHRITIS/PAIN	**Median (%[c])**	**Q1**	**Q3**	**N**	**Median (%[d])**	**Q1**	**Q3**	**N**
Recommended	58	49	65	5	65	65	66	2
Not-recommended	45	35	55	6	21			1
No recommendation	98	88	100	5	53	42	64	2

LATERAL ANKLE SPRAINS	Median (%[c])	Q1	Q3	N	Median (%[d])	Q1	Q3	N
Recommended	39	31	46	2	-			
Not-recommended	14			1	-			
No recommendation	7			1	45			1

PLANTAR FASCIITIS	Median (%[c])	Q1	Q3	N	Median (%[d])	Q1	Q3	N
Recommended	29			1	87			1
Not-recommended	43			1	-			
No recommendation	98			1	90			1

KNEE ARTHROPLASTY**	Median (%[c])	Q1	Q3	N	Median (%[d])	Q1	Q3	N
Recommended	93	83	95	5	65			1
Not-recommended	52	42	67	4	43			1
No recommendation	62	23	95	4	2			1

N=number of studies; Q1: first quartile; Q3: third quartile.

[a]: summary values excluded shoulder pain and knee arthroplasty as they did not have guidelines that recommended 'core' physical therapy treatments.

[b]: high-value care was based on delivering treatment that was 'likely to be beneficial' according to *'Kulkarni RN, Gibson JA, Brownson P, Thomas M, Rangan A, Carr AJ, Rees JL. Subacromial shoulder pain BESS/BOA Patient Care Pathways. Shoulder Elbow. 2015:0(0);1–9.'*

[c]: the percentage of physical therapists that report they provide (or would provide) high-value care, low-value care and care of unknown value for a given condition.

[d]: the percentage of patients that received high-value care, low-value care or care of unknown value from a physical therapist for a given condition as determined by audits of clinical notes, audits of billing codes, treatment recording forms, clinical observation, or surveys completed by patients.

*: summary values for knee arthroplasty includes studies that assessed treatment choices by surveys to physical therapy departments

**: includes one study that combined treatment practices for knee and hip arthroplasty

Table 3. Percentage (median and interquartile range) of physical therapy treatment choices that involved treatments that were recommended, not-recommended or had no recommendation across different conditions.

MUSCULOSKELETAL								
ACUTE LOW BACK PAIN								
	Assessed by surveys of physical therapists				**Assessed by clinical notes**			
Recommended	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
MUST PROVIDE								
Advice to keep active	32	13	55	7	70			1
Reassurance	3			1	-			
CONSIDER PROVIDING								
Group exercise	14	7	20	2	-			
Combination of two or more of 1-3	39	35	60	9	50	47	52	6
1. Manual therapy[a]	45	39	68	9	60	47	78	6
2. Exercise	72	44	78	10	65	51	82	6
3. CBT	-				-			
Superficial heat	33	31	42	5	13	9	43	3
Not-recommended	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
Paracetamol	39			1	-			
McKenzie	36	24	37	6	53			1
US, ES, TENS, IF	34	29	49	7	16	13	29	4
Poor advice[b]	9	2	28	8	-			
Acupuncture	6	3	16	7	-			
Traction	5	4	28	9	16			1
External support[c]	2	2	16	5	-			
No recommendation	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
Other advice[d]	70	54	75	11	49	34	62	5
Cold therapy[e]	29	27	44	5	33	32	34	2
Other electrophysical agents[f]	16	5	27	5	14	12	20	3
Work-related/ergonomic interventions	16	10	28	7	-			
Back schools	11	7	18	5	-			
Other manual therapy[g]	8	8	20	3	7	7	9	3
Biofeedback	1	0	1	3	-			
SUB-ACUTE OR CHRONIC LOW BACK PAIN								
	Assessed by surveys of physical therapists				**Assessed by clinical notes**			

Recommended	Median (%€)	Q1	Q3	N	Median (%¥)	Q1	Q3	N
MUST PROVIDE								
Advice to keep active	56	35	76	4	-			
CONSIDER PROVIDING								
Group exercise	27	14	40	2	-			
Combination of two or more of 1-3	41	28	51	9	32	20	43	5
1. Manual therapy[a]	49	30	51	9	58	25	74	6
2. Exercise	64	51	78	10	64	32	75	5
3. CBT	10			1	-			
McKenzie	28	19	35	6	32			1
Not-recommended	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
US, ES, TENS, IF	38	23	46	6	18	16	32	5
Traction	9	4	22	10	6	6	7	2
Acupuncture	8	5	15	7	-			
External support[c]	2	2	9	5	24			1
Poor advice[b]	1	0	6	7	-			
No recommendation	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
Other advice[d]	68	57	86	9	-			
Superficial heat	38	27	47	4	51	38	55	3
Cold therapy[e]	24	14	34	6	32	18	37	3
Other electrophysical agents[f]	19	19	42	3	11	9	15	4
Work-related/ergonomic interventions	11	6	22	4	1			1
Other manual therapy[g]	10	7	20	3				
Back schools	6	5	26	5				
Biofeedback	1	1	1	2				
Iontophoresis	-				3			1

LOW BACK PAIN (duration not specified)

	Assessed by surveys of physical therapists				Assessed by clinical notes			
	Median (%€)	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
Recommended								
MUST PROVIDE								
Advice to keep active	35			1	50	30	56	3
Advice and education to support self-management	26	22	31	2	21	16	27	2
Reassurance	16			1	-			

CONSIDER PROVIDING								
Group exercise	-				76			1
Combination of two or more of 1-3	59	46	86	8	34	24	46	12
1. Manual therapy[a]	60	57	87	9	34	23	44	12
2. Exercise	89	52	91	8	69	61	81	13
3. CBT	-				47			1
McKenzie	47	36	56	7	58	11	71	5
Superficial heat	39	28	55	7	16	10	34	4

Not-recommended	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
US, ES, TENS, IF	67	37	75	8	14	8	30	5
Acupuncture	45			1	6	4	8	4
Traction	45	15	61	8	8	3	10	6
Poor advice[b]	26	6	57	4	23	12	33	3
External support[c]	23	14	31	2	2	2	2	4

No recommendation	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
Other advice[d]	89	77	93	4	68	33	91	9
Work-related/ergonomic interventions	71	52	87	4	26	23	29	2
Other manual therapy[g]	19	10	43	7	10	6	17	7
Other electrophysical agents[f]	15	9	41	8	23	17	40	8
Cold therapy[e]	7	5	17	4	13	6	49	3
Relaxation therapy	7			1	12			1
Back schools	-				45			1
Iontophoresis	-				3			1

[a]: includes massage, mobilisation or manipulation;
[b]: advice promoting bed rest or time off work;
[c]: corsets, belts, braces, sticks or taping;
[d]: includes advice on posture, heavy lifting, sitting or standing habits, avoiding painful movements, analgesics;
[e]: including where heat and cold therapy could not be separated;
[f]: including laser, infrared therapy, micro current therapy, SWD, etc.;
[g]: includes neural mobilisation, Mulligan, Cyriax, myofascial release, etc.

NECK PAIN*

	Assessed by surveys of physical therapists**				**Assessed by clinical notes**			
Recommended	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
SHOULD PROVIDE								
Importance of maintaining activity and movement	93	89	96	2	-			

CONSIDER structured education[a] in combination with 1, 2, 3 or 4								
1. Multimodal care[b]	51			1	65	57	73	2
2. Range of motion/flexibility and strengthening exercises	89 (range of motion or flexibility only)	84	93	2	55	54	56	2
3. Clinical massage	11			1	64	57	72	2
4. Laser	6			1	4			1

Not-recommended	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
Relaxation therapy	67			1	13			1
US, ES, TENS, SWD	27	23	31	2	32	25	39	3
Strengthening alone[c]	31			1	55	54	56	2
Heat or cold therapy	25			1	79	66	89	4
Poor advice[d]	12			1	-			
CBT	8			1	-			

No recommendation	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
Advice on posture	96			1	2			1
Other exercise[e]	82	73	90	2	59	44	73	2
Acupuncture	40	38	42	2	-			
McKenzie	35			1	-			
Manual therapy alone[f]	31	20	41	2	86	74	90	4
Neural mobilisation	22			1	-			
Traction	20			1	33	24	43	2
Magnetic field therapy	-				2			1
Collar	-				1			1
Biofeedback								

ACUTE WHIPLASH

	Assessed by surveys of physical therapists				**Assessed by clinical notes**			
Recommended	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
SHOULD PROVIDE								
Importance of maintaining activity and movement	81	44	87	3	-			
Information on nature, management and course	56	41	70	2	-			

CONSIDER structured education[a] in combination with 1 or 2								

1. Multimodal care[b]	81	79	84	2	-			
2. Range of motion/flexibility exercises	90	86	94	2	-			

Not-recommended	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
Heat or cold therapy	53	46	61	2	-			
Poor advice[d]	11	5	16	2	-			
Collar	7	4	10	2	-			
US, ES	4	2	7	2	-			

No recommendation	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
Other exercise[e]	96	91	97	3	-			
Clinical massage	86			1	-			
Manual therapy alone[f]	83	79	86	2	-			
Advice on posture or analgesics	53	32	74	2	-			
Work-related/ergonomic interventions	39			2	-			
Traction	30			1	-			
Laser, IF	24	18	30	2	-			
McKenzie	9			1	-			

CHRONIC WHIPLASH

	Assessed by surveys of physical therapists				**Assessed by clinical notes**			
Recommended	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
SHOULD PROVIDE								
Importance of maintaining activity and movement	80	79	80	2	-			
Information on nature, management and course	60			1	-			
CONSIDER structured education[a] in combination with 1, 2 or 3								
1. Multimodal care[b]	72			1	-			
2. Range of motion/flexibility and strengthening exercises	56			1	-			
3. Clinical massage	86			1	-			

Not-recommended	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
Strengthening alone[c]	56			1	-			

Heat or cold therapy	43	38	48	2	-			
US, ES, TENS, SWD	30	30	30	2	-			
Poor advice[d]	10	5	15	2	-			
No recommendation	**Median (%[€])**	**Q1**	**Q3**	**N**	**Median (%[¥])**	**Q1**	**Q3**	**N**
Advice on posture	95			1	-			
Other exercise[e]	94	93	95	2	-			
Work-related/ergonomic interventions	74	71	78	2	-			
Manual therapy alone[e]	68	59	77	2	-			
McKenzie	10			1	-			
Collar	1	1	2	2	-			

*: insufficient data to stratify by symptom duration. We used the guidelines for chronic neck pain from Supplementary Table 3 as they classify a greater number of interventions as high- and low-value
**: included two studies that combined treatment choices for neck pain and whiplash
[a]: no study reported structured education so the below interventions are reported in isolation
[b]: includes mobilisation or manipulation and range of motion exercises
[c]: we were unable to determine the proportion of strengthening that was delivered in isolation
[d]: advice promoting bed rest or time off work
[e]: any exercise not included in the above categories
[f]: includes mobilisation or manipulation, but we were unable to determine the proportion of manual therapy that was delivered in isolation

SUBACROMIAL PAIN (surveys) OR SHOULDER PAIN* (clinical notes)

	Assessed by surveys of physical therapists				**Assessed by clinical notes**			
Recommended**	**Median (%[€])**	**Q1**	**Q3**	**N**	**Median (%[¥])**	**Q1**	**Q3**	**N**
LIKELY TO BE BENEFICIAL								
Exercise	89	85	92	4	72	67	76	2
Manual therapy[a]	49	20	80	4	61	59	68	3
Laser	36	20	52	2	23	18	27	2
Not-recommended	**Median (%[€])**	**Q1**	**Q3**	**N**	**Median (%[¥])**	**Q1**	**Q3**	**N**
IF, Magnetic field therapy	90			1	8			1
No recommendation	**Median (%[€])**	**Q1**	**Q3**	**N**	**Median (%[¥])**	**Q1**	**Q3**	**N**
Any advice[b]	79	77	82	2	91			1
Tape	59	54	64	2	15			1
Acupuncture	53	51	54	2	-			
Shockwave, ES, US, SWD, TENS, microwave current	44	33	65	4	26	13	39	3
Heat or cold therapy	38	24	55	4	47	39	54	2
Body awareness	11			1	-			
CBT	4			1	-			
Iontophoresis	-				15			1

*: two studies combined physical therapy treatment choices for a variety of shoulder conditions
**:there is no high-quality evidence supporting a high-value physical therapy intervention for shoulder pain
[a]: includes massage, mobilisation or manipulation
[b]: including advice on posture and advice to rest or reduce activity

KNEE OSTEOARTHRITIS (surveys)* AND KNEE PAIN (clinical notes)**

	Assessed by surveys of physical therapists				Assessed by clinical notes			
Recommended	**Median (%[€])**	**Q1**	**Q3**	**N**	**Median (%[¥])**	**Q1**	**Q3**	**N**
MUST PROVIDE								
Advice to stay active	89	78	92	3	-			
Self-management strategies [a]	82	74	91	3	-			
Aerobic and strengthening	66	47	72	3	65	65	66	2
Advice on footwear	57			1	-			
Weight loss interventions	54	51	56	3	-			
Advice on weight loss	49			1	-			
CONSIDER PROVIDING								
Heat or cold therapy	62	15	73	5	69	63	74	2
Manual therapy [b], traction or stretching	60	54	76	5	79	78	79	2
TENS	52	32	54	3	21	21	21	1
Walking aids	8	5	38	3	-			
CBT	3			1	-			
Not-recommended	**Median (%[€])**	**Q1**	**Q3**	**N**	**Median (%[¥])**	**Q1**	**Q3**	**N**
ES, US, Laser, IF, SWD	43	20	55	6	21			1
Poor advice [c]	23	15	31	2	-			
Acupuncture	22	20	34	5	-			
No recommendation	**Median (%[€])**	**Q1**	**Q3**	**N**	**Median (%[¥])**	**Q1**	**Q3**	**N**
Other exercise [d]	98	88	100	5	75			1
Balneotherapy	16			1	-			
Iontophoresis	-				8			1

*: one study that combined physical therapy treatment choices for knee and hip osteoarthritis was not included in this table (Barten DJ, et al. 2015) (See Supplementary Table 3)
**: one study that combined physical therapy treatment choices for acute and chronic knee conditions was not included in this table (van Baar ME, et al. 1998) (See Supplementary Table 3)
[a]: includes exercise, weight loss, use of suitable footwear or pacing, but we were unable to assess the content of self-management strategies reported in the included studies
[b]: includes massage, mobilisation or manipulation
[c]: advice promoting bed rest or time off work
[d]: exercise that is neither aerobic nor strengthening
[e]: spa bath therapy (separate to hydrotherapy which is included within 'other exercise')

ACUTE LATERAL ANKLE SPRAINS

	Assessed by surveys of physical therapists				Assessed by clinical notes			
Recommended	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
SHOULD PROVIDE								
Exercise	39	31	46	2	-			
CONSIDER PROVIDING								
Rest, ice, compression and elevation[a]	12			1	-			
External support[b]	34			1	-			
Not-recommended	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
US, ES, Laser	14			1	-			
Joint mobilisation	3			1	-			
Heat or cold therapy	1			1	-			
No recommendation	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
Advice or education	22	12	33	2	-			
IF, SWD, Diadynamic current	7			1	45			1

[a]: only compression was mentioned in the included study
[b]: includes braces, boots or taping

PLANTAR FASCITIS

	Assessed by surveys of physical therapists				Assessed by clinical notes			
Recommended	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
SHOULD PROVIDE								
Stretching	100			1	-			
Manual therapy[a]	81			1	87			1
Night splints	29			1				
MAY PROVIDE								
Strengthening exercises and movement training	94			1	-			
Education and counselling for weight loss	89			1	-			
Laser, US, ES	43			1	-			
Not-recommended	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
Acupuncture	31			1	-			
No recommendation	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
Shockwave	10			1	-			

Heat or cold therapy	79	1	-	
Other exercise[b]	96	1	90	1
Other advice[c]	98	1	-	
Prefabricated orthotics[d]	70	1		

[a]: includes massage, mobilisation or manipulation
[b]: exercise that is neither strengthening or movement training
[c]: includes advice on self-management, pacing, ergonomics, etc.
[d]: custom orthotics were provided by 63% of physical therapists

ORTHOPAEDICS

KNEE OR HIP ARTHROPLASTY (surveys of physical therapists or physical therapy departments)*

	Inpatients				Outpatients**			
Recommended	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%€)**	**Q1**	**Q3**	**N**
Exercise	94	94	95	2	76	66	86	4
Not-recommended	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%€)**	**Q1**	**Q3**	**N**
Passive range of motion	69	57	81	2	1			1
Cold therapy	28	25	30	2	20	16	25	2
No recommendation	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%€)**	**Q1**	**Q3**	**N**
Manual therapy[a]	93			1	31			1
Advice or education	-				55	33	77	2
TENS, electrotherapy	-				0			1
Acupuncture	-				0			1

[a]: includes massage or mobilisation
*one study that reported physical therapy treatment choices as assessed by clinical notes is not included in this table but is represented in the summary table (Table 2)
**includes one study that reported physical therapy treatment choices for knee and hip arthroscopy combined

N=number of studies; Q1: first quartile; Q3: third quartile; CBT: cognitive behavioural therapy; ES: electrical stimulation; IF: interferential current; SWD: short wave diathermy; TENS: transcutaneous electrical nerve stimulation; US: Ultrasound.
€: the percentage of physical therapists that report they provide (or would provide) high-value care, low-value care and care of unknown value for a given condition.
¥: the percentage of patients that received high-value care, low-value care or care of unknown value from a physical therapist for a given condition as determined by audits of clinical notes, audits of billing codes, treatment recording forms, clinical observation, or surveys completed by patients.

Figure legend

Figure 1. PRISMA flow diagram

Figure 2. Median percentage of physical therapy treatment choices that involved treatments that are recommended, not-recommended and had no recommendation

Supplementary Tables

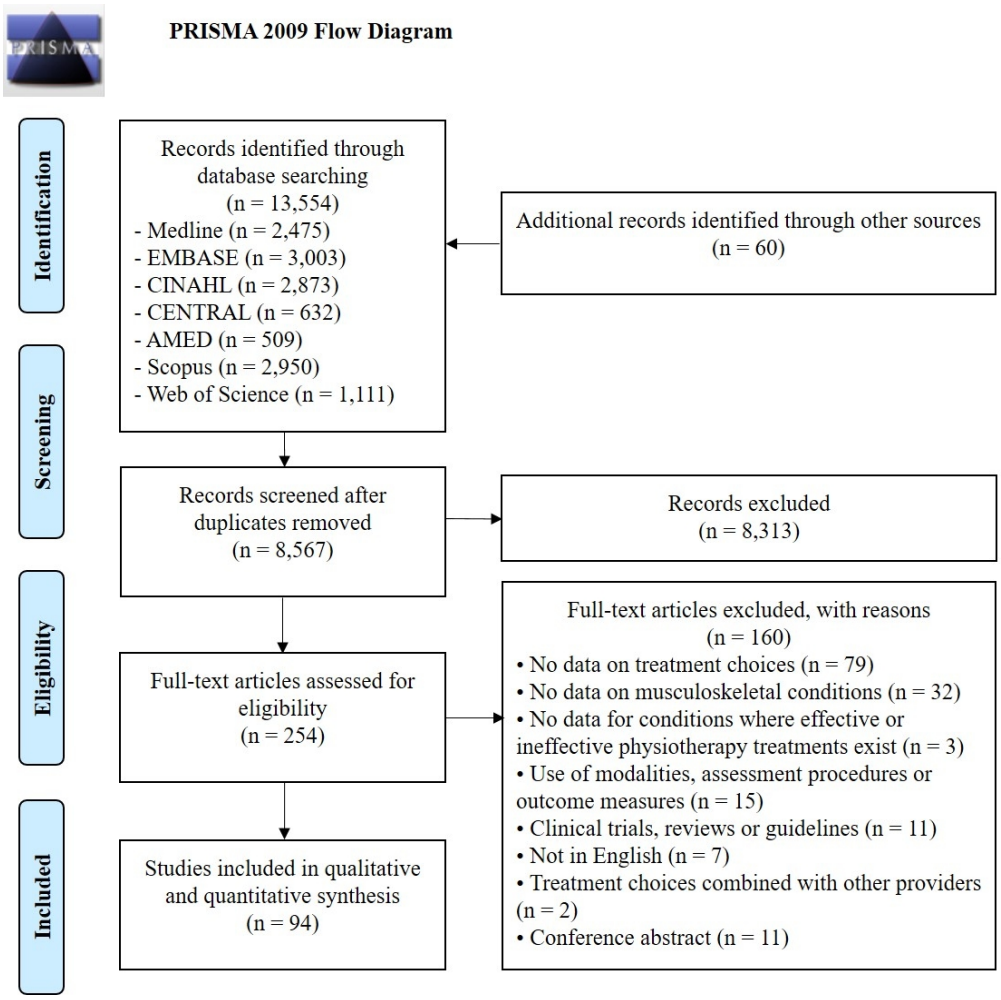

Figure 1. PRISMA flow diagram

186x184mm (150 x 150 DPI)

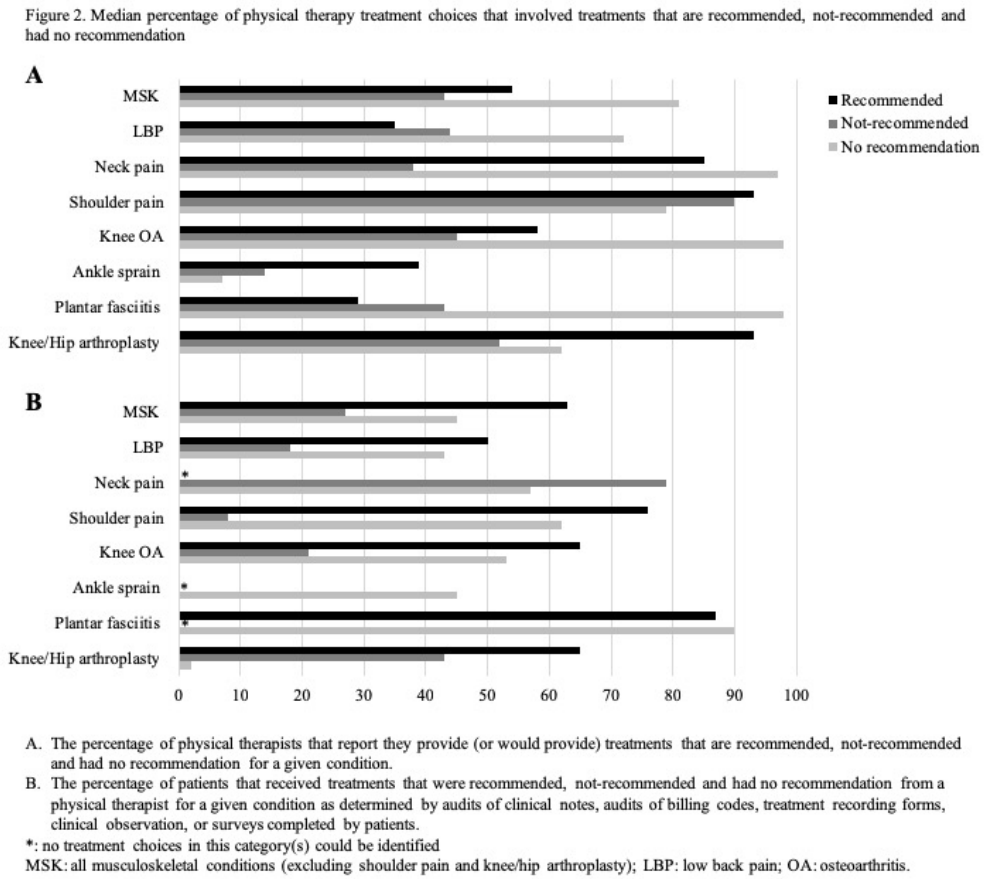

Figure 2. Median percentage of physical therapy treatment choices that involved treatments that are recommended, not-recommended and had no recommendation

249x220mm (72 x 72 DPI)

Supplementary Table 1: Search Strategy

MEDLINE via Ovid

	Searches
Low-value care	1. overdiagnosis.mp 2. "over diagnosis".mp 3. "overdiagnosed".mp 4. overtreatment.mp 5. "over treat*".mp 6. exp Unnecessary Procedures/ 7. "unnecessary".mp 8. "low value".mp 9. "lower value".mp 10. "high value".mp 11. "higher value".mp 12. overutilization.mp 13. "over utilization".mp 14. overutilisation.mp 15. "over utilisation".mp 16. ("overuse" not "overuse injur*").mp 17. exp Health Services Misuse/ 18. "Choosing Wisely".mp 19. exp Guideline Adherence/ 20. "adherence to guidelines".mp 21. "guideline adherence".mp 22. "guideline use".mp 23. "practice pattern*".mp 24. "variability in health care".mp 25. "high cost*".mp 26. "increased cost*".mp 27. "excess cost*".mp 28. "treatment package".mp 29. "transparency of care".mp 30. "resistance to change".mp 31. ineffective.mp 32. "non-evidence based".mp 33. Waste*.mp 34. Inappropriate.mp 35. "poor care".mp 36. "recommended care".mp 37. "right care".mp 38. "quality of care".mp 39. Uncertainty.mp 40. "disinvestment".mp 41. "value based care".mp

	42. 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22 or 23 or 24 or 25 or 26 or 27 or 28 or 29 or 30 or 31 or 32 or 33 or 34 or 35 or 36 or 37 or 38 or 39 or 40
Physiotherapist	43. "physiotherap*".mp 44. exp Physical Therapy Modalities/ 45. exp Physical Therapy Specialty/ 46. "physical therap*".mp 47. 43 or 44 or 45 or 46
	48. 42 and 47 49. Limit 48 to humans

CINHAL via EBSCOhost

	Searches
Low-value care	1. overdiagnosis 2. "over diagnosis" 3. "overdiagnosed" 4. overtreatment 5. "over treat*" 6. MM "Unnecessary Procedures" 7. "unnecessary" 8. "low value" 9. "lower value" 10. "high value" 11. "higher value" 12. overutilization 13. "over utilization" 14. overutilisation 15. "over utilisation" 16. ("overuse" not "overuse injur*") 17. MM "Health Services Misuse+" 18. MM "Guideline Adherence" 19. "Choosing Wisely" 20. "adherence to guidelines" 21. "guideline adherence" 22. "guideline use" 23. "practice pattern*" 24. "variability in health care" 25. "high cost*" 26. "increased cost*" 27. "excess cost*" 28. "treatment package" 29. "transparency of care" 30. "resistance to change" 31. ineffective 32. "non-evidence based" 33. Waste* 34. Inappropriate 35. "poor care" 36. "recommended care" 37. "right care" 38. Uncertainty 39. "disinvestment" 40. "value based care" 41. 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22

	or 23 or 24 or 25 or 26 or 27 or 28 or 29 or 30 or 31 or 32 or 33 or 34 or 35 or 36 or 37 or 38 or 39 or 40
Physiotherapist	42. "physiotherap*" 43. "physical therap*" 44. MM "Research, Physical Therapy" 45. MM "Physical Therapy Practice, Evidence-Based" 46. MM "Physical Therapy Practice" 47. MM "Physical Therapy Service" 48. MM "Physical Therapy Assessment" 49. MM "Physical Therapy Practice, Research-Based" 50. MM "Physical Therapy+" 51. 42 or 43 or 44 or 45 or 46 or 47 or 48 or 49 or 50
	52. 41 and 51

EMBASE via Ovid

	Searches
Low-value care	1. overdiagnosis.mp 2. "over diagnosis".mp 3. "overdiagnosed".mp 4. overtreatment.mp 5. "over treat*".mp 6. exp Unnecessary Procedures/ 7. "unnecessary".mp 8. "low value".mp 9. "lower value".mp 10. "high value".mp 11. "higher value".mp 12. overutilization.mp 13. "over utilization".mp 14. overutilisation.mp 15. "over utilisation".mp 16. ("overuse" not "overuse injur*").mp 17. "Choosing Wisely".mp 18. exp Guideline Adherence/ 19. "adherence to guidelines".mp 20. "guideline adherence".mp 21. "guideline use".mp 22. "practice pattern*".mp 23. "variability in health care".mp 24. "high cost*".mp 25. "increased cost*".mp 26. "excess cost*".mp 27. "treatment package".mp 28. "transparency of care".mp 29. "resistance to change".mp 30. ineffective.mp 31. "non-evidence based".mp 32. Waste*.mp 33. Inappropriate.mp 34. "poor care".mp 35. "recommended care".mp 36. "right care".mp 37. "quality of care".mp 38. Uncertainty.mp 39. "disinvestment".mp 40. "value based care".mp 41. 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22

	or 23 or 24 or 25 or 26 or 27 or 28 or 29 or 30 or 31 or 32 or 33 or 34 or 35 or 36 or 37 or 38 or 39 or 40
Physiotherapist	42. "physiotherap*".mp 43. exp Physical Therapy Modalities/ 44. exp Physical Therapy Specialty/ 45. "physical therap*".mp 46. 42 or 43 or 44 or 45
	47. 41 and 46 48. Limit 47 to humans

CENTRAL via Ovid

	Searches
Low-value care	1. overdiagnosis.mp 2. "over diagnosis".mp 3. "overdiagnosed".mp 4. overtreatment.mp 5. "over treat*".mp 6. exp Unnecessary Procedures/ 7. "unnecessary".mp 8. "low value".mp 9. "lower value".mp 10. "high value".mp 11. "higher value".mp 12. overutilization.mp 13. "over utilization".mp 14. "over utilisation".mp 15. ("overuse" not "overuse injur*").mp 16. exp Health Services Misuse/ 17. "Choosing Wisely".mp 18. exp Guideline Adherence/ 19. "adherence to guidelines".mp 20. "guideline adherence".mp 21. "guideline use".mp 22. "practice pattern*".mp 23. "variability in health care".mp 24. "high cost*".mp 25. "increased cost*".mp 26. "excess cost*".mp 27. "treatment package".mp 28. "resistance to change".mp 29. ineffective.mp 30. "non-evidence based".mp 31. Waste*.mp 32. Inappropriate.mp 33. "poor care".mp 34. "recommended care".mp 35. "right care".mp 36. "quality of care".mp 37. Uncertainty.mp 38. "disinvestment".mp 39. "value based care".mp 40. 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22 or 23

	or 24 or 25 or 26 or 27 or 28 or 29 or 30 or 31 or 32 or 33 or 34 or 35 or 36 or 37 or 38 or 39
Physiotherapist	41. "physiotherap*".mp 42. exp Physical Therapy Modalities/ 43. "physical therap*".mp 44. 41 or 42 or 43
	45. 40 and 44 46. Limit 45 to humans

AMED via Ovid

	Searches
Low-value care	1. overdiagnosis.mp 2. "over diagnosis".mp 3. "overdiagnosed".mp 4. overtreatment.mp 5. "over treat*".mp 6. "unnecessary".mp 7. "low value".mp 8. "lower value".mp 9. "high value".mp 10. "higher value".mp 11. overutilization.mp 12. "over utilization".mp 13. ("overuse" not "overuse injur*").mp 14. "Choosing Wisely".mp 15. "adherence to guidelines".mp 16. "guideline adherence".mp 17. "guideline use".mp 18. "practice pattern*".mp 19. "high cost*".mp 20. "increased cost*".mp 21. "excess cost*".mp 22. "treatment package".mp 23. "resistance to change".mp 24. ineffective.mp 25. "non-evidence based".mp 26. Waste*.mp 27. Inappropriate.mp 28. "poor care".mp 29. "recommended care".mp 30. "right care".mp 31. "quality of care".mp 32. Uncertainty.mp 33. "disinvestment".mp 34. "value based care".mp 35. 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22 or 23 or 24 or 25 or 26 or 27 or 28 or 29 or 30 or 31 or 32 or 33 or 34
Physiotherapist	36. "physiotherap*".mp 37. exp Physical Therapy Modalities/ 38. "physical therap*".mp 39. 36 or 37 or 38

	40. 35 and 39

Scopus

	Searches
Low-value care	1. TITLE-ABS-KEY (“overdiagnosis”) 2. TITLE-ABS-KEY (“over diagnosis”) 3. TITLE-ABS-KEY (“overdiagnosed”) 4. TITLE-ABS-KEY (“overtreatment”) 5. TITLE-ABS-KEY (“over treat*”) 6. TITLE-ABS-KEY (“low value”) 7. TITLE-ABS-KEY (“high value”) 8. TITLE-ABS-KEY (“lower value”) 9. TITLE-ABS-KEY (“higher value”) 10. TITLE-ABS-KEY (“unnecessary”) 11. TITLE-ABS-KEY (“overutilisation”) 12. TITLE-ABS-KEY (“over utilization”) 13. TITLE-ABS-KEY (“overutilization”) 14. TITLE-ABS-KEY (“over utilisation”) 15. TITLE-ABS-KEY (“Choosing Wisely”) 16. TITLE-ABS-KEY ("overuse" not "overuse injur*") 17. TITLE-ABS-KEY (“adherence to guidelines”) 18. TITLE-ABS-KEY (“guideline adherence”) 19. TITLE-ABS-KEY (“guideline use”) 20. TITLE-ABS-KEY (“inappropriate”) 21. TITLE-ABS-KEY (“transparency of care”) 22. TITLE-ABS-KEY (“variation in utilisation”) 23. TITLE-ABS-KEY (“practice pattern”) 24. TITLE-ABS-KEY (“variability in health care”) 25. TITLE-ABS-KEY (“increased cost*”) 26. TITLE-ABS-KEY (“excess cost*”) 27. TITLE-ABS-KEY (“high cost*”) 28. TITLE-ABS-KEY (“treatment package”) 29. TITLE-ABS-KEY (“resistance to change”) 30. TITLE-ABS-KEY (“ineffective”) 31. TITLE-ABS-KEY (“non-evidence based”) 32. TITLE-ABS-KEY (“waste”) 33. TITLE-ABS-KEY ("poor care") 34. TITLE-ABS-KEY ("recommended care") 35. TITLE-ABS-KEY ("right care") 36. TITLE-ABS-KEY (“quality of care") 37. TITLE-ABS-KEY (“uncertainty”) 38. TITLE-ABS-KEY ("disinvestment") 39. TITLE-ABS-KEY ("value based care") 40. 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22

	or 23 or 24 or 25 or 26 or 27 or 28 or 29 or 30 or 31 or 32 or 33 or 34 or 35 or 36 or 37 or 38 or 39
Physiotherapist	41. TITLE-ABS-KEY("physiotherap*") 42. TITLE-ABS-KEY("physical therap*") 43. 41 or 42
	44. 40 and 43

Web of Science

	Searches
Low-value care	1. TS= (“overdiagnosis”) 2. TS= (“over diagnosis”) 3. TS= (“overdiagnosed”) 4. TS= (“overtreatment”) 5. TS= (“over treat*”) 6. TS= (“unnecessary”) 7. TS= (“low value”) 8. TS= (“high value”) 9. TS= (“lower value”) 10. TS= (“higher value”) 11. TS= (“overutilization”) 12. TS= (“overutilisation”) 13. TS= (“over utilization”) 14. TS= (“over utilisation”) 15. TS= ("overuse" not "overuse injur*") 16. TS= (“Choosing Wisely”) 17. TS= (“adherence to guidelines”) 18. TS= (“guideline adherence”) 19. TS= (“guideline use”) 20. TS= (“inappropriate”) 21. TS= (“transparency of care”) 22. TS= (“practice pattern*”) 23. TS= (“variability in health care”) 24. TS= (“increased cost*”) 25. TS= (“excess cost*”) 26. TS= (“high cost*”) 27. TS= (“treatment package”) 28. TS= (“resistance to change”) 29. TS= (“ineffective”) 30. TS= (“non-evidence based”) 31. TS= (“waste*”) 32. TS= ("poor care") 33. TS= ("recommended care") 34. TS= ("right care") 35. TS= (“quality of care") 36. TS= (“uncertainty”) 37. TS= ("disinvestment") 38. TS= ("value based care") 39. 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22 or 23 or 24 or 25 or 26 or 27 or 28 or 29 or 30 or 31 or 32 or 33 or 34 or 35 or 36 or 37 or 38

Physiotherapist	40. TS=("physiotherapy*") 41. TS=("physical therap*") 42. 40 or 41
	43. 39 and 42 44. TS=(animals) NOT TS=(humans) 45. 43 NOT 44

Supplementary Table 2. Modified 'Downs and Black' checklist including descriptors*

Checklist item	Scoring system
1. Is the hypothesis/aim/objective of the study clearly described?	Yes or no (1,0)
2. Are the main outcomes to be measured clearly described in the Introduction or Methods section? • If the main outcomes are first mentioned in the Results section, the question should be answered no.	Yes or no (1,0)
3. Are the characteristics of the patients included in the study clearly described? • In cohort studies and trials, inclusion and/or exclusion criteria should be given. In case-control studies, a case-definition and the source for controls should be given.	Yes or no (1,0)
4. Are the main findings of the study clearly described? • Simple outcome data (including denominators and numerators) should be reported for all major findings so that the reader can check the major analyses and conclusions. (This question does not cover statistical tests which are considered below).	Yes or no (1,0)
5. Were the subjects asked to participate in the study representative of the entire population from which they were recruited? • The study must identify the source population for patients and describe how the patients were selected. Patients would be representative if they comprised the entire source population, an unselected sample of consecutive patients, or a random sample. Random sampling is only feasible where a list of all members of the relevant	Yes or no (1,0); 0 if unable to determine
6. Were those subjects who were prepared to participate representative of the entire population from which they were recruited? • The proportion of those asked who agreed should be stated. Validation that the sample was representative would include demonstrating that the distribution of the main confounding factors was the same in the study sample and the source population	Yes or no (1,0); 0 if unable to determine
7. Were the statistical tests used to assess the main outcomes appropriate? • The statistical techniques used must be appropriate to the data. For example, nonparametric methods should be used for small sample sizes. Where little statistical analysis has been undertaken but where there is no evidence of bias, the question should be answered yes. If the distribution of the data (normal or not) is not described it must be assumed that the estimates used were appropriate and the question should be answered yes.	Yes or no (1,0); 0 if unable to determine
8. Were the main outcome measures used accurate (valid and reliable) • For studies where the outcome measures are clearly described, the question should be answered yes. For studies which refer to other work or that demonstrates the outcome measures are accurate, the question should be answered as yes.	Yes or no (1,0); 0 if unable to determine

*descriptors from: Downs SH, Black N. The feasibility of creating a checklist for the assessment of the methodological quality both of randomised and non-randomised studies of health care interventions. *J Epidemiol Community Health*. 1998;52(6):377-84.

Supplementary Table 3. Classifying treatments as recommended, not-recommended and no recommendation

MUSCULOSKELETAL			
Low back pain	**RECOMMENDED**	**NOT-RECOMMENDED**	**NO RECOMMENDATION***
	Primary guideline (1): *MUST PROVIDE* • Advice and education to support self-management • Reassurance • Advice to keep active *CONSIDER PROVIDING* • Group exercise *CONSIDER* combinations of two or more of: • Manual therapy[a] • Exercise • Psychological therapy (with a CBT approach) **Secondary guideline (2):** *SHOULD PROVIDE* • Superficial heat (acute and sub-acute low back pain) **Systematic reviews:** • McKenzie (chronic low back pain) (3)	**Primary guideline (1):** • US, ES, TENS, IF • Poor advice[b] • Acupuncture • Traction • External support[c] **Systematic reviews:** • McKenzie (acute or subacute low back pain) (3)	**Secondary guideline (2):** • Superficial heat (4) (chronic low back pain) • Cold therapy (4) • SWD **Systematic reviews:** • Pulse electromagnetic field therapy (5) • Laser (6) • Work-related interventions (7) • Ergonomic interventions (8) • Back schools (9, 10) • Biofeedback (11) • Neural mobilisation (12) • Mulligan (13) **No reviews:** • Infrared or Micro current therapy • Cyriax manual therapy • Magnet therapy • Electroacupuncture • Advice on heavy lifting, long standing, sitting habits, posture, avoiding painful movements • Relaxation therapy

[a]: includes massage, mobilisation or manipulation;
[b]: advice promoting bed rest or time off work
[c]: corsets, belts, braces, sticks or taping

	RECOMMENDED	NOT-RECOMMENDED	NO RECOMMENDATION*
Neck pain and whiplash	**<u>Acute neck pain/whiplash</u>** **Primary guideline (14):** *SHOULD PROVIDE* • Information on nature, management and course • Importance of maintaining activity and movement *CONSIDER* structured education in combination with: • Multimodal care[a] • Unsupervised range of motion/flexibility exercises **<u>Chronic neck pain/whiplash</u>** (not mentioned above) **Primary guideline (14):** *CONSIDER* structured education in combination with: • Range of motion/flexibility and strengthening exercises • Strengthening combined exercise • Yoga • Clinical massage • Laser	**<u>Acute neck pain/whiplash</u>** **Primary guideline (14):** • Education alone • Strain-counter strain therapy • Relaxation massage • Electroacupuncture • ES • Collar • Clinic based heat • Poor advice[b] • Heat therapy **<u>Chronic neck pain/whiplash</u>** **Primary guideline (14):** • Strengthening alone • Strain-counter strain therapy • Relaxation massage • Electroacupuncture • ES, TENS, SWD • Relaxation therapy • Clinic based heat • Poor advice[b] • Heat therapy **<u>All neck pain/whiplash</u>**	**<u>Acute neck pain/whiplash</u>** **Primary guideline (14):** • Supervised combined exercise • Supervised graded strengthening • Yoga • Strengthening alone • Clinical massage • Laser • Acupuncture • TENS, SWD • Traction • Relaxation therapy • CBT **<u>Chronic neck pain/whiplash</u>** **Primary guideline (14):** • Education alone • Supervised graded strengthening • Acupuncture • Traction • Collar • CBT **<u>All neck pain</u>** **Systematic reviews:**

		Systematic reviews: • US (15) • Cold therapy (15)	• Other exercise[c] (16) • Manual therapy alone[d] (17) • Neural mobilisation (12) • Ergonomic interventions (8) **<u>All whiplash</u>** **Systematic reviews:** • Other exercise[c] (18) • Manual therapy alone[d] (19) **No reviews for neck pain/whiplash*:** • Advice on posture • McKenzie • Biofeedback **No reviews for neck pain*:** • Magnetic field therapy **No reviews for whiplash*:** • Neural mobilisation • Work-related/ergonomic interventions • Motor control[e]

*: treatments were only listed here if the included studies reported them
[a]: includes mobilisation or manipulation and unsupervised range of motion exercises
[b]: advice promoting bed rest or time off work;
[c]: includes any exercise not included in the above categories;
[d]: includes mobilisation or manipulation;
[e]: includes deep flexor strengthening or cervical kinaesthetic training

Subacromial pain syndrome or shoulder pain	**RECOMMENDED**	**NOT-RECOMMENDED**	**NO RECOMMENDATION***
	Primary guideline (20):	**Systematic reviews:**	**Primary guideline (20):**

	LIKELY TO BE BENEFICIAL • Exercise • Manual therapy[a] • Laser	• IF (21) • Magnetic field therapy (22)	• Shockwave • Acupuncture • ES, US • Cold therapy **Secondary guideline (23):** • CBT • Advice to reduce activity or rest **Systematic reviews:** • SWD, TENS or microwave current (23, 24) • Tape (25, 26) **No reviews:** • Advice on posture • Heat therapy • Body awareness
	[a]: includes massage, mobilisation or manipulation		
Knee osteoarthritis/pain	**RECOMMENDED**	**NOT-RECOMMENDED**	**NO RECOMMENDATION***
	Primary guideline (27): *MUST PROVIDE* • Advice to stay active • Advice on weight loss • Education • Reassurance • Self-management strategies [a] • Prescribe aerobic and strengthening • Offer weight loss interventions	**Primary guideline (27):** • Acupuncture • Poor advice[c] **Secondary guideline (28):** • SWD • IF • US • Laser **Systematic reviews:**	**Primary guideline (27):** • Other exercise[d] **Systematic reviews:** • Balneotherapy[e] (30)

		• ES (29) *CONSIDER PROVIDING* • Bracing/joint supports/insoles • Manual therapy[b]/traction or stretching • Assistive devices (e.g. stick) • Advice on footwear • TENS • Heat or cold therapy **Secondary guideline (28):** *CONSIDER PROVIDING* • CBT	
	[a]: included exercise, weight loss, use of suitable footwear or pacing; [b]: includes massage, mobilisation or manipulation; [c]: advice promoting bed rest or time off work; [d]: exercise that is neither aerobic nor strengthening; [e]: spa bath therapy (separate to hydrotherapy which is included within 'other exercise')		
Acute ankle sprain	**RECOMMENDED**	**NOT-RECOMMENDED**	**NO RECOMMENDATION***
	Primary guideline (31): *SHOULD PROVIDE* • Exercise *CONSIDER PROVIDING* • Short period of immobilisation • Rest, ice, compression and elevation • External support[a]	**Primary guideline (31):** • US, ES, Laser • Joint mobilisation • Heat or cold therapy alone	**No reviews:** • Advice or education • IF, SWD, Diadynamic current
	[a]: includes braces, boots or taping		

Plantar fascitis	**RECOMMENDED**	**NOT-RECOMMENDED**	**NO RECOMMENDATION***
	Primary guideline(32): *SHOULD PROVIDE* • Stretching • Night splints • Manual therapy[a] • Taping *MAY PROVIDE* • Laser • Strengthening exercises and movement training • Education and counselling for weight loss • Rocker-bottom show and shoe rotation during the week	**Primary guideline (32):** • Acupuncture • US, ES	**Primary guideline (32):** • Shockwave **No reviews:** • Heat or cold therapy • Other exercise[b] • Other advice[c] • Prefabricated or custom orthotics
	[a]: includes massage, mobilisation or manipulation; [b]: includes any exercise not included in the above categories; [c]: includes advice on self-management, pacing, ergonomics, etc.		
Total knee arthroplasty	**RECOMMENDED**	**NOT-RECOMMENDED**	**NO RECOMMENDATION***
	Systematic reviews: • Exercise (33-35)	**Systematic reviews:** • Passive range of motion (36) • Cold therapy (37)	**Systematic reviews:** • TENS (38) • Electrotherapy (39) • Acupuncture (39) **No reviews:** • Manual therapy[a] • Advice or education • Biofeedback
	[a]: includes massage or mobilisation		

*: treatments that have not been mentioned in a clinical practice guideline or investigated in a systematic review do not have a citation.
CBT: cognitive behavioural therapy; ES: electrical stimulation; IF: interferential current; NSAIDs: non-steroidal anti-inflammatory drugs; SWD: short wave diathermy; TENS: transcutaneous electrical nerve stimulation; US: Ultrasound.

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Supplementary Table 4. Summary of study characteristics by condition

Citation (country)	**Condition**	**Age:** mean (SD) unless stated otherwise	**Experience of PTs:** mean years (SD) unless stated otherwise	**Gender** (females)	**Sample size**	**Assessment measure**
Low back pain (LBP)						
Bernhardsson 2015* (Sweden)	Subacute LBP (3-12 weeks)	PTs: >40y (60%);	<3y (14.8%); 3-5y (12.2%); 6-10y (18.5%); 11-15y (16.2%); 16-20y (14.0%); >20y (24.4%)	PTs: 75.3%	271 PTs	Survey without vignette
Armstrong 2003 (Ireland)	LBP with or without radiation (unable to stratify by duration)	Pts: 26-35y (27%); 36-45y (25%)	>2y (61.5%); >10y (15.4%)	Pts: 57%	200 Pts treated by 25 PTs	Audit of clinical notes
Ayanniyi 2007 (Nigeria)	Acute LBP that is recurrent and non-recurrent, and chronic LBP (no duration specified)	PTs: Age: 35.7 (7.1)	10.1 (6.5)	Not reported	101 PTs	Survey with vignette
Battie 1994 (United States)	Acute LBP and sciatica (1 day), acute-recurrent back pain (1 week), and chronic LBP (6 months)	PTs: Age: 36.9 (SE 0.76)	10.7 (SE 0.65)	Not reported	186 PTs	Survey with vignette
Bekkering 2005 (Netherlands)	LBP (unable to stratify by duration)	PTs in the intervention group: 43.1 (8.6); PTs (control group): 38.7 (8.8). Pts in the intervention group: 46.2 (14.8); Pts in the	Intervention group: 15.7 (8.8). Control group: 14.1 (8.3)	PTs in the intervention group: 45.8%; Pts in the control group: 40.7%. Pts in the intervention group:	500 Pts treated by 113 PTs	Treatment recording forms

		control group: 44.4 (13.3)		53.4%; Pts in the control group: 50.2%		
Bishop 2008 (United Kingdom)	Acute LBP (4 weeks)	Not reported	15.2 (11.6)	PTs: 80.8%	580 PTs	Survey with vignette
Byrne 2006 (Ireland)	Acute LBP (<3 months) and chronic LBP (>3 months)	Not reported	1–3y (25%); 4–6y (25%); 7–10y (25%); >10y (25%).		87 PTs	Survey without vignette
Carlesso 2013* (Canada)	LBP (duration not specified)	Not reported	<5y (0.7%); 5-9y (14.0%); 10-14y (31.3%); 15-19y (23.7%); >19y (33.2%)	PTs: 55.8%	278 PTs	Survey without vignette
Casserley-Feeney 2008 (Ireland)	Acute LBP (≤12 weeks) and chronic LBP (>12 weeks) (unable to stratify by duration)	Pts in hospital: 46.0 (20.0). Pts in private practice: 36.0 (10.0)	PTs in hospital: 2.0 (IQR 5.0). PTs in private practice: 12 (IQR 14.8)	Pts in hospital: 66%. Pts in private practice: 50%	249 Pts	Audit of clinical notes
de Souza 2017 (Brazil)	Acute and subacute LBP (no duration specified)	PTs: 35.6 (7.77)	11.8 (6.8)	PTs: 24.9%	189 PTs	Survey with vignette
Ehrmann-Feldman 1996 (Canada)	LBP (no information on duration of symptoms)	Pts: 36.4 (no SD)	Not reported	Pts: 22%	389 Pts	Audit of clinical notes
Evans 2010 (United Kingdom)	Acute LBP (3 weeks) NB: PT characteristics are combined with characteristics of chiropractors and osteopaths	PTs in the intervention group: 41.6 (9.7). PTs in the control group: 41.2 (9.4)	Intervention group: 14 (IQR: 8–20); Control group: 14 (IQR 8–21).	PTs in the intervention group: 61%. PTs in the control group: 61%	824 PTs (409 in intervention group and 415 in control group)	Survey with vignette

Fidvi 2010 (India)	LBP (no duration specified)	Not reported	0-5y (38%); 5-10y (43%); >10y (19%)	Not reported	186 PTs	Survey without vignette
Foster 1999 (Ireland)	LBP (no duration specified)	PTs: 36-45y (47%); 46-55y (31.4%).	>10y (58.9%).	PTs: 53.6%	813 PTs	Survey without vignette
Freburger 2011 (United States)	Chronic LBP (>3 months or >24 episodes of activity limiting pain lasting >1 day in the last 12 months)	Pts: 53.9 (95% CI: 51.5–56.2)	Not reported	Pts: 65.8% (95% CI: 57.5–73.2)	126 Pts	Survey of Pts
Gracey 2002 (Northern Ireland)	Acute, subacute and chronic LBP (unable to stratify by duration)	Pts: <45y (65%); >45y (35%)	>2y (80%); >10y (36%).	Pts: 51%.	1062 Pts treated by 157 PTs	Treatment recording forms
Groenendijk 2007 (Netherlands)	Acute, subacute and chronic LBP without radiation (unable to stratify by duration)	Pts (1989-1992): 42.6 (14.8) Pts (2002-2003): 48.3 (16.2)	Not reported	Pts (1989-1992): 45.5% Pts (2002-2003): 54.5%	3148 Pts treated by 180 PTs	Treatment recording forms
Hamm 2003 (Denmark)	Acute LBP (<3 months) and chronic LBP (≥3 months) with and without radiation	PTs: Males 40 (no SD); Females 44 (no SD). Pts: 49 (no SD)	Males: 11 (no SD). Females: 18y (no SD)	PTs: 71% Pts: 65%	242 PTs recording 4725 treatments	Treatment recording forms
Harte 2005 (United Kingdom)	LBP (no duration specified)	Not reported	3-5y (2.6%); 6-10y (18.3%); >10y (79.1%)	Not reported	1239 PTs	Survey without vignette
Hendrick 2013 (New Zealand)	LBP (no duration specified)	PTs: 38.5 (11)	15.0 (11)	PTs: 64.7%	170 PTs	Survey without vignette
Jackson 2001 (United Kingdom)	LBP (no duration specified)	Pts: 40 (IQR 30-51)	Not reported	Pts: 47.5%	200 Pts	Audit of clinical notes

Jette AM 1997* (United States)	Acute, subacute and chronic LBP (unable to stratify by duration)	PTs: 32.6 (7.8) Pts: 40.8 (13.2)	8.4 (7.4).	PT: 70% Pts: 48%	1279 Pts treated by 141 PTs	Treatment recording forms
Jette AM 1994 (United States)	LBP (no duration specified)	Pts: 45.26 (17.0)	Not reported	Pts: 49%	2,328 Pts	Treatment recording forms
Jette DU 1997* (United States)	LBP (no duration specified)	Pts: 18-35y (40%); 36-59y (50%); >60y (10%).	Not reported	Pts: 49%	2,491 Pts treated by 462 PTs	Treatment recording forms
Keating 2016 (Australia)	Acute LBP (1-2 weeks) and subacute LBP (6-8 weeks)	PTs: 39 (12)	15 (11)	PTs: 61%	203 PTs	Survey with vignette
Kerssens 1999 (Netherlands)	LBP (no duration specified)	Pts: 42.8 (13.9)	Not reported	Pts: 58.3%	1,151 records including 132 Pts treated by 21 PTs	Treatment recording forms
Ladeira 2015 (United States)	Acute LBP (1 week) and subacute LBP (6 weeks)	PTs: 38 (9)	15.8 (8.2)	PTs: 61.2%	327 PTs	Survey with vignette
Ladeira 2017 (United States)	Acute LBP (1-2 weeks) and subacute LBP (6 weeks)	PTs: 42.9 (10.1)	17.2 (10.5)	PTs: 37.1%	410 PTs	Survey with vignette
Li 2001 (Canada)	Acute LBP (1 week), subacute LBP (6 weeks) and acute sciatica (4 days)	Not reported	14.7 (10.1)	PTs: 86.0%;	274 PTs	Survey with vignette
Liddle 2009 (Ireland)	Chronic LBP (12 weeks or 3 or episodes within 12 months)	Not reported	Experience treating LBP: >5y (78%); Total experience: >10y (44%)	Not reported	280 PTs	Survey without vignette
Louw 2010 (South Africa)	LBP (no duration specified)	Pts: 41.7 (13.3)	Not reported	Pts: 52.2%	50 Pts	Treatment recording forms

Madson 2015 (United States)	LBP (no duration specified)	PTs: 20-30y (18.9%); 31-40y (28.7%); 41-50y (22.5%); >50y (29.8%);	1-5y (22.1%); 6-10y (13.3%); 11-15y (16.5%); 16-20y (11.7%); >20y (36.3%)	PTs: 60%	1001 PTs	Survey with vignette
Mielenz 1997 (United States)	Acute LBP (<10 weeks)	Pts: 41 (13)	Not reported	Pts: 53%	1580 Pts	Audit of clinical notes
Mikhail 2005 (Canada)	Acute LBP (5 days)	Not reported	<1y (1.0%); 1-5y (20.0%); 6-10y (18.0%); 11-15y (24.0%); >15y (37.0%)	PTs: 67%;	100 PTs	Survey with vignette
Oppong-Yeboah 2014 (Ghana)	LBP (no duration specified)	Not reported	1-5y (77.3%); 5-10y (15.9%); >10y (6.8%)	Not reported	44 PTs	Survey without vignette
Pensri 2005 (Thailand)	LBP (no duration specified)	Not reported	<3y (18.7%); 3-5y (20.7%); 6-10y (29.5%); >10y (31.3%)	Not reported	502 PTs	Survey without vignette
Pincus 2011 (United Kingdom)	Work-related LBP (duration not specified)	PTs: 47 (9.3)	24 (9.4)	Not reported	113 PTs	Survey without vignette
Poitras 2005 (Canada)	Work-related LBP with or without radiation (no duration specified)	Pts with radiating pain: 41.6 (10.2). Pts with non-radiating pain: 38.7 (10.9)	9.3 (7.4)	PTs: 63.7% Pts with radiating pain: 35.3%. Pts with non-radiating pain: 30%	328 Pts (190 without radiation and 139 with radiation)	Treatment recording forms
Reid 2002 (New Zealand)	Acute LBP (4 days)	Not reported	Not reported	Not reported	324 PTs	Survey with vignette

Serrano-Aguilar 2011* (Spain)	Chronic LBP (≥12 weeks)	Pts: 53.9 (14.5)	Not reported	Pts: 73.3%	4693 Pts	Audit of billing codes
Sparkes 2005 (United Kingdom)	Acute LBP (<6 weeks) and chronic LBP (≥6 weeks) with or without radiation (unable to stratify by duration)	Not reported	Not reported	Not reported	130 Pts	Audit of clinical notes
Stevenson 2006 (United Kingdom)	Acute, subacute and chronic LBP (unable to stratify by duration)	Not reported	Not reported	Not reported	306 Pts from 25 PTs	Treatment recording forms
Strand 2005 (Norway)	LBP (unable to stratify by duration)	PTs: 43 (7) Pts: 37 (12)	10 (6)	PTs: 29% Pts: 53%	42 consultations with 34 PTs	Clinical observation
Swinkels 2005 (Netherlands)	LBP without radiation (<1 month and ≥1 month)	Pts: 48 (16)	15-24y (nearly 50%)	PTs: 41% Pts: 54%	1254 Pts treated by 90 PTs	Treatment recording forms
Tumilty 2017 (New Zealand)	Acute LBP (<6 weeks)	Pts: 34.5 (17)	Not reported	Pts: 52%	199 Pts	Treatment recording forms
Turner 1999* (United Kingdom)	LBP (no duration specified)	Pts: 41.9 (no SD)	Not reported	Pts: 60.6%	345 Pts	Audit of clinical notes
van Baar 1998* (Netherlands)	Acute and chronic LBP without radiation (unable to stratify by duration)	PTs: <35y (60%). Pts: 43.5 (16.1)	Not reported	Pts: 58.9%	1,085 Pts	Treatment recording forms

van der Valk 1995 (Netherlands)	LBP (<1 week; ≥1 week and <3 months; and ≥3 months)	Pts with LBP <1 week: 0-14y (0.6%); 15-24y (8.3%); 25-34y (21.5%); 35-44y (25.4%); 45-54y (20.8%); 55-64y (13.9%); 65-74y (6.3%); >74y (3.2%). Pts with LBP ≥1 week and <3 months: 0-14y (0.4%); 15-24y (11.0%); 25-34y (21.8%); 35-44y (23.8%); 45-54y (18.5%); 55-64y (12.0%); 65-74y (8.6%); >74y (3.9%). Pts with LBP ≥3 months: 0-14y (0.7%); 15-24y (12.1%); 25-34y (21.7%); 35-44y (20.4%); 45-54y (18.9%); 55-64y (13.2%); 65-74y (8.2%); >74y (4.9%).	Not reported	Pts with LBP <1 week: 41.4%. Pts with LBP ≥1 week and <3 months: 47.1%. Pts with LBP ≥3 months: 58.3%.	3,507 Pts	Treatment recording forms
Neck pain or whiplash						

Ayanniyi 2007 (Nigeria)	Neck pain (no duration specified)	Pts: 53.4 (11.2)	Not reported	Pts: 56.8%	532 Pts	Audit of clinical notes
Bernhardsson 2015* (Sweden)	Subacute neck pain (3-12 weeks)	PTs: >40y (60%)	<3y (14.8%); 3-5y (12.2%); 6-10y (18.5%); 11-15y (16.2%); 16-20y (14.0%); >20y (24.4%)	PTs: 75.3%	271 PTs	Survey without vignette
Carlesso 2013* (Canada)	Neck pain (duration not specified)	Not reported	<5y (0.7%); 5-9y (14.0%); 10-14y (31.3%); 15-19y (23.7%); >19 (33.2%)	PTs: 55.8%	278 PTs	Survey without vignette
Carlesso 2015 (Various)	Acute and chronic neck pain and whiplash, and cervical radiculopathy (no duration specified)	Not reported	17 (12) (combined with chiropractors)	PTs: 60%	127 PTs	Survey without vignette
Carlesso 2014 (Various)	Acute and chronic neck pain and whiplash, and cervical radiculopathy (no duration specified)	Not reported	16 (12)	PTs: 59%	138 PTs	Survey without vignette
Corkery 2014 (United States)	Acute whiplash (4 weeks) and chronic whiplash (2 months)	Not reported	1-5y (9.3%); 6-10y (19.8%); 11-20y (31.6%); >20y (38.0%)	PTs: 34.2%	237 PTs	Survey with vignette
Jette AM 1997* (United States)	Acute, subacute and chronic neck pain (unable to stratify by duration)	PTs: 32.6 (7.8) Pts: 40.9 (12.6)	8.4 (7.4)	PT: 70% Pts: 64%	613 Pts treated by 141 PTs	Treatment recording forms
Jette DU 1997* (United States)	Neck pain (no duration specified)	Pts: 18-35y (38%); 36-59y	Not reported	Pts: 64%	2491 Pts treated by 462 PTs	Treatment recording forms

		(52%); >60y (10%).				
Ng 2015 (Australia and Singapore)	Acute and chronic whiplash (no duration specified)	Not reported	Median (range) Australia: 20 (1–47) Singapore: 6 (1–20)	PTs in Australia: 51%. PTs in Singapore: 65%	185 PTs (91 from Queensland and 94 from Singapore)	Survey with vignette
Rebbeck 2006 (Australia)	Whiplash (<6 weeks)	Pts (intervention group): 35.5 (11.5). Pts in control group: 36.1 (15.5).	Not reported	Pts (intervention group): (76%). Pts (control group): 89%.	99 Pts treated by 27 PTs (14 in intervention group, 13 in control group)	Survey without vignette and audit of clinical notes
Serrano-Aguilar 2011* (Spain)	Chronic neck pain (≥12 weeks)	Pts: 53.9 (14.5)	Not reported	Pts: 73.3%.	8308 Pts	Audit of billing codes
Shoulder pain						
Ayanniyi 2016 (Nigeria)	Shoulder pain (including: Impingement syndrome, Rotator syndrome, Fracture, Osteoarthritis, Dislocation, , Adhesive capsulitis, Calcific tendinitis of bicep) (no duration specified)	Pts: 50.6 (26.2)	Not reported	Pts: 56.2%	121 Pts	Audit of clinical notes
Bernhardsson 2015* (Sweden)	Subacromial pain (no duration specified)	PTs: >40y (60%)	<3y (14.8%); 3-5y (12.2%); 6-10y (18.5%); 11-15y (16.2%); 16-20y (14.0%); >20y (24.4%)	PTs: 75.3%	271 PTs	Survey without vignette

Johansson 1999 (Sweden)	Subacromial pain (a few weeks)	PTs: 40.8 (8.2)	8.4 (5.6)	PTs: 79%	57 PTs	Survey with vignette
Karel 2017 (Netherlands)	Shoulder pain (including: subacromial impingement, glenohumeral joint instability, biceps tendinopathy, frozen shoulder, and others) (no duration specified)	Pts: 50 (13) PTs: 39 (no SD)	Not reported	Pts: 57%	125 Pts	Treatment recording forms
Phadke 2015 (India)	Subacromial pain (6 weeks)	PTs: 29.1 (5.4)	4.9 (5.1)	PTs: 42.7%	211 PTs	Survey with vignette
Serrano-Aguilar 2011* (Spain)	Chronic shoulder pain (≥12 weeks)	Pts: 53.9 (14.5)	Not reported	Pts: 73.3%.	5035 Pts	Audit of billing codes
Struyf 2012 (Belgium)	Subacromial pain (no duration specified)	PTs: 38 (12)	14 (11.8)	Not reported	119 PTs	Survey without vignette
Knee pain						
Ayanniyi 2017 (Nigeria)	Knee osteoarthritis	Not reported	1-5y (41.7%)	PTs: 38.2%	267 PTs	Survey with vignette
Barten 2015 (Netherlands)	Knee and hip osteoarthritis	Pts: 66.7 (13.2)	Not reported	Pts: 67%	870 Pts	Treatment recording forms
Holden 2008 (United Kingdom)	Knee osteoarthritis	Not reported	1–3y (21%); 4–10y (25%); >10y (54%)	PTs: 87%	538 PTs	Survey with vignette
Jamtvedt 2008 (Norway)	Knee osteoarthritis	PTs: 47 (11)	21 (12)	PTs: 47%	297 PTs	Survey without vignette
Jette AM 1997* (United States)	Acute, subacute and chronic knee pain	PTs: 32.6 (7.8) Pts: 41.2 (14.1)	8.4 (7.4)	PT: 70% Pts: 52%	706 treated by 141 PTs	Treatment recording forms

Jette DU 1997* (United States)	Knee pain (no duration specified)	Pts: 18-35y (39%); 36-59y (49%); >60y (12%)	Not reported	Pts: 52%	2491 Pts treated by 462 PTs	Treatment recording forms
MacIntyre 2013 (Canada)	Knee osteoarthritis	Not reported	<5y (15.4%); 5-10y (17.1%); 11-20y (27.6%); >20y (39.8%)	PTs: 73.2%	123 PTs	Survey without vignette
Spitaels 2017 (Belgium)	Knee osteoarthritis	PTs: 45.7 (11.7)	Median (range): 26 (1-45)	PTs: 45%	284 PTs	Survey without vignette
van Baar 1998* (Netherlands)	Acute and chronic knee pain (unable to stratify by duration)	PTs: <35y (60%) Pts: 36.2 (17.6)	Not reported	Pts: 51.4%	416 Pts	Treatment recording forms
Walsh 2009 (United Kingdom)	Knee osteoarthritis	Not reported	Not reported	Not reported	83 departments	Survey to department
Acute ankle injuries						
Kooijman 2011 (Netherlands)	Ankle injuries (<4 weeks and ≥4 weeks)	PTs treating acute ankle injuries: 51 (9). PTs treating chronic ankle injuries: 51 (10). Pts with acute ankle injuries: 33 (17). Pts with chronic ankle injuries: 33 (17)	PTs treating acute ankle injuries: 8 (15). PTs treating chronic ankle injuries: 4 (4).	PTs treating acute ankle injuries: 37%. PTs treating chronic ankle injuries: 30%. Pts with acute ankle injuries: 49%.	1413 Pts treated by 117 PTs	Treatment recording forms

				Pts with chronic ankle injuries: 49%		
Leemrijse 2006 (Netherlands)	Acute lateral ankle sprains (no duration specified)	PTs: 43 (no SD)	Not reported	PTs: 49%	332 PTs	Survey without vignette
Roebroeck 1998 (Netherlands)	Lateral ankle sprains (unable to stratify by duration)	Pts: 0-14y (1.6%); 15-24y (33.1%); 25-34y (24.7%); 35-44y (16.7%); 45-54y (11.2%); 55-64y (7.6%); 65-74y (4.4%); >74y (0.8%)	Not reported	Pts: 45%	251 Pts treated by 83 PTs	Treatment recording forms
Plantar fascitis						
Fraser 2017 (United States)	Plantar fascitis (no duration specified)	Pts: <20y (5.2%); 20-29y (6.0%); 30-39y (17.7%); 40-49y (29.0%); 50-59y (30.8%); 60-69y (11.1%); >69y (0.2%)	Not reported	Pts: 59.8%	262643 treatments of 57800 Pts	Audit of billing codes
Grieve 2017 (United Kingdom)	Plantar fascitis (no duration specified)	Not reported	0-2y (5%); 3-5y (11%); 6-10y (21%); 11-15y (22%); 16-20y (14%); >20y (27%)	PTs: 66%	257 PTs	Survey without vignette
Other musculoskeletal conditions						
Athanasopoulos 2007 (Greece)	Various musculoskeletal conditions (e.g. ligament sprain, osteoarthritis)	Pts: 29.9 (10.8)	Not reported	Pts: 40.3%	457 Pts	Treatment recording forms

Beales 2015 (Australia and Norway)	Pregnancy-related pelvic girdle pain (6 weeks) and traumatic pelvic girdle pain (4 years)	PTs in Norway: 33.5 (9.3). PTs in Australia: 37.9 (11.2).	PTs in Norway: 9.3 (9.3) PTs in Australia: 15.4 (11.6)	PTs in Norway: 52.3%. PTs in Australia: 61%	142 PTs (65 from Norway, 77 from Australia)	Survey with vignette
Bishop 2016 (United Kingdom)	Pregnancy related acute LBP (began "a few weeks ago")	Not reported	21.5 (10)	PTs: 92%	499 PTs	Survey with vignette
Dekker 1993 (Netherlands)	LBP, neck pain, knee pain, shoulder pain, and scoliosis (no duration specified)	Pts: 0-14y (3.5%); 15-24y (11.6%); 25-34y (18.8%); 35-44y (20.0%); 45-54y (17.1%); 55-64y (13.3%); 65-74y (9.6%); >74y (6.1%)	Not reported	Pts: 53.2%	8714 Pts treated by 74 PTs	Treatment recording forms
Grant 2014 (United Kingdom)	Various musculoskeletal conditions stratified by muscle, joint and tendon injuries	Not reported	Not reported	Not reported	1399 Pts	Treatment recording forms
Hurkmans 2012 (Netherlands)	Rheumatoid arthritis	PTs: 43 (10.8)	19 (10.3)	PTs: 53%	233 PTs	Survey without vignette
Lineker 2006 (Canada)	Rheumatoid arthritis	Pts: 59.2 (13.8)	22.5 (22.0); 15.9 (9.3) treating rheumatoid arthritis	Pts: 80.4%	56 Pts treated by 26 PTs	Treatment recording forms
Murray 2005 (United Kingdom)	Various musculoskeletal conditions with a focus on patella femoral pain syndrome and Achilles tendinopathy	Pts: 35 (12.5)	Not reported	Pts: 37%	100 Pts	Audit of clinical notes

O'Brien 2014 (United States)	Thumb carpometacarpal joint pain	Not reported	Experience as a hand therapist: <5y (4.6%); 6-10y (13.9%); >10y (64.3%)	PTs: 73.8%	547 PTs	Survey without vignette
Owoeye 2009 (Nigeria)	Various musculoskeletal conditions (e.g. ligament sprain, muscle tears, contusions, overuse injury)	Not reported	Not reported	Pts: 33.4%	171 Pts	Audit of clinical notes
Peterson 2011 (United States)	Osteoporosis (females ≥40 years old)	Not reported	13.7 (10.8)	PTs: 77.1%	83 PTs	Survey without vignette
Peterson 2005 (Sweden)	Chronic epicondylitis (≥3 months)	Not reported	Not reported	Not reported	47 PTs	Survey without vignette
Sran 2005 (Canada)	Osteoporosis	Not reported	Not reported	Not reported	67 PTs	Survey without vignette
Tomkins 2010 (Canada)	Lumbar spine stenosis (no duration specified)	Pts: 70 (11)	16.8 (no SD)	Pts: 53%	76 PTs and 44 Pts	Survey without vignette and survey of Pts
Orthopaedic conditions						
Artz 2013 (United Kingdom)	Knee arthroplasty (outpatient)	Not reported	Not reported	Not reported	16 departments	Survey to department
Barry 2003 (United Kingdom)	Knee arthroplasty (inpatient)	Not reported	Not reported	Not reported	303 PTs	Survey without vignette

Bruder 2013 (Australia)	Distal radius fracture (outpatient)	PTs: 33.5 (IQR 23-40). Pts: 19-50y (25%); 51-65y (33%); 66-75y (25%); >75y (16%)	7 (IQR 0.8-11)	PTs: 50% Pts: 71%	160 records of 75 Pts treated by 14 PTs	Treatment recording forms
Frawley 2005 (Australia)	Any pelvic surgery (post-surgery inpatient)	Not reported	Not reported	Not reported	84 PTs	Survey without vignette
Moutzouri 2017 (Greece)	Knee arthroplasty (inpatient and outpatient)	Not reported	<5y (34.1%); 6-10y (30.3%); >10y (35.6%).	Not reported	132 PTs	Survey without vignette
Naylor 2006 (Australia)	Knee arthroplasty (inpatient and outpatient)	Not reported	Not reported	Not reported	65 departments	Survey to department
Peter 2014 (Netherlands)	Knee and hip arthroplasty (no timeframe specified)	PTs: 40.4 (12.6)	Experience: 0-5y (28.8%), 6-10y (14.6%), 11-15y (9.6%), 16-20y (9.1%), 20y+ (37.9%). Experience treating patients following hip or knee arthroplasty: 0-5y (29.7%), 6-10y (18.3%), 11-15y (10.5%), 16-20y (11.9%), >20y (29.6%)	PTs: 54.8%	219 PTs	Survey without vignette

Rushton 2014 (United Kingdom)	Lumbar fusion (post-surgery inpatient and outpatient)		Experience treating patients following lumbar spinal fusion: 10 (IQR: 3-15)		71 PTs	Survey without vignette
Turner 1999* (United Kingdom)	Knee arthroplasty (outpatient)	Pts: 71.4 (7.7)	Not reported	Pts: 66.7%	345 pts	Audit of clinical notes
Williamson 2007 (United Kingdom)	Lumbar discectomy (pre and post-surgery including inpatient and outpatient)	Not reported	Not reported	Not reported	75 departments	Survey to department

CI: confidence intervals; IQR: interquartile range; LBP: low back pain; PTs: physical therapists or physiotherapists; Pts: patients; SD: standard deviation; SE: standard error; y: years.
*: citation included for multiple conditions.

Supplementary Table 5. Percentage (median and interquartile range) of physical therapy treatment choices that involved treatments that were recommended, not-recommended or had no recommendation for 'other' conditions

MUSCULOSKELETAL

RHEUMATOID ARTHRITIS*

	Assessed by surveys of physical therapists				Assessed by clinical notes			
Recommended	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
SHOULD PROVIDE								
Aerobic or strengthening exercise	-				86			1
No-recommendation	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
Other exercise[a]	82			1	100			1
Advice or education[b]	82			1	-			
Manual therapy[c]	68			1	29			1
Superficial heat	57			1	-			
ES, US, TENS	35			1	95			1
Splinting/orthoses[b]	-				54			1
Walking aids[b]	-				63			1

*classification based on Hurkmans EJ et al. Acta Rheumatol Port. 2011;36(2):146-58.
[a]: exercise that is neither aerobic nor strengthening (not mentioned in the above guideline)
[b]: no review on advice or education, splinting/orthoses and walking aids
[c]: includes massage, mobilisation or manipulation

SPORTS INJURIES*

	Assessed by surveys of physical therapists				Assessed by clinical notes			
No-recommendation	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
Manual therapy[a]	-				20	19	22	2
Exercise	-				16	11	21	2
Electrotherapy	-				13	10	17	2
Heat or cold therapy	-				9	8	9	2
Tape	-				5	4	7	2
Advice or education	-				3			1

*includes two studies that did not specify the type of sports injury. Another study (Athanasopoulos et al. 2007) was not included in this table because of the way the data was reported
[a]: includes massage, mobilisation or manipulation

LUMBAR SPINE STENOSIS*

	Assessed by surveys of physical therapists				Assessed by surveys of patients			
No-recommendation	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
Exercise	97			1	55			1
Advice or education	96			1	11			1
Electrotherapy	90			1	27			1
Manual therapy[a]	87			1	48			1

Superficial heat	76			1	14			1
Acupuncture	63			1	23			1
Traction	61			1	5			1
External support[b]	45			1	11			1

*the same study assessed treatment choices by a survey of physical therapists and survey of patients
[a]: includes massage, mobilisation or manipulation
[b]: corsets, belts, braces, sticks or taping

PREGNANCY-RELATED ACUTE LOW BACK PAIN*

	Assessed by surveys of physical therapists				**Assessed by clinical notes**			
Recommended	**Median (%[€])**	**Q1**	**Q3**	**N**	**Median (%[¥])**	**Q1**	**Q3**	**N**
MUST PROVIDE								
Advice to keep active	87			1	-			
Advice and education to support self-management	85			1	-			
CONSIDER PROVIDING								
Combination of two or more of 1-3	48			1	-			
1. Manual therapy[a]	48			1	-			
2. Exercise	94			1	-			
3. CBT	-				-			
Superficial heat	33			1	-			
Not-recommended	**Median (%[€])**	**Q1**	**Q3**	**N**	**Median (%[¥])**	**Q1**	**Q3**	**N**
External support[b]	68			1	-			
Advice to use rest to relieve pain	51			1	-			
Acupuncture	24			1	-			
US, ES, TENS, IF	14			1	-			
Prescribed rest	6			1	-			
No-recommendation	**Median (%[€])**	**Q1**	**Q3**	**N**	**Median (%[¥])**	**Q1**	**Q3**	**N**
Other advice[c]	98			1	-			
Work-related/ergonomic interventions	88			1	-			
Cold therapy	8			1	-			

*classified as per acute low back pain in Appendix 2
[a]: includes massage, mobilisation or manipulation;
[b]: corsets, belts, braces, sticks or taping;
[c]: includes advice on posture and analgesics

KNEE OR HIP OSTEOARTHRITIS

	Assessed by surveys of physical therapists				**Assessed by clinical notes**			
Recommended	**Median (%[€])**	**Q1**	**Q3**	**N**	**Median (%[¥])**	**Q1**	**Q3**	**N**

Exercise	-				72			1
Manual therapy[a]	-				47			1
Advice or education	-				37			1
Electrotherapy	-				7			1

[a]: unspecified in the paper

ACUTE AND CHRONIC KNEE PAIN

	Assessed by surveys of physical therapists				Assessed by clinical notes			
No-recommendation	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
Exercise	-				38			1
Manual therapy[a]	-				16			1
Electrotherapy	-				13			1
Advice or education	-				1			1

[a]: massage or mobilisation

OSTEOPOROSIS

	Assessed by surveys of physical therapists				Assessed by clinical notes			
Recommended	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
SHOULD PROVIDE								
Strength and balance training	75	73	77	2				
No-recommendation	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
Other exercise[a]	95	94	96	2	-			
Advice or education	97			1	-			
Electrotherapy	46			1	-			
Manual therapy[b]	45			1	-			

*classification based on The Royal Australian College of General Practitioners and Osteoporosis Australia. Osteoporosis prevention, diagnosis and management in postmenopausal women and men over 50 years of age. 2nd edn. East Melbourne, Vic: RACGP, 2017.

[a]: exercise that is neither strengthening nor balance

[b]: unspecified in the paper

PELVIC GIRDLE PAIN

Due to pregnancy	Assessed by surveys of physical therapists				Assessed by clinical notes			
No-recommendation	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
Advice or education	62			1	-			
Exercise	48			1	-			
External support[a]	34			1	-			
Manual therapy[b]	33			1	-			
CBT	11			1	-			
Acupuncture	3			1	-			
Electrotherapy	1			1	-			
Due to a fall								

Exercise	51	1	-
Manual therapy[b]	37	1	-
Advice or education	18	1	-
CBT	11	1	-
External support[a]	5	1	-
Acupuncture	4	1	-
Electrotherapy	1	1	-

* classification based on Ferreira CWS et al. Physiother Theory Pract 2013; 29: 419–431 (all unknown value or have not been investigated in a systematic review)
[a]: includes tape, compression pants, belt, orthoses or a walking aid
[b]: includes any form of hands on therapy

COMBINED MUSCULOSKELETAL CONDITIONS*

	Assessed by surveys of physical therapists				Assessed by clinical notes			
No-recommendation	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
Massage	-				24			1
Exercise	-				20			1
Electrotherapy	-				7			1
Heat or cold therapy	-				3			1
Advice or education	-				2			1

*includes low back pain, neck pain, shoulder pain, knee pain and acquired deformities of the spine so we were unable to classify the interventions

CHRONIC TENNIS ELBOW

	Assessed by surveys of physical therapists				Assessed by clinical notes			
Recommended	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
Stretching and strengthening	62			1	-			
Not-recommended	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
Deep friction massage	19			1	-			
No-recommendation	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
Advice or education[a]	94			1	-			
Acupuncture	85			1	-			
Orthotic device[a]	51			1	-			
TENS	26			1	-			

*classification based on Hoogvliet P et al. Br J Sports Med 2013;47(17): 1112-1119
Dingemanse R et al. Br J Sports Med 2014;48(12): 957-965
Tang H et al. eCAM 2015;2015:861849
[a]: no review on advice or education, or orthotic devices

THUMB CMC PAIN

	Assessed by surveys of physical therapists				Assessed by clinical notes			
No-recommendation	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**

Advice or education	96			1	-			
Self-management	93			1	-			
Exercise	91			1	-			
Splinting	88			1	-			
PATELLA FEMORAL PAIN SYNDROME								
	Assessed by surveys of physical therapists				**Assessed by clinical notes**			
Recommended	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
Strengthening	-				100			
Stretching	-				20			
Not-recommended	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
IF, US	-				20			
Mobilisation	-				20			
No-recommendation	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
Tape	-				20			
Acupuncture	-				20			
Advice or education	-				20			
Cold therapy[a]	-				20			
*classification based on Crossley KM et al. Br J Sports Med. 2016;50(14): 844-852.								
[a]: no review on cold therapy								
ACHILLES TENDINOPATHY								
	Assessed by surveys of physical therapists				**Assessed by clinical notes**			
Recommended	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
Eccentric strengthening	-				67			1
No-recommendation	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
Deep friction massage	-				100			1
Stretching	-				83			1
IF, US	-				50			1
Acupuncture	-				33			1
*classification based on Habets B et al. Scand J Med Sci Sports 2015;25(1): 3-15 (for eccentric exercises) Rowe V et al. (2012). Sports Med 2012;42(11): 941-967 (all other interventions)								
ORTHOPEDICS								
LUMBAR DISCECTOMY AND FUSION (surveys of physical therapists)								
	Inpatients				**Outpatients**			
Recommended	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
Discectomy								
High-intensity exercise[a]	81	81	81	1	-			

Rehabilitation starting 4-6 weeks post-surgery	-				15			1
Fusion								
Exercise and CBT	-				61			1

No-recommendation	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
Other exercises[b, c]	96	94	97	2	72	63	82	2
Advice, education or reassurance	86	79	92	2	68	53	83	2
Neural mobilisation	57			1	49	36	61	2
CBT	-				61			1
Rehabilitation starting 0-4 weeks post-surgery (discectomy)	-				49			

*classified based on
Oosterhuis T et al. Cochrane Database Syst Rev. 2014(3):Cd003007
Greenwood J et al. Spine (Phila Pa 1976). 2016;41(1):E28-36.
[a]: includes aerobic or strengthening exercise;
[b]: exercise that is neither aerobic Nor strengthening (for discectomy) or any exercise (fusion)
[c]: no reviews for other exercises, advice, education or reassurance, neural mobilisation and CBT (alone)

DISTAL RADIUS FRACTURE

	Assessed by surveys of physical therapists				**Assessed by clinical notes**			
No-recommendation	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
Exercise	-				97			1
Advice or education[a]	-				90			1
Manual therapy[b]	-				55			1
Compression	-				28			1
Heat or cold therapy	-				10			1
Walking aids[a]	-				1			1
Electrotherapy	-				0			1
Whirlpool	-				0			1
Wax baths[a]	-				0			1

*classification based on Handoll HH and Elliott J. Cochrane Database Syst Rev 2015;(9):Cd003324 (all unknown value)
[a]: no review for advice or education, wax baths, walking aids, heat or cold therapy
[b]: includes massage or mobilisation

POST PELVIC SURGERY

	Assessed by surveys of physical therapists				**Assessed by clinical notes**			
No-recommendation	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
Exercise	82			1	-			
Advice on activity restriction	75			1	-			

N=number of studies; Q1: first quartile; Q3: third quartile; CBT: cognitive behavioural therapy; CMC: carpometacarpal; ES: electrical stimulation; TENS: transcutaneous electrical

nerve stimulation; US: Ultrasound.

€: the percentage of physical therapists that report they provide (or would provide) high-value care, low-value care and care of unknown value for a given condition.

¥: the percentage of patients that received high-value care, low-value care or care of unknown value from a physical therapist for a particular condition as determined by audits of clinical notes, treatment recording forms, or surveys of patients.

Supplementary Table 6. Methodological quality ratings of included studies using a modified Downs and Black checklist

		Checklist items									
Author (year)	**Condition**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**Total**	**Assessment measure**
Armstrong MP (2003)	LBP	1	1	1	1	1	0	1	1	7	Audit of clinical notes
Artz N (2013)	TKR	1	1	0	1	1	1	1	0	6	Survey to department
Athanasopoulos S (2007)	Various musculoskeletal conditions (e.g. ligament sprain, osteoarthritis)	1	1	1	1	1	0	1	1	7	Treatment recording forms
Ayanniyi O (2007a)	Acute and chronic LBP	1	1	1	1	0	0	1	0	5	Survey with vignettes
Ayanniyi O (2007b)	Neck pain	1	1	1	1	1	0	1	1	7	Audit of clinical notes
Ayanniyi O (2016)	Shoulder pain	1	1	1	1	1	0	1	1	7	Audit of clinical notes
Ayanniyi O (2017)	Knee OA	1	1	1	1	1	0	1	0	6	Survey with vignettes
Barry S (2003)	TKR	1	1	1	1	1	0	1	0	6	Survey without vignettes
Barten DJ (2015)	Knee and hip OA	1	1	1	1	1	0	1	1	7	Treatment recording forms
Battie MC (1994)	Acute and chronic LBP	0	1	1	1	1	0	1	0	5	Survey with vignettes
Beales D (2015)	Pelvic girdle pain	1	1	1	1	0	0	1	0	5	Survey with vignettes
Bekkering GE (2005)	LBP	1	1	1	1	1	0	1	1	7	Survey without vignettes
Bernhardsson S (2015)	Subacute LBP, subacute neck pain and subacromial pain	1	1	1	1	1	0	1	0	6	Survey without vignettes
Bishop A (2008)	Acute LBP	1	1	1	1	1	0	1	0	6	Survey with vignettes

Bishop A (2016)	Pregnancy-related acute LBP	1	1	1	1	1	0	1	0	6	Survey with vignettes
Bruder AM (2013)	Distal radius fracture	1	1	1	1	0	0	1	1	6	Treatment recording forms
Byrne K (2006)	Acute and chronic LBP	1	1	1	1	1	0	1	0	6	Survey without vignettes
Carlesso LC (2013)	LBP and neck pain	1	1	1	1	1	0	1	0	6	Survey without vignettes
Carlesso LC (2015)	Acute and chronic neck pain and whiplash	1	1	1	1	1	0	1	0	6	Survey without vignettes
Carlesso LC (2014)	Acute and chronic neck pain and whiplash	1	1	1	1	1	0	1	0	6	Survey without vignettes
Casserley-Feeney SN (2008)	LBP	1	1	1	1	0	0	1	1	6	Audit of clinical notes
Corkery MB (2014)	Acute and chronic whiplash	1	1	1	1	1	0	1	0	6	Survey with vignettes
de Souza FS (2017)	Acute and subacute LBP	1	1	1	1	0	0	1	0	5	Survey with vignettes
Dekker J (1993)	LBP, neck pain, knee pain, shoulder pain	1	1	1	1	1	0	1	1	7	Treatment recording forms
Ehrmann-Feldman D (1996)	LBP	1	1	1	1	1	0	1	1	7	Audit of clinical notes
Evans DW (2010)	Acute LBP	1	1	1	1	1	1	1	0	7	Survey with vignettes
Fidvi N (2010)	LBP	1	1	1	1	1	0	1	0	6	Survey without vignettes
Foster NE (1999)	LBP	1	1	0	1	1	0	1	0	5	Survey without vignettes
Fraser JJ (2017)	Plantar fascitis	1	1	1	1	1	0	1	1	7	Audit of billing codes

Frawley HC (2005)	Pelvic surgery	1	0	1	1	1	0	1	0	5	Survey without vignettes
Freburger JK (2011)	Chronic LBP	1	1	1	1	1	0	1	0	6	Survey without vignettes
Gracey JH (2002)	LBP	1	0	1	1	1	0	1	1	6	Treatment recording forms
Grant ME (2014)	Various musculoskeletal conditions	1	1	1	1	1	0	1	1	7	Treatment recording forms
Grieve R (2017)	Plantar fascitis	1	1	0	1	1	0	1	0	5	Survey without vignettes
Groenendijk JJ (2007)	LBP	1	1	1	1	1	0	1	1	7	Treatment recording forms
Hamm L (2003)	Acute and chronic LBP	1	1	0	1	1	0	1	1	6	Treatment recording forms
Harte AA (2005)	LBP	1	1	1	1	1	0	1	0	6	Survey without vignettes
Hendrick P (2013)	LBP	1	1	1	1	1	0	1	0	6	Survey without vignettes
Holden MA (2008)	Knee OA	1	1	1	1	1	0	1	0	6	Survey with vignettes
Hurkmans EJ (2012)	Rheumatoid arthritis	1	0	1	1	1	0	1	0	5	Survey without vignettes
Jackson DA (2001)	LBP	1	1	1	1	1	0	1	1	7	Audit of clinical notes
Jamtvedt G (2008)	Knee OA	1	1	1	1	1	0	1	0	6	Survey without vignettes
Jette AM (1997)	LBP, neck pain and knee pain	1	1	1	1	0	0	1	1	6	Treatment recording forms
Jette AM (1994)	LBP	1	1	1	1	1	0	1	1	7	Treatment recording forms
Jette DU (1997)	LBP, neck pain and knee pain	1	1	1	1	1	0	1	1	7	Treatment recording forms

Johansson K (1999)	Subacromial pain	1	1	0	1	0	0	1	0	4	Survey with vignettes
Karel Y (2017)	Shoulder pain	1	1	1	1	0	0	1	1	6	Treatment recording forms
Keating JL (2016)	Acute and sub-acute LBP	1	1	1	1	1	0	1	0	6	Survey with vignettes
Kerssens JJ (1999)	LBP	1	1	1	1	1	0	1	1	7	Treatment recording forms
Kooijman MK (2011)	Lateral ankle sprains	1	1	1	1	1	0	1	1	7	Treatment recording forms
Ladeira CE (2015)	Acute and subacute LBP	1	1	1	1	0	0	1	0	5	Survey with vignettes
Ladeira CE (2017)	Acute and subacute LBP	1	1	1	1	1	1	1	0	7	Survey with vignettes
Leemrijse CJ (2006)	Lateral ankle sprains	1	1	1	1	1	0	1	0	6	Survey without vignettes
Li LC (2001)	Acute and sub-acute LBP	1	1	1	1	1	0	1	0	6	Survey with vignettes
Liddle SD (2009)	Chronic LBP	1	1	1	1	1	0	1	0	6	Survey without vignettes
Lineker SC (2006)	Rheumatoid arthritis	1	1	1	1	0	0	1	1	6	Treatment recording forms
Louw QA (2010)	LBP	1	1	1	1	1	0	1	1	7	Treatment recording forms
MacIntyre NJ (2013)	Knee OA	1	1	1	1	0	0	1	0	5	Survey without vignettes
Madson TJ (2015)	LBP	1	1	1	1	1	0	1	0	6	Survey with vignettes
Mielenz TJ (1997)	Acute LBP	1	1	1	1	1	0	1	1	7	Audit of clinical notes
Mikhail C (2005)	Acute LBP	1	1	1	1	1	1	1	0	7	Survey with vignettes
Moutzouri M (2017)	TKR	1	1	1	1	1	0	1	0	6	Survey without vignettes

Murray IR (2005)	Patella femoral pain and Achilles tendinopathy	1	1	1	1	0	0	1	1	6	Audit of clinical notes
Naylor J (2006)	TKR	1	0	1	1	1	0	1	0	5	Survey to department
Ng TS (2015)	Acute and chronic whiplash	1	1	1	1	0	0	1	0	5	Survey with vignettes
O'Brien VH (2014)	Thumb carpometacarpal joint pain	1	1	1	1	1	0	1	0	6	Survey without vignettes
Oppong-Yeboah B (2014)	LBP	1	0	1	1	1	0	1	0	5	Survey without vignettes
Owoeye OB (2009)	Various musculoskeletal conditions	1	1	1	1	1	0	1	1	7	Audit of clinical notes
Pensri P (2005)	LBP	1	1	1	1	1	0	1	0	6	Survey without vignettes
Peter WF (2014)	TKR and THR	1	1	1	1	1	0	1	0	6	Survey without vignettes
Peterson ML (2011)	Osteoporosis	1	1	1	1	1	0	1	0	6	Survey without vignettes
Peterson M (2005)	Chronic lateral epicondylitis	1	1	0	1	0	0	1	0	4	Survey without vignettes
Phadke V (2015)	Subacromial pain	1	1	1	1	0	0	1	0	5	Survey with vignettes
Pincus T (2011)	LBP	1	1	1	1	0	0	1	0	5	Survey without vignettes
Poitras S (2005)	LBP	1	1	1	1	1	0	1	1	7	Treatment recording forms
Rebbeck T (2006)	Acute whiplash	1	1	1	1	1	1	1	1	8	Survey without vignettes and audit of clinical notes
Reid D (2002)	Acute LBP	1	0	1	1	0	0	1	0	4	Survey with vignettes

Roebroeck ME (1998)	Lateral ankle sprains	1	1	1	1	1	0	1	1	7	Treatment recording forms
Rushton A (2014)	Lumbar fusion	1	0	1	1	1	0	1	0	5	Survey without vignettes
Serrano-Aguilar P (2011)	Chronic LBP, neck pain or shoulder pain	1	1	1	1	1	1	1	1	8	Audit of billing codes
Sparkes V (2005)	LBP	1	1	1	1	0	0	1	1	6	Audit of clinical notes
Spitaels D (2017)	Knee OA	1	1	1	1	0	0	1	0	5	Survey without vignettes
Sran MM (2005)	Osteoporosis	1	1	0	1	1	0	1	0	5	Survey without vignettes
Stevenson K (2006)	LBP	1	1	1	1	0	0	1	1	6	Treatment recording forms
Strand LI (2005)	LBP	1	1	1	1	0	0	1	1	6	Clinical observation
Struyf F (2012)	Subacromial pain	1	1	1	1	1	0	1	0	6	Survey without vignettes
Swinkels IC (2005)	Acute and chronic LBP	1	1	1	1	1	0	1	1	7	Treatment recording forms
Tomkins CC (2010)	Lumbar spine stenosis	1	1	1	1	0	0	1	0	5	Survey without vignettes and telephone interview of Pts
Tumilty S (2017)	Acute LBP	1	1	1	1	0	0	1	1	6	Treatment recording forms
Turner PA (1999)	LBP and TKR	1	1	0	1	0	0	1	1	5	Audit of clinical notes
van Baar ME (1998)	LBP and knee pain	1	1	1	1	0	0	1	1	6	Treatment recording forms
van der Valk RWA (1995)	Acute, subacute and chronic LBP	1	1	1	1	0	0	1	1	6	Treatment recording forms
Walsh NE (2009)	Knee OA	1	1	1	1	0	0	1	0	5	Survey to department
Williamson E (2007)	Lumbar discectomy	1	0	0	1	1	0	1	0	4	Survey to department

Number of studies scoring positive (/94)	93	86	85	94	67	6	94	39
% of studies scoring positive	99%	91%	90%	100%	71%	6%	100%	41%
Mean (SD) total score = 6.0 (0.9)								
Median (IQR) total score = 6 (5-7)								

IQR: inter quartile range; LBP: low back pain; OA: osteoarthritis; PTs: physical therapists; Pts: patients; SD: standard deviation; THR: total hip replacement; TKR: total knee replacement.

PRISMA 2009 Checklist

Section/topic	#	Checklist item	Reported on page #
TITLE			
Title	1	Identify the report as a systematic review, meta-analysis, or both.	1: Title
ABSTRACT			
Structured summary	2	Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number.	2: Abstract
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known.	5: Introduction
Objectives	4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).	6: Final paragraph of introduction
METHODS			
Protocol and registration	5	Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number.	6: This review was conducted in accordance with the "Preferred reporting items for systematic reviews and meta-analyses" (PRISMA) statement (22) and was prospectively registered on PROSPERO (CRD42018094979).
Eligibility criteria	6	Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale.	6. 2.2. Study Selection
Information sources	7	Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.	6. 2.1 Data sources and searches
Search	8	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.	Supplementary Table 1.
Study selection	9	State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis).	6. 1st paragraph
Data collection process	10	Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators.	7. 2.3. Data extraction and Quality assessment

PRISMA 2009 Checklist

Data items	11	List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.	7. 2.3. Data extraction and Quality assessment and Table 1
Risk of bias in individual studies	12	Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.	7. 2.3. Data extraction and Quality assessment
Summary measures	13	State the principal summary measures (e.g., risk ratio, difference in means).	10. 2.5 Analysis (Medians and IQR)
Synthesis of results	14	Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., I^2) for each meta-analysis.	10-12. 2.5 Analysis

Section/topic	#	Checklist item	Reported on page #
Risk of bias across studies	15	Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies).	7. 2.3. Data extraction and Quality assessment “assessment of treatment choices”
Additional analyses	16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.	N/A.
RESULTS			
Study selection	17	Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram.	12 and Fig 1.
Study characteristics	18	For each study, present characteristics for which data were extracted (e.g., study size, PICOS, follow-up period) and provide the citations.	Table 1
Risk of bias within studies	19	Present data on risk of bias of each study and, if available, any outcome level assessment (see item 12).	13. 3.1 Methodological Quality and Supplementary Table 6.
Results of individual studies	20	For all outcomes considered (benefits or harms), present, for each study: (a) simple summary data for each intervention group (b) effect estimates and confidence intervals, ideally with a forest plot.	13-14. Table 2 and Figure 2
Synthesis of results	21	Present results of each meta-analysis done, including confidence intervals and measures of consistency.	Table 2 and Figure 2.
Risk of bias across studies	22	Present results of any assessment of risk of bias across studies (see Item 15).	13. 3.1 Methodological Quality and Supplementary Table 6.
Additional analysis	23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).	N/A.

PRISMA 2009 Checklist

DISCUSSION			
Summary of evidence	24	Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers).	14-15
Limitations	25	Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias).	15. 4.1. Strengths and weaknesses of the study
Conclusions	26	Provide a general interpretation of the results in the context of other evidence, and implications for future research.	15-16. 4.2 Strengths and weaknesses in relation to other studies and 4.3 Meaning of the study
FUNDING			
Funding	27	Describe sources of funding for the systematic review and other support (e.g., supply of data); role of funders for the systematic review.	20. None

From: Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. PLoS Med 6(7): e1000097. doi:10.1371/journal.pmed1000097

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Do physical therapists follow evidence-based guidelines when managing musculoskeletal conditions? A systematic review

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ABSTRACT

Objectives: Physicians often refer patients with musculoskeletal conditions to physical therapy. However, it is unclear to what extent physical therapists' treatment choices align with the evidence. The aim of this systematic review was to determine what percentage of physical therapy treatment choices for musculoskeletal conditions agree with management recommendations in evidence-based guidelines and systematic reviews.

Design: Systematic review

Setting: We performed searches in MEDLINE, EMBASE, CINAHL, CENTRAL, AMED, Scopus and Web of Science combining terms synonymous with "practice patterns" and "physical therapy" from the earliest record to April 2018.

Participants: Studies that quantified physical therapy treatment choices for musculoskeletal conditions through surveys of physical therapists, audits of clinical notes, and other methods (e.g. audits of billing codes, clinical observation) were eligible for inclusion.

Primary and secondary outcomes: Using medians and interquartile ranges, we summarised the percentage of physical therapists who chose treatments that were recommended, not-recommended and had no recommendation, and summarised the percentage of physical therapy treatments provided for various musculoskeletal conditions within the categories of recommended, not-recommended and no recommendation. Results were stratified by condition and how treatment choices were assessed (surveys of physical therapists vs. audits of clinical notes).

Results: We included 94 studies. The median percentage of physical therapists who chose recommended treatments for musculoskeletal conditions ranged from 54% (n=23 studies; surveys) to 63% (n=8 studies; audits). For treatments not-recommended, the range was 27% (n=20; audits) to 43% (n=37; surveys). For treatments with no recommendation, the range was 45% (n=31; audits) to 81% (n=37; surveys).

Conclusions: Many physical therapists seem not to follow evidence-based guidelines when managing musculoskeletal conditions. There is considerable scope to increase use of recommended treatments and reduce use of treatments that are not recommended.

Keywords: Non-pharmacological; musculoskeletal; physical therapy; treatment choices; systematic review; recommended care.

Strengths and limitations of this study

- This is the first study to summarise the proportion of physical therapy treatment choices for musculoskeletal conditions that agree with management recommendations in evidence-based guidelines and systematic reviews
- We used a systematic approach to identify studies on physical therapy treatment choices and classified recommendations for physical therapy treatments according to evidence-based guidelines and systematic reviews
- Experts provided feedback to help refine our classification, and a second reviewer double-checked all the extracted data to ensure accuracy
- The main limitation is that primary studies only reported treatment choices for individual treatments and not for combinations of treatments.
- Recommended treatments such as advice and reassurance might not have been documented in clinical notes or listed in a survey because they may be viewed as a routine part of physical therapy; this could have underestimated the proportion of physical therapists that provided recommended treatments

1. Introduction

Musculoskeletal conditions (such as back and neck pain) have remained the leading cause of disability worldwide over the past two decades and the burden is increasing (1). Concerns about the harms of medicines such as opioids, and new evidence on the lack of effectiveness of common surgical procedures have shifted guideline recommendations for musculoskeletal conditions so there is now more explicit recommendation of non-pharmacological treatments such as those provided by physical therapists. For example, the Center for Disease Control and Prevention (CDC) recommends exercise therapy instead of opioids in the management of chronic pain (2). Similarly, the 2018 Royal Australian College of General Practitioners (RACGP) guideline for the management of hip and knee osteoarthritis discourages opioids and arthroscopy for knee osteoarthritis and recommends aquatic and land-based exercise (3).

Physicians often refer patients with musculoskeletal conditions to physical therapy for non-pharmacological care. In the United States, there are nearly 250,000 physical therapists (4) and in Australia there are now more practising physical therapists than general practitioners (5, 6). It is important to appreciate however that there are a range of non-pharmacological treatments that physical therapists can provide; some such as exercise are recommended in guidelines for musculoskeletal conditions while others such as electrotherapy are recommended against (7).

While there has been considerable attention in medicine on whether physicians are providing recommended care, there has been less attention on whether health services that physicians refer for involve recommended care (8). Determining whether physical therapists are providing treatments recommended in evidence-based guidelines when they manage musculoskeletal conditions is an important step towards ensuring evidence-based care across all health care settings.

The aim of this systematic review was to summarise the proportion of physical therapy treatment choices for musculoskeletal conditions that agree with management recommendations in evidence-based guidelines and systematic reviews.

2. Methods

This review was conducted in accordance with the "Preferred reporting items for systematic reviews and meta-analyses" (PRISMA) statement (9) and was prospectively registered on PROSPERO (CRD42018094979). Due to the size of the review, other research questions in our registered protocol (including physical therapy treatment choices for cardiorespiratory and neurological conditions) will be addressed in separate manuscripts. Other deviations to our registered protocol include using a modified version of the 'Downs and Black' checklist to rate study quality and changing the focus from 'high- and low-value care' to 'recommended and not-recommended care'.

2.1. Data Sources and Searches

We conducted a comprehensive keyword search in MEDLINE, EMBASE, Cumulative Index to Nursing and Allied Health Literature, Cochrane Central Register of Controlled Trials, Allied and Complementary Medicine, Scopus and Web of Science, from the earliest record until April 2018. Our search strategy combined terms relating to "practice patterns" and "physical therapy" (Supplementary Table 1) and was designed to capture studies investigating physical therapy treatment choices for any condition (as per our registered protocol). We performed citation tracking and reviewed the reference lists of included studies to identify those missed by our initial database search.

Two independent reviewers (JZ and MO) performed the selection of studies by subsequently screening the title, abstract and full-text of studies retrieved through our electronic database search. Any disagreements between the two reviewers were resolved through discussion.

2.2. Study Selection

We included any study that reported physical therapy treatment choices for musculoskeletal conditions through surveys of physical therapists (with or without vignettes), audits of clinical notes and other methods (e.g. surveys of patients). We only included full-text studies in English. There was no restriction on the musculoskeletal condition treated (e.g. neck pain, rehabilitation post-knee arthroplasty) or practice setting (e.g. private, public), but we excluded studies that reported treatment choices for conditions where there were no known effective or ineffective physical therapist-delivered treatments. We also excluded studies that only quantified physical therapists' use of assessment procedures, outcome measures, referrals, treatments without specifying a target condition, pharmacological treatments (e.g. recommending paracetamol) or treatments outside the usual scope of physical therapy practice (e.g. injections); and studies where physical therapy treatment choices were unable to be separated from other healthcare providers.

2.3. Data Extraction and Quality Assessment

One reviewer (JZ) independently extracted individual study characteristics (e.g. condition, country, participant demographics) and proportions that quantified physical therapy treatment choices (see sections 2.4 and 2.5). A second reviewer (MO) double-checked the extracted data to ensure accuracy. Discrepancies were resolved by discussion between the two reviewers and re-checking data against the original citation. We contacted authors when it appeared relevant data were not reported.

The methodological quality of included studies was assessed independently by two reviewers (JZ and MO) using a modified version of the 'Downs and Black' checklist. Any disagreements between the two reviewers were resolved through discussion. We modified the original 27-item 'Downs and Black' checklist (10) and selected eight items that were relevant to studies on treatment choices (Supplementary Table 2). For item eight, we considered the

following assessments of treatment choices as 'accurate': observation, audits of clinical notes, audits of billing codes, treatment recording forms and validated surveys.

2.4. Data Synthesis

The following definitions were used to classify treatments as recommended, not-recommended and no recommendation:

- **Recommended treatments** included physical therapy treatments endorsed in well-recognised evidence-based clinical practice guidelines (e.g. guidelines from the National Institute for Health and Care Excellence, NICE) or found to be effective in recent systematic reviews. Treatments recommended in guidelines were further categorised as those that 'must be provided' ('core' treatments) and those that 'should be considered'. When guidelines specified 'core' treatments, only these treatments were considered 'recommended' in our primary analysis (see 2.5.1). Otherwise, treatments that 'should be considered' were accepted as 'recommended'.
- **Not-recommended treatments** included physical therapy treatments not recommended in guidelines or found to be ineffective in recent systematic reviews
- **Treatments with no recommendation** included physical therapy treatments where guideline recommendations and evidence from systematic reviews was inconclusive; or where treatments had not been investigated in a systematic review.

We used one clinical practice guideline per condition to classify physical therapy treatments (primary guideline) and contacted leading experts to help us select our primary guideline and refine our classification for a number of conditions (see Acknowledgements). If we found a physical therapy treatment that was not mentioned in the primary guideline, we searched in other evidence-based clinical practice guidelines and systematic reviews to inform our

classification (Supplementary Table 3). We selected recently published high-quality systematic reviews where possible.

2.4.1. Assessments of treatment choices

Data on physical therapy treatment choices were divided into two main categories (and analysed separately) due to differences in how each category is interpreted:

2.4.2. Treatment choices assessed by surveys completed by physical therapists (with or without vignettes)

Interpretation. Surveys completed by physical therapists' yielded data on the percentage of physical therapists that provide (survey without vignette) or would provide (survey with vignette) a particular treatment for a condition they frequently treat.

Survey without vignette. Physical therapists outlined the treatments they provide for a condition or rated how often they provide a particular treatment for a condition (e.g. "frequently"; "sometimes"; "rarely"; or "never"). When studies reported how often treatments were provided, we extracted the percentage of treatments that were provided at least 'sometimes'. We combined data when studies separated survey responses by different samples of physical therapists (usually by country or practice setting). Some surveys were completed by a senior physical therapist on behalf of the physical therapy department within a hospital (e.g. management following knee arthroplasty).

Survey with vignette. Physical therapists outlined the treatments they would provide for a particular case (vignette). For studies that included multiple vignettes of the same condition, we took an average of physical therapists' responses across vignettes of equal sample sizes or used data from the vignette with the highest sample size.

2.4.3. Treatment choices assessed by audits of clinical notes, audits of billing codes, treatment recording forms, clinical observation, or surveys completed by patients

Interpretation. These assessment measures yielded data on the percentage of patients that received a particular physical therapy-delivered treatment in a single treatment session or throughout an episode of care (i.e. from initial consultation to discharge).

Audits of clinical notes and billing codes were performed retrospectively in the included studies. Treatment recording forms provided similar information to clinical notes, except they were often implemented as part of a study or registry on treatment practices (prospective). Within a study, we combined data across samples that presented with the same condition (e.g. physical therapists from different countries treatment low back pain).

2.5. Analysis

We used counts and ranges to summarise study characteristics for each condition. We used medians and interquartile ranges (IQR) to summarise the percentage of physical therapy treatment choices that involved treatments that were recommended, not-recommended and had no recommendation across studies. We provided an overall result for all studies and then separately for individual musculoskeletal conditions (e.g. low back pain). Since physical therapists can provide multiple treatments for the same patient, and treatment choices were summarised across studies, the percentage of treatment choices that involved treatments that were recommended, not-recommended and had no recommendation do not sum to 100%. For example, 70% of physiotherapists might provide recommended treatments for low back pain, but the same percentage might also provide some treatments that are not-recommended or have no recommendation.

2.5.1. Treatment choices that involved treatments that were recommended, not-recommended and had no recommendation

Where possible, recommended treatment was based on treatment choices involving all 'core' treatments recommended in guidelines (i.e. physical therapists 'must' or 'should' provide). For example, the NICE guidelines for low back pain recommend that all patients receive advice and education to support self-management, reassurance, and advice to keep active (7). Since studies did not report combinations of treatments, we used the lowest value across all 'core' treatments. For example, if 30% of physical therapists provide reassurance and 50% provide advice to stay active, we used 30% as the proportion of treatment choices that involved recommended treatments. This is because no more than 30% of the sample could have provided both reassurance and advice to stay active ('core' treatments). If guidelines did not mention 'core' treatments or if there were no guidelines for a condition, we used data from the most frequently provided recommended treatment that 'should be considered' or was found to be effective in a systematic review. We used data from the most frequently provided treatment that was not recommended and had no recommendation to provide an estimate of the percentage of physical therapists' treatment choices that involve at least one treatment that is not-recommended and had no recommendation. For studies that reported treatment choices stratified by the duration of symptoms (acute vs. chronic) or different settings (inpatient vs. outpatient), we used the highest value of treatments that were recommended, not-recommended and had no recommendation across the strata. We summarised the percentage of physical therapy treatment choices that were recommended, not-recommended and had no recommendation across all musculoskeletal conditions where guidelines recommended 'core' treatments.

2.5.2. Physical therapy treatments provided for various musculoskeletal conditions

We summarised the percentage of physical therapy treatments provided for various conditions within the categories of recommended, not-recommended and no recommendation. Treatments that were procedurally similar and had the same recommendation (i.e. recommended, not-recommended and no recommendation) were grouped together. For example, according to the NICE low back pain guidelines, mobilisation, manipulation and massage should all be 'considered' (7). Hence, these were grouped as 'manual therapy'. Studies rarely reported combinations of physical therapy treatments, so we used data from the most frequently provided treatment where appropriate. For example, if 67% of physical therapists provide massage for acute low back pain and 20% provide mobilisation, we used 67% as the best estimate for the percentage of physical therapists that provide manual therapy.

2.6. Patient or Public Involvement

Patients and members of the public were not involved in the design of this study

3. Results

After removing duplicates and screening 8,567 titles and abstracts and 254 full-texts reports, 94 studies were included (Fig 1). Physical therapy treatment choices were investigated for low back pain (n=48 studies) (11-58), knee pain (n=10) (32, 34, 57, 59-65), neck pain or whiplash (n=11) (15, 18, 32, 34, 51, 66-71), foot or ankle pain (n=5) (72-76), shoulder pain (n=7) (15, 51, 77-81), pre or post knee arthroplasty (n=6) (46, 82-86) (including one study of hip and knee arthroplasty (86)), and other musculoskeletal or orthopaedic conditions (where treatment choices were only reported in one study or where one of either recommended or not-recommended treatments could not be inferred from guidelines or systematic reviews) (n=18) (87-104). We contacted 15 authors for data (regarding 18 studies); 12 responded and five were able to provide the data we requested (regarding six studies) (15, 16, 22, 64, 89,

100). A summary of study characteristics across conditions is in Table 1. Characteristics of included studies is in Supplementary Table 4.

Seven studies investigated treatment choices for shoulder pain; four (15, 78, 80, 81) focused on subacromial pain syndrome (the most common form of shoulder pain (105)), two (77, 79) included patients with various diagnoses (including subacromial pain syndrome) and one (51) did not specify a diagnosis (Supplementary Table 4). Evidence on the management of subacromial pain syndrome was used to categorise treatment choices for all studies on shoulder pain. Similarly, evidence on the management of lateral ankle sprains was used to categorise treatment choices for all studies on acute ankle injuries (n=2/3 studies on lateral ankle sprains (75, 76)) and evidence on the management of knee osteoarthritis for all studies on knee pain (excluding one study on acute knee injuries (57) and another on a mixed sample of hip and knee osteoarthritis (60) – see Supplementary Table 5).

3.1. Methodological quality

Individual study scores ranged from 4-8 (out of a possible 8) with a mean score of 6.0 (median=6) (Supplementary Table 6). The most common methodological limitations included failing to report that physical therapists who were prepared to participate were representative of the population from which they were drawn (n=88/94) and not using an accurate assessment of treatment choices (n=55/94). All studies clearly described their main findings and used appropriate statistical tests, and most scored positive on the remaining checklist items (Supplementary Table 6).

3.2. Treatment choices that involved treatments that were recommended, not-recommended and had no recommendation (all studies)

3.2.1. Treatment choices assessed by surveys completed by physical therapists (with or without vignettes)

The median percentage of physical therapists that provide (or would provide) treatments that were recommended, not-recommended and had no recommendation was 54%, 43% and 81% for all musculoskeletal conditions, respectively; 35%, 44% and 72% for low back pain; 85%, 38% and 97% for neck pain and whiplash; 93%, 90% and 79% for shoulder pain; 58%, 45% and 98% for knee pain; 39%, 14% and 7% for lateral ankle sprains; 29%,43% and 98% for plantar fasciitis; and 93%, 52% and 62% following knee or hip arthroplasty (Table 2) (Figure 2).

3.2.2. Treatment choices assessed by audits of clinical notes, audits of billing codes, treatment recording forms, clinical observation, or surveys completed by patients

The median percentage of patients that received physical therapy-delivered treatments that were recommended, not-recommended and had no recommendation was 63%, 27% and 45% for all musculoskeletal conditions, respectively; 50%, 18% and 43% for low back pain; 79% (not-recommended) and 57% (no recommendation) for neck pain and whiplash; 76%, 8% and 62% for shoulder pain; 65%, 21% and 53% for knee pain; 45% (no recommendation) for lateral ankle sprains; 87% (recommended) and 90% (no recommendation) for plantar fasciitis; and 65%, 43% and 2% following knee or hip arthroplasty (Table 2) (Figure 2).

3.3. Physical therapy treatment choices for various musculoskeletal conditions

The results summarising the percentage of physical therapy treatments provided for various musculoskeletal conditions that were recommended, not-recommended and had no recommendation can be found in Table 3. For example, as assessed by surveys of physical therapists, the most frequently provided recommended treatment for acute low back pain that

physical therapists 'must provide' was advice to stay active (median=32%, IQR: 13% to 55%, n=7 studies). The most frequently provided not-recommended treatment for acute low back pain was McKenzie therapy (median=36%, IQR: 24% to 37%, n=6) (Table 3). Treatment choices for conditions that were only reported in one study or where one of either recommended or not-recommended treatments could not be inferred from guidelines or systematic reviews can be found in Supplementary Table 5.

4. Discussion

Many physical therapists seem not to follow evidence-based guidelines when managing musculoskeletal conditions. Our review highlights that there is considerable scope to increase the frequency with which physical therapists provide recommended treatments for musculoskeletal conditions and reduce the use of treatments that are not-recommended or have no recommendation to guide their use. Across all musculoskeletal conditions, 54% to 63% of physical therapy treatment choices involve recommended care, while 27% to 43% involve at least one treatment that is not recommended and 45% to 81% at least one treatment that has no recommendation.

4.1. Strengths and weaknesses of the study

The primary strength of this review is that we used a systematic approach to identify studies on physical therapy treatment choices and classified recommendations for physical therapy treatments according to evidence-based guidelines and systematic reviews (Supplementary Table 3). Experts provided feedback to help refine our classification, and a second reviewer double-checked all the extracted data to ensure accuracy.

The main weakness of this review is that primary studies only reported treatment choices for individual treatments and not combinations of treatments. As a result, we could not determine

the percentage of physical therapists that provided only recommended treatments, only not-recommended treatments, only treatments with no recommendation, or other combinations of treatments. Second, it is possible that recommended treatments such as advice and reassurance were not documented in clinical notes or listed in a survey because they are viewed as a routine part of physical therapy. For example, only 12 out of the 48 studies on low back pain reported that physical therapists provide advice to stay active, while even less reported reassurance (n=2) or advice and education to support self-management (n=2). This could have underestimated the proportion of recommended treatment choices. Third, physical therapists' treatment choices may have changed over time so including older studies could limit the relevance of our findings. Nevertheless, we do not believe this is an important limitation because many guideline recommendations have remained largely consistent overtime. For example, although some studies on treatment choices for low back pain are from 1994, a comparison of low back pain guidelines between 1994 and 2000 found a high degree of consistency of recommendations, such as advice to stay active and avoid bed rest (106). This is consistent with current low back pain guidelines. Finally, most studies did not use an accurate assessment of treatment choices (n=55/94). However, we stratified our analysis by how treatment choices were assessed so the influence of having an accurate method of assessment is clear to readers.

4.2. Strengths and weaknesses in relation to other studies

Our finding that approximately half of treatment choices involved recommended treatments is similar to previous studies of healthcare. For example, the CareTrack study in Australia found that 57% of healthcare provided by general practitioners, specialists, physiotherapists, chiropractors, psychologists and counsellors was appropriate (107), while the earlier CareTrack study in the United States found a figure of 55% (108). The percentage of recommended treatment choices for low back pain however was lower in our review (35-

50%) when compared to estimates from the Australian (72%) (107) and United States (69%) CareTrack studies (108). A difference to our study is that the CareTrack studies used consensus of experts to judge the value of care; whereas we based this decision upon evidence-based practice guidelines and systematic reviews. Another difference is that the CareTrack studies only assessed healthcare decisions through audits of clinical notes; we used audit of clinical notes, surveys, vignettes, and clinical observation. Further, the Care Track studies reported primary data collected and were not systematic reviews.

4.3. Meaning of the study

Our results suggest that physical therapy treatment choices for musculoskeletal conditions are often not based upon research evidence. There was extensive use of not-recommended treatments and treatments without recommendations; for some conditions treatments that were not-recommended or had no recommendation were more common choices than recommended treatments (Figure 2). As there are now over 42,000 clinical practice guidelines, systematic reviews and clinical trials to guide physical therapy practice, the challenge in physical therapy is applying this evidence to practice. Professional associations have a potential role to play in this area. Unfortunately, recent marketing from professional associations, popular social media handles and leading journals have emphasised the importance of early referral to physical therapy (109) rather than the nature of physical therapy care provided. The high percentage of non-evidence-based treatment choices in our review suggests that referring patients with musculoskeletal conditions for early physical therapy – without emphasising the importance of the type of non-pharmacological care they receive – may be unwise.

Treatment waste is another important issue highlighted in our review. Even when patients receive recommended treatments they also usually receive not-recommended treatments and treatments that have no recommendation to guide their use. With nearly $100 billion spent on

physical therapy, optometry, podiatry, or chiropractic medicine each year in the United States (110), the waste due to non-evidence-based physical therapy is likely enormous. Further, billing patients for physical therapy treatments that are not evidence-based could also be considered unethical; the Vision Statement of the American Physical Therapy Association makes clear that there is an expectation that "*physical therapists and physical therapist assistants will render evidence-based services"* (111).

4.4. Unanswered questions and future research

Understanding what drives poor patterns of physical therapy care is important as it will guide the design of strategies to ensure the use of treatments that are not-recommended for musculoskeletal conditions does not simply shift from medicine to allied health. One possible explanation is the large variation in physical therapists who receive training in evidence-based practice (21-82%) and can critically appraise research papers (48-70%) (systematic review of 12 studies (112)). Physical therapists with a poor understanding of evidence-based practice might be misled into providing treatments with weak supporting evidence. Another explanation is a lack of awareness of, and agreement with, evidence-based clinical practice guidelines. For example, only 12% of physical therapists are aware of clinical practice guidelines for low back pain (survey of 108 physical therapists) (113) and 46% agree that guidelines should inform the management of low back pain (survey of 274 physical therapists) (114).

A recent initiative that could help physical therapists replace treatments that are not-recommended with recommended treatments is *Choosing Wisely* (115). Over 225 professional societies worldwide endorse *Choosing Wisely* and have published lists of tests and treatments that clinicians and their patients should question. This includes physical therapy associations in Australia, the United States and Italy. Testing strategies to increase adoption of *Choosing Wisely* recommendations among physical therapists is important.

However, existing *Choosing Wisely* recommendations are likely not maximising the potential of the campaign to reduce the use of physical therapy treatments that are not-recommended in guidelines and systematic reviews. For example, half of the Australian Physiotherapy Association *Choosing Wisely* recommendations target diagnostic testing that is not-recommended, while other recommendations target treatments not part of routine physical therapy care, such as whirlpools for wound management and bed rest following diagnosis of acute deep vein thrombosis (American Physical Therapy Association). Our review highlighted the most frequently provided not-recommended non-pharmacological physical therapy treatments across a range of musculoskeletal conditions (Table 3) and could be used to enhance the relevance of future *Choosing Wisely* recommendations. Further, in countries where physical therapists bill for specific treatments (e.g. the United States), another approach could be to restrict funding for anything but recommended physical therapy treatments.

5. Conclusion

Our results suggest that that there is considerable scope to increase the contribution physical therapists could make to managing musculoskeletal conditions by increasing the frequency with which they provide treatments that are recommended in guidelines and systematic reviews and reduce their use of treatments that are not-recommended or have no recommendations to guide their use.

Authors' contributions

All authors critically revised the manuscript for important intellectual content and approved the final manuscript. Please find below a detailed description of the role of each author:

- Joshua R Zadro: conception and design, analysis and interpretation of data, drafting and revision of the manuscript, and final approval of the version to be published
- Mary O'Keeffe: conception and design, interpretation of data, drafting and revision of the manuscript and final approval of the version to be published
- Christopher G Maher: conception and design, interpretation of data, drafting and revision of the manuscript and final approval of the version to be published

The Corresponding Author (JZ) attests that all listed authors meet authorship criteria and that no others meeting the criteria have been omitted.

Competing interests: All authors declare: no support from any organisation for the submitted work; no financial relationships with any organisations that might have an interest in the submitted work; no other relationships or activities that could appear to have influenced the submitted work.

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Table 1. Summary of study characteristics by condition

Condition	**N**	**Countries**	**Age range*;** mean (SD) unless stated otherwise	**Experience*;** mean years (SD) unless stated otherwise **Low:** lowest values from studies **High:** highest values from studies	**Sample size range***	**Assessment measure**
Musculoskeletal						
Low back pain (one study did not contribute data) • Acute (n=18) • Subacute or chronic (n=17) • No duration specified or unable to stratify (n=26)	48	United States (n=9); UK (n=8); Netherlands (n=6); Ireland (n=6); Canada (n=5); New Zealand (n=3); Australia; Brazil; Denmark; Ghana; India; Nigeria Norway; South Africa; Spain; Sweden; Thailand	PTs: 32.6 (7.8) to 47 (9.3) Pts: 34.5 (17) to 53.9 (14.5).	**Low:** 2 (IQR 5) or 77.3% between 1-5y **High:** 24 (9.4) or 50% between 15-24y	PTs: 44-1239 Pts: 42-8714 Treatment sessions: 1151-12387	Survey with vignettes=12 Survey without vignette=11 Treatment recording forms=15 Audit of clinical notes=7 Survey of Pts=1 Audit of billing codes=1 Clinical observation=1
Neck pain and whiplash[a] • Neck pain (n=8) • Whiplash (n=3)	11	United States (n=3); Australia (n=2); various (n=2); Canada; Nigeria; Singapore; Spain; Sweden**	PTs: 32.6 (7.8) or 60% >40y Pts: 35.5 (11.5) to 53.9 (14.5)	**Low:** 8.4 (7.4) or 14.8% <3y **High:** 16 (12)or 38% ≥20y or median (range) 20y (1–47)	PTs: 27-278 Pts: 532-2491	Survey with vignettes=2 Survey without vignette=5 Treatment recording forms=2 Audit of clinical notes =2 Audit of billing codes=1 NB: one study included both a survey without vignette and audit of clinical notes

Subacromial pain or shoulder pain[b]	7	Sweden (n=2); Belgium; India; Netherlands; Nigeria; Spain	PTs: 29.1 (5.4) to 50.6 (26.2) Pts: 50 (13) to 53.9 (14.5)	**Low:** 4.9 (5.1) **High:** 14 (11.8)	PTs: 57-271 Pts: 121-365	Survey with vignettes=2 Survey without vignette=2 Treatment recording forms=1 Audit of clinical notes =1 Audit of billing codes=1
Knee osteoarthritis (one study combined knee and hip osteoarthritis)	7	UK (n=2); Belgium; Canada; Netherlands; Nigeria; Norway	PTs: 45.7 (11.7) to 66.7 (13.2)	**Low:** 8.4 (7.4) or 41.7% between 1-5y **High:** 21 (12) or median (range) 26 (1-45)	Departments: 83 PTs: 123-538 Pts: 870	Survey with vignettes=2 Survey without vignette=3 Survey to department=1 Treatment recording forms=1
Knee pain[c]	3	United States (n=2); Netherlands	PTs: 32.6 (7.8) or 60% <35y Pts: 36.2 (17.6) or 39% between to 41.2 (14.1) or 12% >60y	8.4 (7.4)	PTs: 141-462 Pts: 416-2491	Treatment recording forms=3
Lateral ankle sprains	3	Netherlands (n=3)	PTs: 43 (no SD) to 51 (9) Pts: 34.7% between 0-24y to 5.2% ≥65y or 33 (17)	4 (4) to 8 (15) (within the same study; two separate groups)	PTs: 83-332 Pts: 251-1413	Survey without vignette=1 Treatment recording forms=2
Plantar fascitis	2	UK; United States	Pts: 5.2% <20y to 11.3% ≥60y	5% between 0-2y 11% between 3-5y 27% ≥20y (within the same study)	PTs: 257 Pts: 57800	Survey without vignette=1 Audit of billing codes=1
Lumbar spine stenosis	1	Canada	Pts: 70 (11)	16.8 (no SD)	PTs: 76 Pts: 44	Survey without vignette and survey of Pts=1
Pregnancy-related acute low back pain	1	United Kingdom	No data	21.5 (10)	PTs: 499	Survey with vignettes=1

Pelvic girdle pain	1	Norway; Australia (within the same study)	PTs: 33.5 (9.3) (Norway) 37.9 (11.2) (Australia)	9.3 (9.3) (Norway) 15.4 (11.6) (Australia)	PTs: 142	Survey with vignettes=1
Chronic lateral epicondylitis	1	Sweden	No data	No data	PTs: 47	Survey without vignette=1
Thumb carpometacarpal joint pain	1	United States	No data	Hand therapy experience: 4.6% ≤5y; 13.9% between 6-10y; 64.3% ≥11y	PTs: 547	Survey without vignette=1
Rheumatoid arthritis	2	Canada; Netherlands	PTs: 43 (10.8) Pts: 59.2 (13.8)	**Low:** 19 (SD 10.3) **High:** 22.5 (no SD)	PTs: 26-233	Survey without vignette=1 Treatment recording forms=1
Osteoporosis	2	Canada; United States	No data	13.7 (10.8)	PTs: 67-83	Survey without vignette=2
Sports injuries	3	Greece; Nigeria; United Kingdom	Pts: 29.9 (10.8) to 35 (12.5)	No data	Pts: 171-1399	Treatment recording forms=2 Audit of clinical notes =1
Patella femoral pain syndrome and Achilles tendinopathy	1	United Kingdom	35 (12.5)	No data	Pts: 100	Audit of clinical notes =1
Combined musculoskeletal conditions (low back pain, neck pain, shoulder pain, knee pain and acquired deformities of the spine)	1	Netherlands	Pts: 46.1% ≥45y	No data	Pts: 8714 PTs: 74	Treatment recording forms=1
Orthopaedics						

Knee arthroplasty[d] (one study combined knee and hip arthroplasty)	6	UK (n=3); Australia; Greece; Netherlands	PTs: 40.4 (12.6) Pts: 71.4 (7.7)	**Low:** 34.1% <5y **High:** 37.9% ≥20y	Departments: 16-65 PTs: 132-303 Pts: 63	Survey without vignette=3 Survey to department=2 Audit of clinical notes =1
Lumbar surgery (fusion or discectomy)	2	UK (n=2)	No data	Condition specific experience: 10 (IQR: 3-15)	Departments: 75 PTs: 71	Survey without vignette=1 Survey to department=1
Pelvic surgery	1	Australia	No data	No data	PTs: 84	Survey without vignette=1
Distal radius fracture	1	Australia	PTs: median (IQR) 33.5 (23-40) Pts: 71% >51y	Median (IQR) 7 (0.8-11)	Pts: 70 Treatment sessions: 160	Treatment recording forms=1

N: number of studies; PTs: physical therapists or physiotherapists; Pts: patients; SD: standard deviation; IQR: interquartile range; COPD: chronic obstructive pulmonary disease; ICU: intensive care unit; y: years.

*: single values indicate that only one study provided data for this field

**: one study looked at data from more than one country

[a]: two studies also provided data on physical therapy treatment choices for low back pain and knee pain, two for low back pain and shoulder pain and one for low back pain only.

[b]: two studies also provided data on physical therapy treatment choices for low back pain and neck pain

[c]: two studies also provided data on physical therapy treatment choices for neck pain and low back pain, and one for low back pain only

[d]: one study also provided data on physical therapy treatment choices for low back pain

Table 2. Percentage (median and interquartile range) of physical therapy treatment choices that involved treatments that were recommended, not-recommended or had no recommendation.

	Assessed by surveys of physical therapists*				Assessed by clinical notes			
MUSCULOSKELETAL CONDITIONS[a]	**Median (%[c])**	**Q1**	**Q3**	**N**	**Median (%[d])**	**Q1**	**Q3**	**N**
Recommended	54	25	76	23	63	46	68	8
Not-recommended	43	34	61	37	27	13	45	20
No recommendation	81	49	96	37	45	31	85	31
LOW BACK PAIN	**Median (%[c])**	**Q1**	**Q3**	**N**	**Median (%[d])**	**Q1**	**Q3**	**N**
Recommended	35	16	56	9	50	32	62	5
Not-recommended	44	34	64	24	18	10	36	15
No recommendation	72	45	88	24	43	31	81	23
NECK PAIN AND WHIPLASH	**Median (%[c])**	**Q1**	**Q3**	**N**	**Median (%[d])**	**Q1**	**Q3**	**N**
Recommended	85	82	94	6	-			
Not-recommended	38	35	67	5	79	66	89	4
No recommendation	97	72	98	6	57	26	84	4
SHOULDER PAIN	**Median (%[c])**	**Q1**	**Q3**	**N**	**Median (%[d])**	**Q1**	**Q3**	**N**
Recommended[b]	93	90	94	4	76	68	79	3
Not-recommended	90			1	8			1
No recommendation	79	69	88	4	62	57	77	3
KNEE OSTEOARTHRITIS/PAIN	**Median (%[c])**	**Q1**	**Q3**	**N**	**Median (%[d])**	**Q1**	**Q3**	**N**
Recommended	58	49	65	5	65	65	66	2
Not-recommended	45	35	55	6	21			1
No recommendation	98	88	100	5	53	42	64	2

LATERAL ANKLE SPRAINS	Median (%[c])	Q1	Q3	N	Median (%[d])	Q1	Q3	N
Recommended	39	31	46	2	-			
Not-recommended	14			1	-			
No recommendation	7			1	45			1

PLANTAR FASCIITIS	Median (%[c])	Q1	Q3	N	Median (%[d])	Q1	Q3	N
Recommended	29			1	87			1
Not-recommended	43			1	-			
No recommendation	98			1	90			1

KNEE ARTHROPLASTY**	Median (%[c])	Q1	Q3	N	Median (%[d])	Q1	Q3	N
Recommended	93	83	95	5	65			1
Not-recommended	52	42	67	4	43			1
No recommendation	62	23	95	4	2			1

N=number of studies; Q1: first quartile; Q3: third quartile.

[a]: summary values excluded shoulder pain and knee arthroplasty as they did not have guidelines that recommended 'core' physical therapy treatments.

[b]: recommended care was based on delivering treatment that was 'likely to be beneficial' according to *'Kulkarni RN, Gibson JA, Brownson P, Thomas M, Rangan A, Carr AJ, Rees JL. Subacromial shoulder pain BESS/BOA Patient Care Pathways. Shoulder Elbow. 2015:0(0);1–9.'*

[c]: the percentage of physical therapists that report they provide (or would provide) treatments that were recommended, not-recommended and had no recommendation.

[d]: the percentage of patients that received treatments from a physical therapist that were recommended, not-recommended or had no recommendation for a given condition as determined by audits of clinical notes, audits of billing codes, treatment recording forms, clinical observation, or surveys completed by patients.

*: summary values for knee arthroplasty includes studies that assessed treatment choices by surveys to physical therapy departments

**: includes one study that combined treatment practices for knee and hip arthroplasty

Table 3. Percentage (median and interquartile range) of physical therapy treatment choices that involved treatments that were recommended, not-recommended or had no recommendation across different conditions.

MUSCULOSKELETAL								
ACUTE LOW BACK PAIN								
	Assessed by surveys of physical therapists				**Assessed by clinical notes**			
Recommended	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
MUST PROVIDE								
Advice to keep active	32	13	55	7	70			1
Reassurance	3			1	-			
CONSIDER PROVIDING								
Group exercise	14	7	20	2	-			
Combination of two or more of 1-3	39	35	60	9	50	47	52	6
1. Manual therapy[a]	45	39	68	9	60	47	78	6
2. Exercise	72	44	78	10	65	51	82	6
3. CBT	-				-			
Superficial heat	33	31	42	5	13	9	43	3
Not-recommended	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
Paracetamol	39			1	-			
McKenzie	36	24	37	6	53			1
US, ES, TENS, IF	34	29	49	7	16	13	29	4
Poor advice[b]	9	2	28	8	-			
Acupuncture	6	3	16	7	-			
Traction	5	4	28	9	16			1
External support[c]	2	2	16	5	-			
No recommendation	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
Other advice[d]	70	54	75	11	49	34	62	5
Cold therapy[e]	29	27	44	5	33	32	34	2
Other electrophysical agents[f]	16	5	27	5	14	12	20	3
Work-related/ergonomic interventions	16	10	28	7	-			
Back schools	11	7	18	5	-			
Other manual therapy[g]	8	8	20	3	7	7	9	3
Biofeedback	1	0	1	3	-			
SUB-ACUTE OR CHRONIC LOW BACK PAIN								
	Assessed by surveys of physical therapists				**Assessed by clinical notes**			

Recommended	Median (%€)	Q1	Q3	N	Median (%¥)	Q1	Q3	N
MUST PROVIDE								
Advice to keep active	56	35	76	4	-			
CONSIDER PROVIDING								
Group exercise	27	14	40	2	-			
Combination of two or more of 1-3	41	28	51	9	32	20	43	5
1. Manual therapy[a]	49	30	51	9	58	25	74	6
2. Exercise	64	51	78	10	64	32	75	5
3. CBT	10			1	-			
McKenzie	28	19	35	6	32			1
Not-recommended	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
US, ES, TENS, IF	38	23	46	6	18	16	32	5
Traction	9	4	22	10	6	6	7	2
Acupuncture	8	5	15	7	-			
External support[c]	2	2	9	5	24			1
Poor advice[b]	1	0	6	7	-			
No recommendation	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
Other advice[d]	68	57	86	9	-			
Superficial heat	38	27	47	4	51	38	55	3
Cold therapy[e]	24	14	34	6	32	18	37	3
Other electrophysical agents[f]	19	19	42	3	11	9	15	4
Work-related/ergonomic interventions	11	6	22	4	1			1
Other manual therapy[g]	10	7	20	3				
Back schools	6	5	26	5				
Biofeedback	1	1	1	2				
Iontophoresis	-				3			1

LOW BACK PAIN (duration not specified)

	Assessed by surveys of physical therapists				Assessed by clinical notes			
	Median (%€)	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
Recommended								
MUST PROVIDE								
Advice to keep active	35			1	50	30	56	3
Advice and education to support self-management	26	22	31	2	21	16	27	2
Reassurance	16			1	-			

CONSIDER PROVIDING								
Group exercise	-				76			1
Combination of two or more of 1-3	59	46	86	8	34	24	46	12
1. Manual therapy[a]	60	57	87	9	34	23	44	12
2. Exercise	89	52	91	8	69	61	81	13
3. CBT	-				47			1
McKenzie	47	36	56	7	58	11	71	5
Superficial heat	39	28	55	7	16	10	34	4

Not-recommended	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
US, ES, TENS, IF	67	37	75	8	14	8	30	5
Acupuncture	45			1	6	4	8	4
Traction	45	15	61	8	8	3	10	6
Poor advice[b]	26	6	57	4	23	12	33	3
External support[c]	23	14	31	2	2	2	2	4

No recommendation	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
Other advice[d]	89	77	93	4	68	33	91	9
Work-related/ergonomic interventions	71	52	87	4	26	23	29	2
Other manual therapy[g]	19	10	43	7	10	6	17	7
Other electrophysical agents[f]	15	9	41	8	23	17	40	8
Cold therapy[e]	7	5	17	4	13	6	49	3
Relaxation therapy	7			1	12			1
Back schools	-				45			1
Iontophoresis	-				3			1

[a]: includes massage, mobilisation or manipulation;
[b]: advice promoting bed rest or time off work;
[c]: corsets, belts, braces, sticks or taping;
[d]: includes advice on posture, heavy lifting, sitting or standing habits, avoiding painful movements, analgesics;
[e]: including where heat and cold therapy could not be separated;
[f]: including laser, infrared therapy, micro current therapy, SWD, etc.;
[g]: includes neural mobilisation, Mulligan, Cyriax, myofascial release, etc.

NECK PAIN*

	Assessed by surveys of physical therapists**				**Assessed by clinical notes**			
Recommended	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
SHOULD PROVIDE								
Importance of maintaining activity and movement	93	89	96	2	-			

CONSIDER structured education[a] in combination with 1, 2, 3 or 4								
1. Multimodal care[b]	51			1	65	57	73	2
2. Range of motion/flexibility and strengthening exercises	89 (range of motion or flexibility only)	84	93	2	55	54	56	2
3. Clinical massage	11			1	64	57	72	2
4. Laser	6			1	4			1

Not-recommended	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
Relaxation therapy	67			1	13			1
US, ES, TENS, SWD	27	23	31	2	32	25	39	3
Strengthening alone[c]	31			1	55	54	56	2
Heat or cold therapy	25			1	79	66	89	4
Poor advice[d]	12			1	-			
CBT	8			1	-			

No recommendation	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
Advice on posture	96			1	2			1
Other exercise[e]	82	73	90	2	59	44	73	2
Acupuncture	40	38	42	2	-			
McKenzie	35			1	-			
Manual therapy alone[f]	31	20	41	2	86	74	90	4
Neural mobilisation	22			1	-			
Traction	20			1	33	24	43	2
Magnetic field therapy	-				2			1
Collar	-				1			1
Biofeedback								

ACUTE WHIPLASH

	Assessed by surveys of physical therapists				**Assessed by clinical notes**			
Recommended	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
SHOULD PROVIDE								
Importance of maintaining activity and movement	81	44	87	3	-			
Information on nature, management and course	56	41	70	2	-			

CONSIDER structured education[a] in combination with 1 or 2								

1. Multimodal care[b]	81	79	84	2	-			
2. Range of motion/flexibility exercises	90	86	94	2	-			

Not-recommended	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
Heat or cold therapy	53	46	61	2	-			
Poor advice[d]	11	5	16	2	-			
Collar	7	4	10	2	-			
US, ES	4	2	7	2	-			

No recommendation	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
Other exercise[e]	96	91	97	3	-			
Clinical massage	86			1	-			
Manual therapy alone[f]	83	79	86	2	-			
Advice on posture or analgesics	53	32	74	2	-			
Work-related/ergonomic interventions	39			2	-			
Traction	30			1	-			
Laser, IF	24	18	30	2	-			
McKenzie	9			1	-			

CHRONIC WHIPLASH

	Assessed by surveys of physical therapists				**Assessed by clinical notes**			
Recommended	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
SHOULD PROVIDE								
Importance of maintaining activity and movement	80	79	80	2	-			
Information on nature, management and course	60			1	-			
CONSIDER structured education[a] in combination with 1, 2 or 3								
1. Multimodal care[b]	72			1	-			
2. Range of motion/flexibility and strengthening exercises	56			1	-			
3. Clinical massage	86			1	-			

Not-recommended	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
Strengthening alone[c]	56			1	-			

Heat or cold therapy	43	38	48	2	-			
US, ES, TENS, SWD	30	30	30	2	-			
Poor advice[d]	10	5	15	2	-			
No recommendation	**Median (%[€])**	**Q1**	**Q3**	**N**	**Median (%[¥])**	**Q1**	**Q3**	**N**
Advice on posture	95			1	-			
Other exercise[e]	94	93	95	2	-			
Work-related/ergonomic interventions	74	71	78	2	-			
Manual therapy alone[e]	68	59	77	2	-			
McKenzie	10			1	-			
Collar	1	1	2	2	-			

*: insufficient data to stratify by symptom duration. We used the guidelines for chronic neck pain from Supplementary Table 3 as they classify a greater number of interventions as high- and low-value
**: included two studies that combined treatment choices for neck pain and whiplash
[a]: no study reported structured education so the below interventions are reported in isolation
[b]: includes mobilisation or manipulation and range of motion exercises
[c]: we were unable to determine the proportion of strengthening that was delivered in isolation
[d]: advice promoting bed rest or time off work
[e]: any exercise not included in the above categories
[f]: includes mobilisation or manipulation, but we were unable to determine the proportion of manual therapy that was delivered in isolation

SUBACROMIAL PAIN (surveys) OR SHOULDER PAIN* (clinical notes)

	Assessed by surveys of physical therapists				**Assessed by clinical notes**			
Recommended**	**Median (%[€])**	**Q1**	**Q3**	**N**	**Median (%[¥])**	**Q1**	**Q3**	**N**
LIKELY TO BE BENEFICIAL								
Exercise	89	85	92	4	72	67	76	2
Manual therapy[a]	49	20	80	4	61	59	68	3
Laser	36	20	52	2	23	18	27	2
Not-recommended	**Median (%[€])**	**Q1**	**Q3**	**N**	**Median (%[¥])**	**Q1**	**Q3**	**N**
IF, Magnetic field therapy	90			1	8			1
No recommendation	**Median (%[€])**	**Q1**	**Q3**	**N**	**Median (%[¥])**	**Q1**	**Q3**	**N**
Any advice[b]	79	77	82	2	91			1
Tape	59	54	64	2	15			1
Acupuncture	53	51	54	2	-			
Shockwave, ES, US, SWD, TENS, microwave current	44	33	65	4	26	13	39	3
Heat or cold therapy	38	24	55	4	47	39	54	2
Body awareness	11			1	-			
CBT	4			1	-			
Iontophoresis	-				15			1

*: two studies combined physical therapy treatment choices for a variety of shoulder conditions
**:there is no high-quality evidence supporting a recommended physical therapy intervention for shoulder pain
[a]: includes massage, mobilisation or manipulation
[b]: including advice on posture and advice to rest or reduce activity

KNEE OSTEOARTHRITIS (surveys)* AND KNEE PAIN (clinical notes)**

	Assessed by surveys of physical therapists				Assessed by clinical notes			
Recommended	**Median (%[€])**	**Q1**	**Q3**	**N**	**Median (%[¥])**	**Q1**	**Q3**	**N**
MUST PROVIDE								
Advice to stay active	89	78	92	3	-			
Self-management strategies [a]	82	74	91	3	-			
Aerobic and strengthening	66	47	72	3	65	65	66	2
Advice on footwear	57			1	-			
Weight loss interventions	54	51	56	3	-			
Advice on weight loss	49			1	-			
CONSIDER PROVIDING								
Heat or cold therapy	62	15	73	5	69	63	74	2
Manual therapy [b], traction or stretching	60	54	76	5	79	78	79	2
TENS	52	32	54	3	21	21	21	1
Walking aids	8	5	38	3	-			
CBT	3			1	-			
Not-recommended	**Median (%[€])**	**Q1**	**Q3**	**N**	**Median (%[¥])**	**Q1**	**Q3**	**N**
ES, US, Laser, IF, SWD	43	20	55	6	21			1
Poor advice [c]	23	15	31	2	-			
Acupuncture	22	20	34	5	-			
No recommendation	**Median (%[€])**	**Q1**	**Q3**	**N**	**Median (%[¥])**	**Q1**	**Q3**	**N**
Other exercise [d]	98	88	100	5	75			1
Balneotherapy	16			1	-			
Iontophoresis	-				8			1

*: one study that combined physical therapy treatment choices for knee and hip osteoarthritis was not included in this table (Barten DJ, et al. 2015) (See Supplementary Table 3)
**: one study that combined physical therapy treatment choices for acute and chronic knee conditions was not included in this table (van Baar ME, et al. 1998) (See Supplementary Table 3)
[a]: includes exercise, weight loss, use of suitable footwear or pacing, but we were unable to assess the content of self-management strategies reported in the included studies
[b]: includes massage, mobilisation or manipulation
[c]: advice promoting bed rest or time off work
[d]: exercise that is neither aerobic nor strengthening
[e]: spa bath therapy (separate to hydrotherapy which is included within 'other exercise')

ACUTE LATERAL ANKLE SPRAINS

	Assessed by surveys of physical therapists				Assessed by clinical notes			
Recommended	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
SHOULD PROVIDE								
Exercise	39	31	46	2	-			
CONSIDER PROVIDING								
Rest, ice, compression and elevation[a]	12			1	-			
External support[b]	34			1	-			
Not-recommended	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
US, ES, Laser	14			1	-			
Joint mobilisation	3			1	-			
Heat or cold therapy	1			1	-			
No recommendation	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
Advice or education	22	12	33	2	-			
IF, SWD, Diadynamic current	7			1	45			1

[a]: only compression was mentioned in the included study
[b]: includes braces, boots or taping

PLANTAR FASCITIS

	Assessed by surveys of physical therapists				Assessed by clinical notes			
Recommended	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
SHOULD PROVIDE								
Stretching	100			1	-			
Manual therapy[a]	81			1	87			1
Night splints	29			1				
MAY PROVIDE								
Strengthening exercises and movement training	94			1	-			
Education and counselling for weight loss	89			1	-			
Laser, US, ES	43			1	-			
Not-recommended	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
Acupuncture	31			1	-			
No recommendation	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
Shockwave	10			1	-			

Heat or cold therapy	79	1	-	
Other exercise[b]	96	1	90	1
Other advice[c]	98	1	-	
Prefabricated orthotics[d]	70	1		

[a]: includes massage, mobilisation or manipulation
[b]: exercise that is neither strengthening or movement training
[c]: includes advice on self-management, pacing, ergonomics, etc.
[d]: custom orthotics were provided by 63% of physical therapists

ORTHOPAEDICS

KNEE OR HIP ARTHROPLASTY (surveys of physical therapists or physical therapy departments)*

	Inpatients				Outpatients**			
Recommended	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%€)**	**Q1**	**Q3**	**N**
Exercise	94	94	95	2	76	66	86	4
Not-recommended	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%€)**	**Q1**	**Q3**	**N**
Passive range of motion	69	57	81	2	1			1
Cold therapy	28	25	30	2	20	16	25	2
No recommendation	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%€)**	**Q1**	**Q3**	**N**
Manual therapy[a]	93			1	31			1
Advice or education	-				55	33	77	2
TENS, electrotherapy	-				0			1
Acupuncture	-				0			1

[a]: includes massage or mobilisation
*one study that reported physical therapy treatment choices as assessed by clinical notes is not included in this table but is represented in the summary table (Table 2)
**includes one study that reported physical therapy treatment choices for knee and hip arthroscopy combined

N=number of studies; Q1: first quartile; Q3: third quartile; CBT: cognitive behavioural therapy; ES: electrical stimulation; IF: interferential current; SWD: short wave diathermy; TENS: transcutaneous electrical nerve stimulation; US: Ultrasound.
€: the percentage of physical therapists that report they provide (or would provide) treatments that was recommended, not-recommended and had no recommendation for a given condition.
¥: the percentage of patients that received treatments from a physical therapist that were recommended, not-recommended, or had no recommendation for a given condition as determined by audits of clinical notes, audits of billing codes, treatment recording forms, clinical observation, or surveys completed by patients.

Figure legend

Figure 1. PRISMA flow diagram

Figure 2. Median percentage of physical therapy treatment choices that involved treatments that are recommended, not-recommended and had no recommendation

Supplementary Tables

PRISMA 2009 Flow Diagram

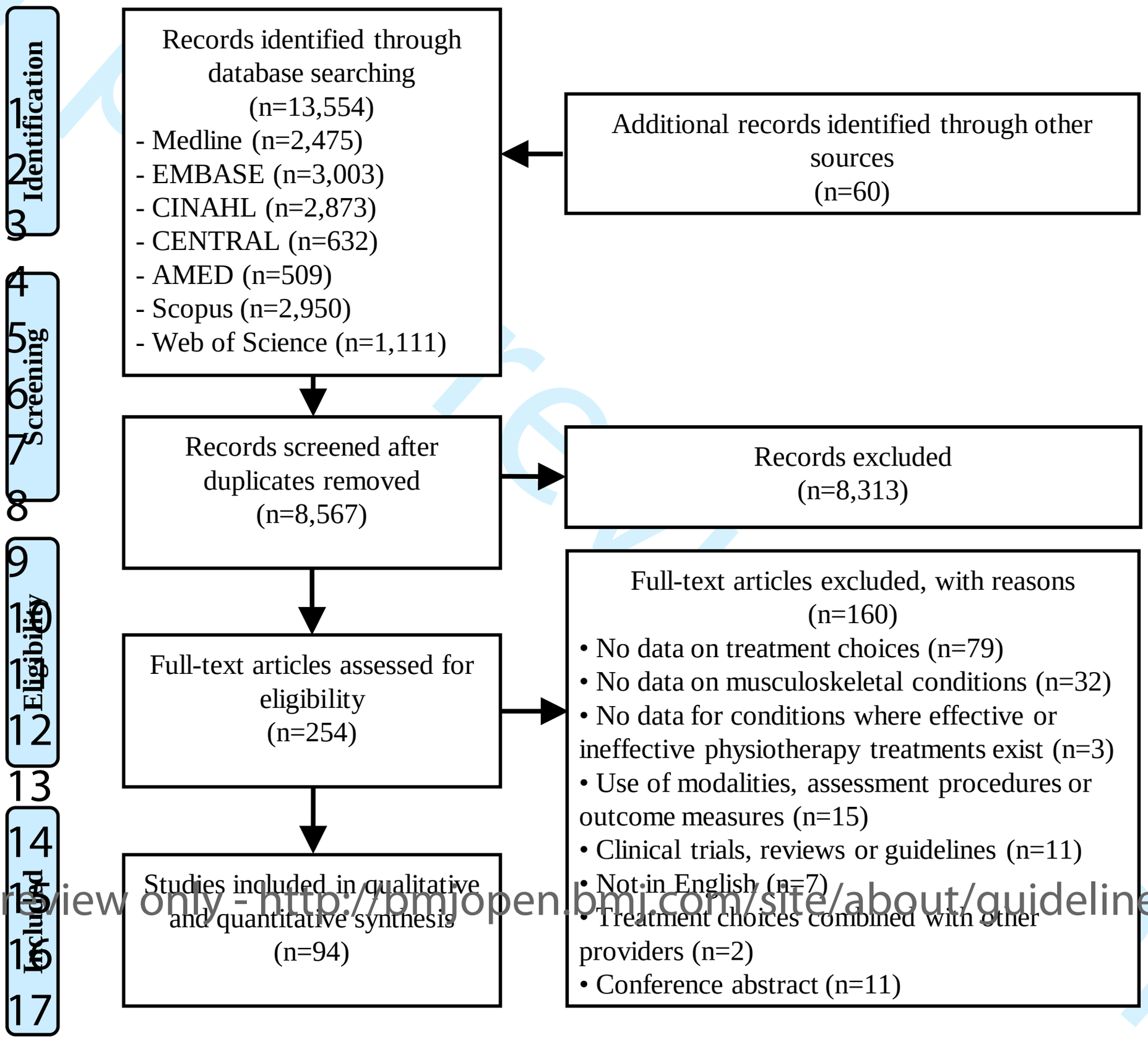
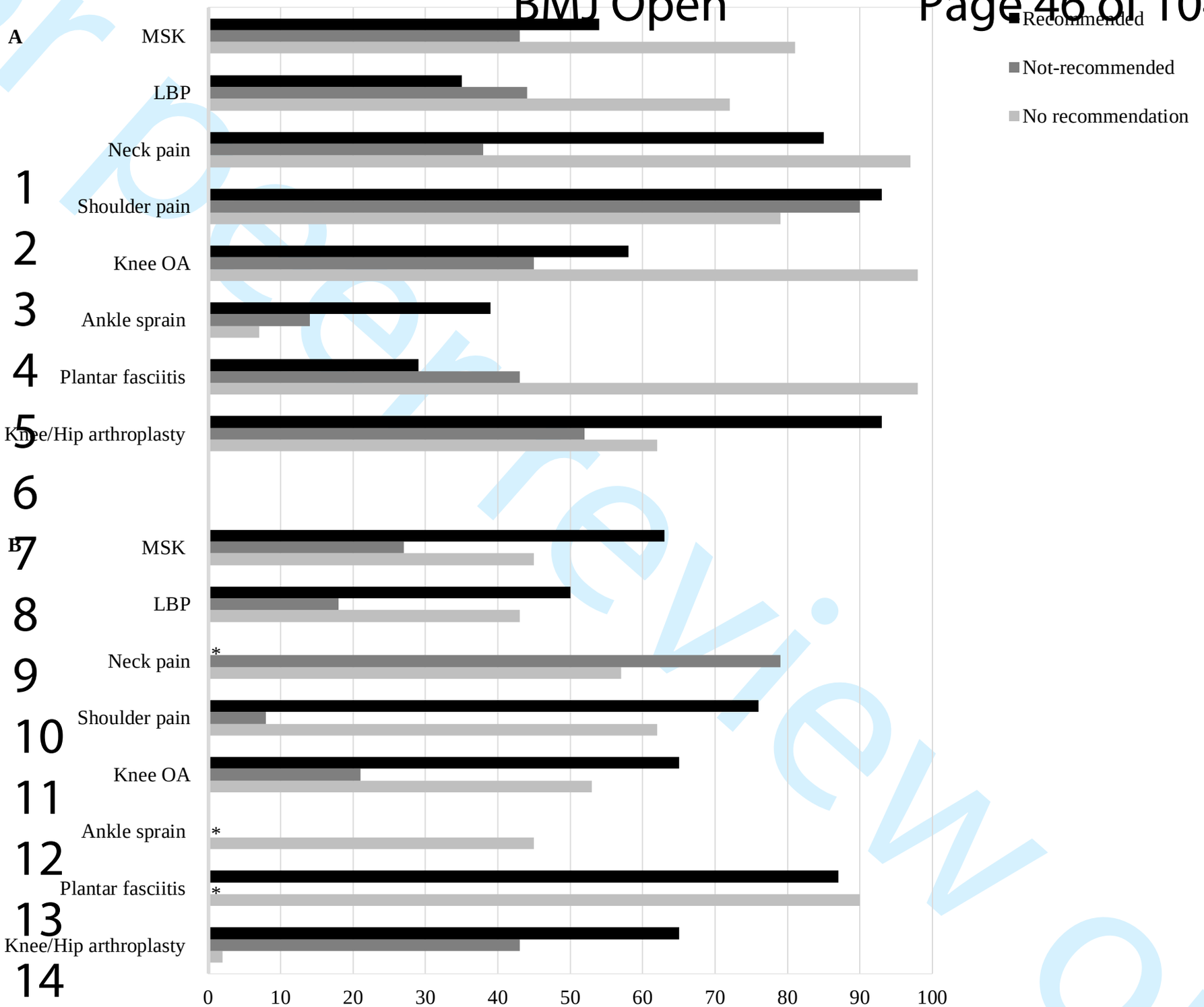


Figure 2. Median percentage of physical therapy treatment choices that involved treatments that are recommended, not-recommended and had no recommendation



A: The percentage of physical therapists that report they provide (or would provide) treatments that are recommended, not-recommended and had no recommendation for a given condition.

B: The percentage of patients that received treatments that were recommended, not-recommended and had no recommendation from a physical therapist for a given condition as determined by audits of clinical notes, audits of billing codes, treatment recording forms, clinical observation, or surveys completed by patients.

*: no treatment choices in this category(s) could be identified

MSK: all musculoskeletal conditions (excluding shoulder pain and knee/hip arthroplasty); LBP: low back pain; OA: osteoarthritis.

Supplementary Table 1: Search Strategy

MEDLINE via Ovid

	Searches
Low-value care	1. overdiagnosis.mp 2. "over diagnosis".mp 3. "overdiagnosed".mp 4. overtreatment.mp 5. "over treat*".mp 6. exp Unnecessary Procedures/ 7. "unnecessary".mp 8. "low value".mp 9. "lower value".mp 10. "high value".mp 11. "higher value".mp 12. overutilization.mp 13. "over utilization".mp 14. overutilisation.mp 15. "over utilisation".mp 16. ("overuse" not "overuse injur*").mp 17. exp Health Services Misuse/ 18. "Choosing Wisely".mp 19. exp Guideline Adherence/ 20. "adherence to guidelines".mp 21. "guideline adherence".mp 22. "guideline use".mp 23. "practice pattern*".mp 24. "variability in health care".mp 25. "high cost*".mp 26. "increased cost*".mp 27. "excess cost*".mp 28. "treatment package".mp 29. "transparency of care".mp 30. "resistance to change".mp 31. ineffective.mp 32. "non-evidence based".mp 33. Waste*.mp 34. Inappropriate.mp 35. "poor care".mp 36. "recommended care".mp 37. "right care".mp 38. "quality of care".mp 39. Uncertainty.mp 40. "disinvestment".mp 41. "value based care".mp

	42. 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22 or 23 or 24 or 25 or 26 or 27 or 28 or 29 or 30 or 31 or 32 or 33 or 34 or 35 or 36 or 37 or 38 or 39 or 40 or 41
Physiotherapist	43. "physiotherap*".mp 44. exp Physical Therapy Modalities/ 45. exp Physical Therapy Specialty/ 46. "physical therap*".mp 47. 43 or 44 or 45 or 46
	48. 42 and 47 49. Limit 48 to humans

CINHAL via EBSCOhost

	Searches
Low-value care	1. overdiagnosis 2. "over diagnosis" 3. "overdiagnosed" 4. overtreatment 5. "over treat*" 6. MM "Unnecessary Procedures" 7. "unnecessary" 8. "low value" 9. "lower value" 10. "high value" 11. "higher value" 12. overutilization 13. "over utilization" 14. overutilisation 15. "over utilisation" 16. ("overuse" not "overuse injur*") 17. MM "Health Services Misuse+" 18. MM "Guideline Adherence" 19. "Choosing Wisely" 20. "adherence to guidelines" 21. "guideline adherence" 22. "guideline use" 23. "practice pattern*" 24. "variability in health care" 25. "high cost*" 26. "increased cost*" 27. "excess cost*" 28. "treatment package" 29. "transparency of care" 30. "resistance to change" 31. ineffective 32. "non-evidence based" 33. Waste* 34. Inappropriate 35. "poor care" 36. "recommended care" 37. "right care" 38. Uncertainty 39. "disinvestment" 40. "value based care" 41. 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22

	or 23 or 24 or 25 or 26 or 27 or 28 or 29 or 30 or 31 or 32 or 33 or 34 or 35 or 36 or 37 or 38 or 39 or 40
Physiotherapist	42. "physiotherap*" 43. "physical therap*" 44. MM "Research, Physical Therapy" 45. MM "Physical Therapy Practice, Evidence-Based" 46. MM "Physical Therapy Practice" 47. MM "Physical Therapy Service" 48. MM "Physical Therapy Assessment" 49. MM "Physical Therapy Practice, Research-Based" 50. MM "Physical Therapy+" 51. 42 or 43 or 44 or 45 or 46 or 47 or 48 or 49 or 50
	52. 41 and 51

EMBASE via Ovid

	Searches
Low-value care	1. overdiagnosis.mp 2. "over diagnosis".mp 3. "overdiagnosed".mp 4. overtreatment.mp 5. "over treat*".mp 6. exp Unnecessary Procedures/ 7. "unnecessary".mp 8. "low value".mp 9. "lower value".mp 10. "high value".mp 11. "higher value".mp 12. overutilization.mp 13. "over utilization".mp 14. overutilisation.mp 15. "over utilisation".mp 16. ("overuse" not "overuse injur*").mp 17. "Choosing Wisely".mp 18. exp Guideline Adherence/ 19. "adherence to guidelines".mp 20. "guideline adherence".mp 21. "guideline use".mp 22. "practice pattern*".mp 23. "variability in health care".mp 24. "high cost*".mp 25. "increased cost*".mp 26. "excess cost*".mp 27. "treatment package".mp 28. "transparency of care".mp 29. "resistance to change".mp 30. ineffective.mp 31. "non-evidence based".mp 32. Waste*.mp 33. Inappropriate.mp 34. "poor care".mp 35. "recommended care".mp 36. "right care".mp 37. "quality of care".mp 38. Uncertainty.mp 39. "disinvestment".mp 40. "value based care".mp 41. 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22

	or 23 or 24 or 25 or 26 or 27 or 28 or 29 or 30 or 31 or 32 or 33 or 34 or 35 or 36 or 37 or 38 or 39 or 40
Physiotherapist	42. "physiotherap*".mp 43. exp Physical Therapy Modalities/ 44. exp Physical Therapy Specialty/ 45. "physical therap*".mp 46. 42 or 43 or 44 or 45
	47. 41 and 46 48. Limit 47 to humans

CENTRAL via Ovid

	Searches
Low-value care	1. overdiagnosis.mp 2. "over diagnosis".mp 3. "overdiagnosed".mp 4. overtreatment.mp 5. "over treat*".mp 6. exp Unnecessary Procedures/ 7. "unnecessary".mp 8. "low value".mp 9. "lower value".mp 10. "high value".mp 11. "higher value".mp 12. overutilization.mp 13. "over utilization".mp 14. "over utilisation".mp 15. ("overuse" not "overuse injur*").mp 16. exp Health Services Misuse/ 17. "Choosing Wisely".mp 18. exp Guideline Adherence/ 19. "adherence to guidelines".mp 20. "guideline adherence".mp 21. "guideline use".mp 22. "practice pattern*".mp 23. "variability in health care".mp 24. "high cost*".mp 25. "increased cost*".mp 26. "excess cost*".mp 27. "treatment package".mp 28. "resistance to change".mp 29. ineffective.mp 30. "non-evidence based".mp 31. Waste*.mp 32. Inappropriate.mp 33. "poor care".mp 34. "recommended care".mp 35. "right care".mp 36. "quality of care".mp 37. Uncertainty.mp 38. "disinvestment".mp 39. "value based care".mp 40. 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22 or 23

	or 24 or 25 or 26 or 27 or 28 or 29 or 30 or 31 or 32 or 33 or 34 or 35 or 36 or 37 or 38 or 39
Physiotherapist	41. "physiotherap*".mp 42. exp Physical Therapy Modalities/ 43. "physical therap*".mp 44. 41 or 42 or 43
	45. 40 and 44 46. Limit 45 to humans

AMED via Ovid

	Searches
Low-value care	1. overdiagnosis.mp 2. "over diagnosis".mp 3. "overdiagnosed".mp 4. overtreatment.mp 5. "over treat*".mp 6. "unnecessary".mp 7. "low value".mp 8. "lower value".mp 9. "high value".mp 10. "higher value".mp 11. overutilization.mp 12. "over utilization".mp 13. ("overuse" not "overuse injur*").mp 14. "Choosing Wisely".mp 15. "adherence to guidelines".mp 16. "guideline adherence".mp 17. "guideline use".mp 18. "practice pattern*".mp 19. "high cost*".mp 20. "increased cost*".mp 21. "excess cost*".mp 22. "treatment package".mp 23. "resistance to change".mp 24. ineffective.mp 25. "non-evidence based".mp 26. Waste*.mp 27. Inappropriate.mp 28. "poor care".mp 29. "recommended care".mp 30. "right care".mp 31. "quality of care".mp 32. Uncertainty.mp 33. "disinvestment".mp 34. "value based care".mp 35. 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22 or 23 or 24 or 25 or 26 or 27 or 28 or 29 or 30 or 31 or 32 or 33 or 34
Physiotherapist	36. "physiotherap*".mp 37. exp Physical Therapy Modalities/ 38. "physical therap*".mp 39. 36 or 37 or 38

	40. 35 and 39

Scopus

	Searches
Low-value care	1. TITLE-ABS-KEY (“overdiagnosis”) 2. TITLE-ABS-KEY (“over diagnosis”) 3. TITLE-ABS-KEY (“overdiagnosed”) 4. TITLE-ABS-KEY (“overtreatment”) 5. TITLE-ABS-KEY (“over treat*”) 6. TITLE-ABS-KEY (“low value”) 7. TITLE-ABS-KEY (“high value”) 8. TITLE-ABS-KEY (“lower value”) 9. TITLE-ABS-KEY (“higher value”) 10. TITLE-ABS-KEY (“unnecessary”) 11. TITLE-ABS-KEY (“overutilisation”) 12. TITLE-ABS-KEY (“over utilization”) 13. TITLE-ABS-KEY (“overutilization”) 14. TITLE-ABS-KEY (“over utilisation”) 15. TITLE-ABS-KEY (“Choosing Wisely”) 16. TITLE-ABS-KEY ("overuse" not "overuse injur*") 17. TITLE-ABS-KEY (“adherence to guidelines”) 18. TITLE-ABS-KEY (“guideline adherence”) 19. TITLE-ABS-KEY (“guideline use”) 20. TITLE-ABS-KEY (“inappropriate”) 21. TITLE-ABS-KEY (“transparency of care”) 22. TITLE-ABS-KEY (“variation in utilisation”) 23. TITLE-ABS-KEY (“practice pattern”) 24. TITLE-ABS-KEY (“variability in health care”) 25. TITLE-ABS-KEY (“increased cost*”) 26. TITLE-ABS-KEY (“excess cost*”) 27. TITLE-ABS-KEY (“high cost*”) 28. TITLE-ABS-KEY (“treatment package”) 29. TITLE-ABS-KEY (“resistance to change”) 30. TITLE-ABS-KEY (“ineffective”) 31. TITLE-ABS-KEY (“non-evidence based”) 32. TITLE-ABS-KEY (“waste”) 33. TITLE-ABS-KEY ("poor care") 34. TITLE-ABS-KEY ("recommended care") 35. TITLE-ABS-KEY ("right care") 36. TITLE-ABS-KEY (“quality of care") 37. TITLE-ABS-KEY (“uncertainty”) 38. TITLE-ABS-KEY ("disinvestment") 39. TITLE-ABS-KEY ("value based care") 40. 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22

	or 23 or 24 or 25 or 26 or 27 or 28 or 29 or 30 or 31 or 32 or 33 or 34 or 35 or 36 or 37 or 38 or 39
Physiotherapist	41. TITLE-ABS-KEY(“physiotherap*”) 42. TITLE-ABS-KEY(“physical therap*”) 43. 41 or 42
	44. 40 and 43

Web of Science

	Searches
Low-value care	1. TS= (“overdiagnosis”) 2. TS= (“over diagnosis”) 3. TS= (“overdiagnosed”) 4. TS= (“overtreatment”) 5. TS= (“over treat*”) 6. TS= (“unnecessary”) 7. TS= (“low value”) 8. TS= (“high value”) 9. TS= (“lower value”) 10. TS= (“higher value”) 11. TS= (“overutilization”) 12. TS= (“overutilisation”) 13. TS= (“over utilization”) 14. TS= (“over utilisation”) 15. TS= ("overuse" not "overuse injur*") 16. TS= (“Choosing Wisely”) 17. TS= (“adherence to guidelines”) 18. TS= (“guideline adherence”) 19. TS= (“guideline use”) 20. TS= (“inappropriate”) 21. TS= (“transparency of care”) 22. TS= (“practice pattern*”) 23. TS= (“variability in health care”) 24. TS= (“increased cost*”) 25. TS= (“excess cost*”) 26. TS= (“high cost*”) 27. TS= (“treatment package”) 28. TS= (“resistance to change”) 29. TS= (“ineffective”) 30. TS= (“non-evidence based”) 31. TS= (“waste*”) 32. TS= ("poor care") 33. TS= ("recommended care") 34. TS= ("right care") 35. TS= (“quality of care") 36. TS= (“uncertainty”) 37. TS= ("disinvestment") 38. TS= ("value based care") 39. 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22 or 23 or 24 or 25 or 26 or 27 or 28 or 29 or 30 or 31 or 32 or 33 or 34 or 35 or 36 or 37 or 38

Physiotherapist	40. TS=(“physiotherapy*”) 41. TS=(“physical therap*”) 42. 40 or 41
	43. 39 and 42 44. TS=(animals) NOT TS=(humans) 45. 43 NOT 44

Supplementary Table 2. Modified 'Downs and Black' checklist including descriptors*

Checklist item	Scoring system
1. Is the hypothesis/aim/objective of the study clearly described?	Yes or no (1,0)
2. Are the main outcomes to be measured clearly described in the Introduction or Methods section? • If the main outcomes are first mentioned in the Results section, the question should be answered no.	Yes or no (1,0)
3. Are the characteristics of the patients included in the study clearly described? • In cohort studies and trials, inclusion and/or exclusion criteria should be given. In case-control studies, a case-definition and the source for controls should be given.	Yes or no (1,0)
4. Are the main findings of the study clearly described? • Simple outcome data (including denominators and numerators) should be reported for all major findings so that the reader can check the major analyses and conclusions. (This question does not cover statistical tests which are considered below).	Yes or no (1,0)
5. Were the subjects asked to participate in the study representative of the entire population from which they were recruited? • The study must identify the source population for patients and describe how the patients were selected. Patients would be representative if they comprised the entire source population, an unselected sample of consecutive patients, or a random sample. Random sampling is only feasible where a list of all members of the relevant	Yes or no (1,0); 0 if unable to determine
6. Were those subjects who were prepared to participate representative of the entire population from which they were recruited? • The proportion of those asked who agreed should be stated. Validation that the sample was representative would include demonstrating that the distribution of the main confounding factors was the same in the study sample and the source population	Yes or no (1,0); 0 if unable to determine
7. Were the statistical tests used to assess the main outcomes appropriate? • The statistical techniques used must be appropriate to the data. For example, nonparametric methods should be used for small sample sizes. Where little statistical analysis has been undertaken but where there is no evidence of bias, the question should be answered yes. If the distribution of the data (normal or not) is not described it must be assumed that the estimates used were appropriate and the question should be answered yes.	Yes or no (1,0); 0 if unable to determine
8. Were the main outcome measures used accurate (valid and reliable) • For studies where the outcome measures are clearly described, the question should be answered yes. For studies which refer to other work or that demonstrates the outcome measures are accurate, the question should be answered as yes.	Yes or no (1,0); 0 if unable to determine

*descriptors from: Downs SH, Black N. The feasibility of creating a checklist for the assessment of the methodological quality both of randomised and non-randomised studies of health care interventions. *J Epidemiol Community Health*. 1998;52(6):377-84.

Supplementary Table 3. Classifying treatments as recommended, not-recommended and no recommendation

MUSCULOSKELETAL			
Low back pain	**RECOMMENDED**	**NOT-RECOMMENDED**	**NO RECOMMENDATION***
	Primary guideline (1): *MUST PROVIDE* • Advice and education to support self-management • Reassurance • Advice to keep active *CONSIDER PROVIDING* • Group exercise *CONSIDER* combinations of two or more of: • Manual therapy[a] • Exercise • Psychological therapy (with a CBT approach) **Secondary guideline (2):** *SHOULD PROVIDE* • Superficial heat (acute and sub-acute low back pain) **Systematic reviews:** • McKenzie (chronic low back pain) (3)	**Primary guideline (1):** • US, ES, TENS, IF • Poor advice[b] • Acupuncture • Traction • External support[c] **Systematic reviews:** • McKenzie (acute or subacute low back pain) (3)	**Secondary guideline (2):** • Superficial heat (4) (chronic low back pain) • Cold therapy (4) • SWD **Systematic reviews:** • Pulse electromagnetic field therapy (5) • Laser (6) • Work-related interventions (7) • Ergonomic interventions (8) • Back schools (9, 10) • Biofeedback (11) • Neural mobilisation (12) • Mulligan (13) **No reviews:** • Infrared or Micro current therapy • Cyriax manual therapy • Magnet therapy • Electroacupuncture • Advice on heavy lifting, long standing, sitting habits, posture, avoiding painful movements • Relaxation therapy

[a]: includes massage, mobilisation or manipulation;
[b]: advice promoting bed rest or time off work
[c]: corsets, belts, braces, sticks or taping

	RECOMMENDED	NOT-RECOMMENDED	NO RECOMMENDATION*
Neck pain and whiplash	**<u>Acute neck pain/whiplash</u>** **Primary guideline (14):** *SHOULD PROVIDE* • Information on nature, management and course • Importance of maintaining activity and movement *CONSIDER* structured education in combination with: • Multimodal care[a] • Unsupervised range of motion/flexibility exercises **<u>Chronic neck pain/whiplash</u>** (not mentioned above) **Primary guideline (14):** *CONSIDER* structured education in combination with: • Range of motion/flexibility and strengthening exercises • Strengthening combined exercise • Yoga • Clinical massage • Laser	**<u>Acute neck pain/whiplash</u>** **Primary guideline (14):** • Education alone • Strain-counter strain therapy • Relaxation massage • Electroacupuncture • ES • Collar • Clinic based heat • Poor advice[b] • Heat therapy **<u>Chronic neck pain/whiplash</u>** **Primary guideline (14):** • Strengthening alone • Strain-counter strain therapy • Relaxation massage • Electroacupuncture • ES, TENS, SWD • Relaxation therapy • Clinic based heat • Poor advice[b] • Heat therapy **<u>All neck pain/whiplash</u>**	**<u>Acute neck pain/whiplash</u>** **Primary guideline (14):** • Supervised combined exercise • Supervised graded strengthening • Yoga • Strengthening alone • Clinical massage • Laser • Acupuncture • TENS, SWD • Traction • Relaxation therapy • CBT **<u>Chronic neck pain/whiplash</u>** **Primary guideline (14):** • Education alone • Supervised graded strengthening • Acupuncture • Traction • Collar • CBT **<u>All neck pain</u>** **Systematic reviews:**

		Systematic reviews: • US (15) • Cold therapy (15)	• Other exercise[c] (16) • Manual therapy alone[d] (17) • Neural mobilisation (12) • Ergonomic interventions (8) **<u>All whiplash</u>** **Systematic reviews:** • Other exercise[c] (18) • Manual therapy alone[d] (19) **No reviews for neck pain/whiplash*:** • Advice on posture • McKenzie • Biofeedback **No reviews for neck pain*:** • Magnetic field therapy **No reviews for whiplash*:** • Neural mobilisation • Work-related/ergonomic interventions • Motor control[e]
	*: treatments were only listed here if the included studies reported them [a]: includes mobilisation or manipulation and unsupervised range of motion exercises [b]: advice promoting bed rest or time off work; [c]: includes any exercise not included in the above categories; [d]: includes mobilisation or manipulation; [e]: includes deep flexor strengthening or cervical kinaesthetic training		
Subacromial pain syndrome or shoulder pain	**RECOMMENDED** **Primary guideline (20):**	**NOT-RECOMMENDED** **Systematic reviews:**	**NO RECOMMENDATION*** **Primary guideline (20):**

	LIKELY TO BE BENEFICIAL • Exercise • Manual therapy[a] • Laser	• IF (21) • Magnetic field therapy (22)	• Shockwave • Acupuncture • ES, US • Cold therapy **Secondary guideline (23):** • CBT • Advice to reduce activity or rest **Systematic reviews:** • SWD, TENS or microwave current (23, 24) • Tape (25, 26) **No reviews:** • Advice on posture • Heat therapy • Body awareness
	[a]: includes massage, mobilisation or manipulation		
Knee osteoarthritis/pain	**RECOMMENDED**	**NOT-RECOMMENDED**	**NO RECOMMENDATION***
	Primary guideline (27): *MUST PROVIDE* • Advice to stay active • Advice on weight loss • Education • Reassurance • Self-management strategies [a] • Prescribe aerobic and strengthening • Offer weight loss interventions	**Primary guideline (27):** • Acupuncture • Poor advice[c] **Secondary guideline (28):** • SWD • IF • US • Laser **Systematic reviews:**	**Primary guideline (27):** • Other exercise[d] **Systematic reviews:** • Balneotherapy[e] (30)

		• ES (29) *CONSIDER PROVIDING* • Bracing/joint supports/insoles • Manual therapy[b]/traction or stretching • Assistive devices (e.g. stick) • Advice on footwear • TENS • Heat or cold therapy **Secondary guideline (28):** *CONSIDER PROVIDING* • CBT	
	[a]: included exercise, weight loss, use of suitable footwear or pacing; [b]: includes massage, mobilisation or manipulation; [c]: advice promoting bed rest or time off work; [d]: exercise that is neither aerobic nor strengthening; [e]: spa bath therapy (separate to hydrotherapy which is included within 'other exercise')		
Acute ankle sprain	**RECOMMENDED**	**NOT-RECOMMENDED**	**NO RECOMMENDATION***
	Primary guideline (31): *SHOULD PROVIDE* • Exercise *CONSIDER PROVIDING* • Short period of immobilisation • Rest, ice, compression and elevation • External support[a]	**Primary guideline (31):** • US, ES, Laser • Joint mobilisation • Heat or cold therapy alone	**No reviews:** • Advice or education • IF, SWD, Diadynamic current
	[a]: includes braces, boots or taping		

Plantar fascitis	**RECOMMENDED**	**NOT-RECOMMENDED**	**NO RECOMMENDATION***
	Primary guideline(32): *SHOULD PROVIDE* • Stretching • Night splints • Manual therapy[a] • Taping *MAY PROVIDE* • Laser • Strengthening exercises and movement training • Education and counselling for weight loss • Rocker-bottom show and shoe rotation during the week	**Primary guideline (32):** • Acupuncture • US, ES	**Primary guideline (32):** • Shockwave **No reviews:** • Heat or cold therapy • Other exercise[b] • Other advice[c] • Prefabricated or custom orthotics
	[a]: includes massage, mobilisation or manipulation; [b]: includes any exercise not included in the above categories; [c]: includes advice on self-management, pacing, ergonomics, etc.		
Total knee arthroplasty	**RECOMMENDED**	**NOT-RECOMMENDED**	**NO RECOMMENDATION***
	Systematic reviews: • Exercise (33-35)	**Systematic reviews:** • Passive range of motion (36) • Cold therapy (37)	**Systematic reviews:** • TENS (38) • Electrotherapy (39) • Acupuncture (39) **No reviews:** • Manual therapy[a] • Advice or education • Biofeedback
	[a]: includes massage or mobilisation		

*: treatments that have not been mentioned in a clinical practice guideline or investigated in a systematic review do not have a citation.
CBT: cognitive behavioural therapy; ES: electrical stimulation; IF: interferential current; NSAIDs: non-steroidal anti-inflammatory drugs; SWD: short wave diathermy; TENS: transcutaneous electrical nerve stimulation; US: Ultrasound.

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Supplementary Table 4. Summary of study characteristics by condition

Citation (country)	**Condition**	**Age:** mean (SD) unless stated otherwise	**Experience of PTs:** mean years (SD) unless stated otherwise	**Gender** (females)	**Sample size**	**Assessment measure**
Low back pain (LBP)						
Bernhardsson 2015* (Sweden)	Subacute LBP (3-12 weeks)	PTs: >40y (60%);	<3y (14.8%); 3-5y (12.2%); 6-10y (18.5%); 11-15y (16.2%); 16-20y (14.0%); >20y (24.4%)	PTs: 75.3%	271 PTs	Survey without vignette
Armstrong 2003 (Ireland)	LBP with or without radiation (unable to stratify by duration)	Pts: 26-35y (27%); 36-45y (25%)	>2y (61.5%); >10y (15.4%)	Pts: 57%	200 Pts treated by 25 PTs	Audit of clinical notes
Ayanniyi 2007 (Nigeria)	Acute LBP that is recurrent and non-recurrent, and chronic LBP (no duration specified)	PTs: Age: 35.7 (7.1)	10.1 (6.5)	Not reported	101 PTs	Survey with vignette
Battie 1994 (United States)	Acute LBP and sciatica (1 day), acute-recurrent back pain (1 week), and chronic LBP (6 months)	PTs: Age: 36.9 (SE 0.76)	10.7 (SE 0.65)	Not reported	186 PTs	Survey with vignette
Bekkering 2005 (Netherlands)	LBP (unable to stratify by duration)	PTs in the intervention group: 43.1 (8.6); PTs (control group): 38.7 (8.8). Pts in the intervention group: 46.2 (14.8); Pts in the	Intervention group: 15.7 (8.8). Control group: 14.1 (8.3)	PTs in the intervention group: 45.8%; Pts in the control group: 40.7%. Pts in the intervention group:	500 Pts treated by 113 PTs	Treatment recording forms

		control group: 44.4 (13.3)		53.4%; Pts in the control group: 50.2%		
Bishop 2008 (United Kingdom)	Acute LBP (4 weeks)	Not reported	15.2 (11.6)	PTs: 80.8%	580 PTs	Survey with vignette
Byrne 2006 (Ireland)	Acute LBP (<3 months) and chronic LBP (>3 months)	Not reported	1–3y (25%); 4–6y (25%); 7–10y (25%); >10y (25%).		87 PTs	Survey without vignette
Carlesso 2013* (Canada)	LBP (duration not specified)	Not reported	<5y (0.7%); 5-9y (14.0%); 10-14y (31.3%); 15-19y (23.7%); >19y (33.2%)	PTs: 55.8%	278 PTs	Survey without vignette
Casserley-Feeney 2008 (Ireland)	Acute LBP (≤12 weeks) and chronic LBP (>12 weeks) (unable to stratify by duration)	Pts in hospital: 46.0 (20.0). Pts in private practice: 36.0 (10.0)	PTs in hospital: 2.0 (IQR 5.0). PTs in private practice: 12 (IQR 14.8)	Pts in hospital: 66%. Pts in private practice: 50%	249 Pts	Audit of clinical notes
de Souza 2017 (Brazil)	Acute and subacute LBP (no duration specified)	PTs: 35.6 (7.77)	11.8 (6.8)	PTs: 24.9%	189 PTs	Survey with vignette
Ehrmann-Feldman 1996 (Canada)	LBP (no information on duration of symptoms)	Pts: 36.4 (no SD)	Not reported	Pts: 22%	389 Pts	Audit of clinical notes
Evans 2010 (United Kingdom)	Acute LBP (3 weeks) NB: PT characteristics are combined with characteristics of chiropractors and osteopaths	PTs in the intervention group: 41.6 (9.7). PTs in the control group: 41.2 (9.4)	Intervention group: 14 (IQR: 8–20); Control group: 14 (IQR 8–21).	PTs in the intervention group: 61%. PTs in the control group: 61%	824 PTs (409 in intervention group and 415 in control group)	Survey with vignette

Fidvi 2010 (India)	LBP (no duration specified)	Not reported	0-5y (38%); 5-10y (43%); >10y (19%)	Not reported	186 PTs	Survey without vignette
Foster 1999 (Ireland)	LBP (no duration specified)	PTs: 36-45y (47%); 46-55y (31.4%).	>10y (58.9%).	PTs: 53.6%	813 PTs	Survey without vignette
Freburger 2011 (United States)	Chronic LBP (>3 months or >24 episodes of activity limiting pain lasting >1 day in the last 12 months)	Pts: 53.9 (95% CI: 51.5–56.2)	Not reported	Pts: 65.8% (95% CI: 57.5–73.2)	126 Pts	Survey of Pts
Gracey 2002 (Northern Ireland)	Acute, subacute and chronic LBP (unable to stratify by duration)	Pts: <45y (65%); >45y (35%)	>2y (80%); >10y (36%).	Pts: 51%.	1062 Pts treated by 157 PTs	Treatment recording forms
Groenendijk 2007 (Netherlands)	Acute, subacute and chronic LBP without radiation (unable to stratify by duration)	Pts (1989-1992): 42.6 (14.8) Pts (2002-2003): 48.3 (16.2)	Not reported	Pts (1989-1992): 45.5% Pts (2002-2003): 54.5%	3148 Pts treated by 180 PTs	Treatment recording forms
Hamm 2003 (Denmark)	Acute LBP (<3 months) and chronic LBP (≥3 months) with and without radiation	PTs: Males 40 (no SD); Females 44 (no SD). Pts: 49 (no SD)	Males: 11 (no SD). Females: 18y (no SD)	PTs: 71% Pts: 65%	242 PTs recording 4725 treatments	Treatment recording forms
Harte 2005 (United Kingdom)	LBP (no duration specified)	Not reported	3-5y (2.6%); 6-10y (18.3%); >10y (79.1%)	Not reported	1239 PTs	Survey without vignette
Hendrick 2013 (New Zealand)	LBP (no duration specified)	PTs: 38.5 (11)	15.0 (11)	PTs: 64.7%	170 PTs	Survey without vignette
Jackson 2001 (United Kingdom)	LBP (no duration specified)	Pts: 40 (IQR 30-51)	Not reported	Pts: 47.5%	200 Pts	Audit of clinical notes

Jette AM 1997* (United States)	Acute, subacute and chronic LBP (unable to stratify by duration)	PTs: 32.6 (7.8) Pts: 40.8 (13.2)	8.4 (7.4).	PT: 70% Pts: 48%	1279 Pts treated by 141 PTs	Treatment recording forms
Jette AM 1994 (United States)	LBP (no duration specified)	Pts: 45.26 (17.0)	Not reported	Pts: 49%	2,328 Pts	Treatment recording forms
Jette DU 1997* (United States)	LBP (no duration specified)	Pts: 18-35y (40%); 36-59y (50%); >60y (10%).	Not reported	Pts: 49%	2,491 Pts treated by 462 PTs	Treatment recording forms
Keating 2016 (Australia)	Acute LBP (1-2 weeks) and subacute LBP (6-8 weeks)	PTs: 39 (12)	15 (11)	PTs: 61%	203 PTs	Survey with vignette
Kerssens 1999 (Netherlands)	LBP (no duration specified)	Pts: 42.8 (13.9)	Not reported	Pts: 58.3%	1,151 records including 132 Pts treated by 21 PTs	Treatment recording forms
Ladeira 2015 (United States)	Acute LBP (1 week) and subacute LBP (6 weeks)	PTs: 38 (9)	15.8 (8.2)	PTs: 61.2%	327 PTs	Survey with vignette
Ladeira 2017 (United States)	Acute LBP (1-2 weeks) and subacute LBP (6 weeks)	PTs: 42.9 (10.1)	17.2 (10.5)	PTs: 37.1%	410 PTs	Survey with vignette
Li 2001 (Canada)	Acute LBP (1 week), subacute LBP (6 weeks) and acute sciatica (4 days)	Not reported	14.7 (10.1)	PTs: 86.0%;	274 PTs	Survey with vignette
Liddle 2009 (Ireland)	Chronic LBP (12 weeks or 3 or episodes within 12 months)	Not reported	Experience treating LBP: >5y (78%); Total experience: >10y (44%)	Not reported	280 PTs	Survey without vignette
Louw 2010 (South Africa)	LBP (no duration specified)	Pts: 41.7 (13.3)	Not reported	Pts: 52.2%	50 Pts	Treatment recording forms

Madson 2015 (United States)	LBP (no duration specified)	PTs: 20-30y (18.9%); 31-40y (28.7%); 41-50y (22.5%); >50y (29.8%);	1-5y (22.1%); 6-10y (13.3%); 11-15y (16.5%); 16-20y (11.7%); >20y (36.3%)	PTs: 60%	1001 PTs	Survey with vignette
Mielenz 1997 (United States)	Acute LBP (<10 weeks)	Pts: 41 (13)	Not reported	Pts: 53%	1580 Pts	Audit of clinical notes
Mikhail 2005 (Canada)	Acute LBP (5 days)	Not reported	<1y (1.0%); 1-5y (20.0%); 6-10y (18.0%); 11-15y (24.0%); >15y (37.0%)	PTs: 67%;	100 PTs	Survey with vignette
Oppong-Yeboah 2014 (Ghana)	LBP (no duration specified)	Not reported	1-5y (77.3%); 5-10y (15.9%); >10y (6.8%)	Not reported	44 PTs	Survey without vignette
Pensri 2005 (Thailand)	LBP (no duration specified)	Not reported	<3y (18.7%); 3-5y (20.7%); 6-10y (29.5%); >10y (31.3%)	Not reported	502 PTs	Survey without vignette
Pincus 2011 (United Kingdom)	Work-related LBP (duration not specified)	PTs: 47 (9.3)	24 (9.4)	Not reported	113 PTs	Survey without vignette
Poitras 2005 (Canada)	Work-related LBP with or without radiation (no duration specified)	Pts with radiating pain: 41.6 (10.2). Pts with non-radiating pain: 38.7 (10.9)	9.3 (7.4)	PTs: 63.7% Pts with radiating pain: 35.3%. Pts with non-radiating pain: 30%	328 Pts (190 without radiation and 139 with radiation)	Treatment recording forms
Reid 2002 (New Zealand)	Acute LBP (4 days)	Not reported	Not reported	Not reported	324 PTs	Survey with vignette

Serrano-Aguilar 2011* (Spain)	Chronic LBP (≥12 weeks)	Pts: 53.9 (14.5)	Not reported	Pts: 73.3%	4693 Pts	Audit of billing codes
Sparkes 2005 (United Kingdom)	Acute LBP (<6 weeks) and chronic LBP (≥6 weeks) with or without radiation (unable to stratify by duration)	Not reported	Not reported	Not reported	130 Pts	Audit of clinical notes
Stevenson 2006 (United Kingdom)	Acute, subacute and chronic LBP (unable to stratify by duration)	Not reported	Not reported	Not reported	306 Pts from 25 PTs	Treatment recording forms
Strand 2005 (Norway)	LBP (unable to stratify by duration)	PTs: 43 (7) Pts: 37 (12)	10 (6)	PTs: 29% Pts: 53%	42 consultations with 34 PTs	Clinical observation
Swinkels 2005 (Netherlands)	LBP without radiation (<1 month and ≥1 month)	Pts: 48 (16)	15-24y (nearly 50%)	PTs: 41% Pts: 54%	1254 Pts treated by 90 PTs	Treatment recording forms
Tumilty 2017 (New Zealand)	Acute LBP (<6 weeks)	Pts: 34.5 (17)	Not reported	Pts: 52%	199 Pts	Treatment recording forms
Turner 1999* (United Kingdom)	LBP (no duration specified)	Pts: 41.9 (no SD)	Not reported	Pts: 60.6%	345 Pts	Audit of clinical notes
van Baar 1998* (Netherlands)	Acute and chronic LBP without radiation (unable to stratify by duration)	PTs: <35y (60%). Pts: 43.5 (16.1)	Not reported	Pts: 58.9%	1,085 Pts	Treatment recording forms

van der Valk 1995 (Netherlands)	LBP (<1 week; ≥1 week and <3 months; and ≥3 months)	Pts with LBP <1 week: 0-14y (0.6%); 15-24y (8.3%); 25-34y (21.5%); 35-44y (25.4%); 45-54y (20.8%); 55-64y (13.9%); 65-74y (6.3%); >74y (3.2%). Pts with LBP ≥1 week and <3 months: 0-14y (0.4%); 15-24y (11.0%); 25-34y (21.8%); 35-44y (23.8%); 45-54y (18.5%); 55-64y (12.0%); 65-74y (8.6%); >74y (3.9%). Pts with LBP ≥3 months: 0-14y (0.7%); 15-24y (12.1%); 25-34y (21.7%); 35-44y (20.4%); 45-54y (18.9%); 55-64y (13.2%); 65-74y (8.2%); >74y (4.9%).	Not reported	Pts with LBP <1 week: 41.4%. Pts with LBP ≥1 week and <3 months: 47.1%. Pts with LBP ≥3 months: 58.3%.	3,507 Pts	Treatment recording forms
Neck pain or whiplash						

Ayanniyi 2007 (Nigeria)	Neck pain (no duration specified)	Pts: 53.4 (11.2)	Not reported	Pts: 56.8%	532 Pts	Audit of clinical notes
Bernhardsson 2015* (Sweden)	Subacute neck pain (3-12 weeks)	PTs: >40y (60%)	<3y (14.8%); 3-5y (12.2%); 6-10y (18.5%); 11-15y (16.2%); 16-20y (14.0%); >20y (24.4%)	PTs: 75.3%	271 PTs	Survey without vignette
Carlesso 2013* (Canada)	Neck pain (duration not specified)	Not reported	<5y (0.7%); 5-9y (14.0%); 10-14y (31.3%); 15-19y (23.7%); >19 (33.2%)	PTs: 55.8%	278 PTs	Survey without vignette
Carlesso 2015 (Various)	Acute and chronic neck pain and whiplash, and cervical radiculopathy (no duration specified)	Not reported	17 (12) (combined with chiropractors)	PTs: 60%	127 PTs	Survey without vignette
Carlesso 2014 (Various)	Acute and chronic neck pain and whiplash, and cervical radiculopathy (no duration specified)	Not reported	16 (12)	PTs: 59%	138 PTs	Survey without vignette
Corkery 2014 (United States)	Acute whiplash (4 weeks) and chronic whiplash (2 months)	Not reported	1-5y (9.3%); 6-10y (19.8%); 11-20y (31.6%); >20y (38.0%)	PTs: 34.2%	237 PTs	Survey with vignette
Jette AM 1997* (United States)	Acute, subacute and chronic neck pain (unable to stratify by duration)	PTs: 32.6 (7.8) Pts: 40.9 (12.6)	8.4 (7.4)	PT: 70% Pts: 64%	613 Pts treated by 141 PTs	Treatment recording forms
Jette DU 1997* (United States)	Neck pain (no duration specified)	Pts: 18-35y (38%); 36-59y	Not reported	Pts: 64%	2491 Pts treated by 462 PTs	Treatment recording forms

		(52%); >60y (10%).				
Ng 2015 (Australia and Singapore)	Acute and chronic whiplash (no duration specified)	Not reported	Median (range) Australia: 20 (1–47) Singapore: 6 (1–20)	PTs in Australia: 51%. PTs in Singapore: 65%	185 PTs (91 from Queensland and 94 from Singapore)	Survey with vignette
Rebbeck 2006 (Australia)	Whiplash (<6 weeks)	Pts (intervention group): 35.5 (11.5). Pts in control group: 36.1 (15.5).	Not reported	Pts (intervention group): (76%). Pts (control group): 89%.	99 Pts treated by 27 PTs (14 in intervention group, 13 in control group)	Survey without vignette and audit of clinical notes
Serrano-Aguilar 2011* (Spain)	Chronic neck pain (≥12 weeks)	Pts: 53.9 (14.5)	Not reported	Pts: 73.3%.	8308 Pts	Audit of billing codes
Shoulder pain						
Ayanniyi 2016 (Nigeria)	Shoulder pain (including: Impingement syndrome, Rotator syndrome, Fracture, Osteoarthritis, Dislocation, , Adhesive capsulitis, Calcific tendinitis of bicep) (no duration specified)	Pts: 50.6 (26.2)	Not reported	Pts: 56.2%	121 Pts	Audit of clinical notes
Bernhardsson 2015* (Sweden)	Subacromial pain (no duration specified)	PTs: >40y (60%)	<3y (14.8%); 3-5y (12.2%); 6-10y (18.5%); 11-15y (16.2%); 16-20y (14.0%); >20y (24.4%)	PTs: 75.3%	271 PTs	Survey without vignette

Johansson 1999 (Sweden)	Subacromial pain (a few weeks)	PTs: 40.8 (8.2)	8.4 (5.6)	PTs: 79%	57 PTs	Survey with vignette
Karel 2017 (Netherlands)	Shoulder pain (including: subacromial impingement, glenohumeral joint instability, biceps tendinopathy, frozen shoulder, and others) (no duration specified)	Pts: 50 (13) PTs: 39 (no SD)	Not reported	Pts: 57%	125 Pts	Treatment recording forms
Phadke 2015 (India)	Subacromial pain (6 weeks)	PTs: 29.1 (5.4)	4.9 (5.1)	PTs: 42.7%	211 PTs	Survey with vignette
Serrano-Aguilar 2011* (Spain)	Chronic shoulder pain (≥12 weeks)	Pts: 53.9 (14.5)	Not reported	Pts: 73.3%.	5035 Pts	Audit of billing codes
Struyf 2012 (Belgium)	Subacromial pain (no duration specified)	PTs: 38 (12)	14 (11.8)	Not reported	119 PTs	Survey without vignette
Knee pain						
Ayanniyi 2017 (Nigeria)	Knee osteoarthritis	Not reported	1-5y (41.7%)	PTs: 38.2%	267 PTs	Survey with vignette
Barten 2015 (Netherlands)	Knee and hip osteoarthritis	Pts: 66.7 (13.2)	Not reported	Pts: 67%	870 Pts	Treatment recording forms
Holden 2008 (United Kingdom)	Knee osteoarthritis	Not reported	1–3y (21%); 4–10y (25%); >10y (54%)	PTs: 87%	538 PTs	Survey with vignette
Jamtvedt 2008 (Norway)	Knee osteoarthritis	PTs: 47 (11)	21 (12)	PTs: 47%	297 PTs	Survey without vignette
Jette AM 1997* (United States)	Acute, subacute and chronic knee pain	PTs: 32.6 (7.8) Pts: 41.2 (14.1)	8.4 (7.4)	PT: 70% Pts: 52%	706 treated by 141 PTs	Treatment recording forms

Jette DU 1997* (United States)	Knee pain (no duration specified)	Pts: 18-35y (39%); 36-59y (49%); >60y (12%)	Not reported	Pts: 52%	2491 Pts treated by 462 PTs	Treatment recording forms
MacIntyre 2013 (Canada)	Knee osteoarthritis	Not reported	<5y (15.4%); 5-10y (17.1%); 11-20y (27.6%); >20y (39.8%)	PTs: 73.2%	123 PTs	Survey without vignette
Spitaels 2017 (Belgium)	Knee osteoarthritis	PTs: 45.7 (11.7)	Median (range): 26 (1-45)	PTs: 45%	284 PTs	Survey without vignette
van Baar 1998* (Netherlands)	Acute and chronic knee pain (unable to stratify by duration)	PTs: <35y (60%) Pts: 36.2 (17.6)	Not reported	Pts: 51.4%	416 Pts	Treatment recording forms
Walsh 2009 (United Kingdom)	Knee osteoarthritis	Not reported	Not reported	Not reported	83 departments	Survey to department
Acute ankle injuries						
Kooijman 2011 (Netherlands)	Ankle injuries (<4 weeks and ≥4 weeks)	PTs treating acute ankle injuries: 51 (9). PTs treating chronic ankle injuries: 51 (10). Pts with acute ankle injuries: 33 (17). Pts with chronic ankle injuries: 33 (17)	PTs treating acute ankle injuries: 8 (15). PTs treating chronic ankle injuries: 4 (4).	PTs treating acute ankle injuries: 37%. PTs treating chronic ankle injuries: 30%. Pts with acute ankle injuries: 49%.	1413 Pts treated by 117 PTs	Treatment recording forms

				Pts with chronic ankle injuries: 49%		
Leemrijse 2006 (Netherlands)	Acute lateral ankle sprains (no duration specified)	PTs: 43 (no SD)	Not reported	PTs: 49%	332 PTs	Survey without vignette
Roebroeck 1998 (Netherlands)	Lateral ankle sprains (unable to stratify by duration)	Pts: 0-14y (1.6%); 15-24y (33.1%); 25-34y (24.7%); 35-44y (16.7%); 45-54y (11.2%); 55-64y (7.6%); 65-74y (4.4%); >74y (0.8%)	Not reported	Pts: 45%	251 Pts treated by 83 PTs	Treatment recording forms
Plantar fascitis						
Fraser 2017 (United States)	Plantar fascitis (no duration specified)	Pts: <20y (5.2%); 20-29y (6.0%); 30-39y (17.7%); 40-49y (29.0%); 50-59y (30.8%); 60-69y (11.1%); >69y (0.2%)	Not reported	Pts: 59.8%	262643 treatments of 57800 Pts	Audit of billing codes
Grieve 2017 (United Kingdom)	Plantar fascitis (no duration specified)	Not reported	0-2y (5%); 3-5y (11%); 6-10y (21%); 11-15y (22%); 16-20y (14%); >20y (27%)	PTs: 66%	257 PTs	Survey without vignette
Other musculoskeletal conditions						
Athanasopoulos 2007 (Greece)	Various musculoskeletal conditions (e.g. ligament sprain, osteoarthritis)	Pts: 29.9 (10.8)	Not reported	Pts: 40.3%	457 Pts	Treatment recording forms

Beales 2015 (Australia and Norway)	Pregnancy-related pelvic girdle pain (6 weeks) and traumatic pelvic girdle pain (4 years)	PTs in Norway: 33.5 (9.3). PTs in Australia: 37.9 (11.2).	PTs in Norway: 9.3 (9.3) PTs in Australia: 15.4 (11.6)	PTs in Norway: 52.3%. PTs in Australia: 61%	142 PTs (65 from Norway, 77 from Australia)	Survey with vignette
Bishop 2016 (United Kingdom)	Pregnancy related acute LBP (began "a few weeks ago")	Not reported	21.5 (10)	PTs: 92%	499 PTs	Survey with vignette
Dekker 1993 (Netherlands)	LBP, neck pain, knee pain, shoulder pain, and scoliosis (no duration specified)	Pts: 0-14y (3.5%); 15-24y (11.6%); 25-34y (18.8%); 35-44y (20.0%); 45-54y (17.1%); 55-64y (13.3%); 65-74y (9.6%); >74y (6.1%)	Not reported	Pts: 53.2%	8714 Pts treated by 74 PTs	Treatment recording forms
Grant 2014 (United Kingdom)	Various musculoskeletal conditions stratified by muscle, joint and tendon injuries	Not reported	Not reported	Not reported	1399 Pts	Treatment recording forms
Hurkmans 2012 (Netherlands)	Rheumatoid arthritis	PTs: 43 (10.8)	19 (10.3)	PTs: 53%	233 PTs	Survey without vignette
Lineker 2006 (Canada)	Rheumatoid arthritis	Pts: 59.2 (13.8)	22.5 (22.0); 15.9 (9.3) treating rheumatoid arthritis	Pts: 80.4%	56 Pts treated by 26 PTs	Treatment recording forms
Murray 2005 (United Kingdom)	Various musculoskeletal conditions with a focus on patella femoral pain syndrome and Achilles tendinopathy	Pts: 35 (12.5)	Not reported	Pts: 37%	100 Pts	Audit of clinical notes

O'Brien 2014 (United States)	Thumb carpometacarpal joint pain	Not reported	Experience as a hand therapist: <5y (4.6%); 6-10y (13.9%); >10y (64.3%)	PTs: 73.8%	547 PTs	Survey without vignette
Owoeye 2009 (Nigeria)	Various musculoskeletal conditions (e.g. ligament sprain, muscle tears, contusions, overuse injury)	Not reported	Not reported	Pts: 33.4%	171 Pts	Audit of clinical notes
Peterson 2011 (United States)	Osteoporosis (females ≥40 years old)	Not reported	13.7 (10.8)	PTs: 77.1%	83 PTs	Survey without vignette
Peterson 2005 (Sweden)	Chronic epicondylitis (≥3 months)	Not reported	Not reported	Not reported	47 PTs	Survey without vignette
Sran 2005 (Canada)	Osteoporosis	Not reported	Not reported	Not reported	67 PTs	Survey without vignette
Tomkins 2010 (Canada)	Lumbar spine stenosis (no duration specified)	Pts: 70 (11)	16.8 (no SD)	Pts: 53%	76 PTs and 44 Pts	Survey without vignette and survey of Pts
Orthopaedic conditions						
Artz 2013 (United Kingdom)	Knee arthroplasty (outpatient)	Not reported	Not reported	Not reported	16 departments	Survey to department
Barry 2003 (United Kingdom)	Knee arthroplasty (inpatient)	Not reported	Not reported	Not reported	303 PTs	Survey without vignette

Bruder 2013 (Australia)	Distal radius fracture (outpatient)	PTs: 33.5 (IQR 23-40). Pts: 19-50y (25%); 51-65y (33%); 66-75y (25%); >75y (16%)	7 (IQR 0.8-11)	PTs: 50% Pts: 71%	160 records of 75 Pts treated by 14 PTs	Treatment recording forms
Frawley 2005 (Australia)	Any pelvic surgery (post-surgery inpatient)	Not reported	Not reported	Not reported	84 PTs	Survey without vignette
Moutzouri 2017 (Greece)	Knee arthroplasty (inpatient and outpatient)	Not reported	<5y (34.1%); 6-10y (30.3%); >10y (35.6%).	Not reported	132 PTs	Survey without vignette
Naylor 2006 (Australia)	Knee arthroplasty (inpatient and outpatient)	Not reported	Not reported	Not reported	65 departments	Survey to department
Peter 2014 (Netherlands)	Knee and hip arthroplasty (no timeframe specified)	PTs: 40.4 (12.6)	Experience: 0-5y (28.8%), 6-10y (14.6%), 11-15y (9.6%), 16-20y (9.1%), 20y+ (37.9%). Experience treating patients following hip or knee arthroplasty: 0-5y (29.7%), 6-10y (18.3%), 11-15y (10.5%), 16-20y (11.9%), >20y (29.6%)	PTs: 54.8%	219 PTs	Survey without vignette

Rushton 2014 (United Kingdom)	Lumbar fusion (post-surgery inpatient and outpatient)		Experience treating patients following lumbar spinal fusion: 10 (IQR: 3-15)		71 PTs	Survey without vignette
Turner 1999* (United Kingdom)	Knee arthroplasty (outpatient)	Pts: 71.4 (7.7)	Not reported	Pts: 66.7%	345 pts	Audit of clinical notes
Williamson 2007 (United Kingdom)	Lumbar discectomy (pre and post-surgery including inpatient and outpatient)	Not reported	Not reported	Not reported	75 departments	Survey to department

CI: confidence intervals; IQR: interquartile range; LBP: low back pain; PTs: physical therapists or physiotherapists; Pts: patients; SD: standard deviation; SE: standard error; y: years.
*: citation included for multiple conditions.

Supplementary Table 5. Percentage (median and interquartile range) of physical therapy treatment choices that involved treatments that were recommended, not-recommended or had no recommendation for 'other' conditions

MUSCULOSKELETAL

RHEUMATOID ARTHRITIS*

	Assessed by surveys of physical therapists				Assessed by clinical notes			
Recommended	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
SHOULD PROVIDE								
Aerobic or strengthening exercise	-				86			1
No-recommendation	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
Other exercise[a]	82			1	100			1
Advice or education[b]	82			1	-			
Manual therapy[c]	68			1	29			1
Superficial heat	57			1	-			
ES, US, TENS	35			1	95			1
Splinting/orthoses[b]	-				54			1
Walking aids[b]	-				63			1

*classification based on Hurkmans EJ et al. Acta Rheumatol Port. 2011;36(2):146-58.
[a]: exercise that is neither aerobic nor strengthening (not mentioned in the above guideline)
[b]: no review on advice or education, splinting/orthoses and walking aids
[c]: includes massage, mobilisation or manipulation

SPORTS INJURIES*

	Assessed by surveys of physical therapists				Assessed by clinical notes			
No-recommendation	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
Manual therapy[a]	-				20	19	22	2
Exercise	-				16	11	21	2
Electrotherapy	-				13	10	17	2
Heat or cold therapy	-				9	8	9	2
Tape	-				5	4	7	2
Advice or education	-				3			1

*includes two studies that did not specify the type of sports injury. Another study (Athanasopoulos et al. 2007) was not included in this table because of the way the data was reported
[a]: includes massage, mobilisation or manipulation

LUMBAR SPINE STENOSIS*

	Assessed by surveys of physical therapists				Assessed by surveys of patients			
No-recommendation	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
Exercise	97			1	55			1
Advice or education	96			1	11			1
Electrotherapy	90			1	27			1
Manual therapy[a]	87			1	48			1

Superficial heat	76			1	14			1
Acupuncture	63			1	23			1
Traction	61			1	5			1
External support[b]	45			1	11			1

*the same study assessed treatment choices by a survey of physical therapists and survey of patients
[a]: includes massage, mobilisation or manipulation
[b]: corsets, belts, braces, sticks or taping

PREGNANCY-RELATED ACUTE LOW BACK PAIN*

	Assessed by surveys of physical therapists				**Assessed by clinical notes**			
Recommended	**Median (%[€])**	**Q1**	**Q3**	**N**	**Median (%[¥])**	**Q1**	**Q3**	**N**
MUST PROVIDE								
Advice to keep active	87			1	-			
Advice and education to support self-management	85			1	-			
CONSIDER PROVIDING								
Combination of two or more of 1-3	48			1	-			
1. Manual therapy[a]	48			1	-			
2. Exercise	94			1	-			
3. CBT	-				-			
Superficial heat	33			1	-			
Not-recommended	**Median (%[€])**	**Q1**	**Q3**	**N**	**Median (%[¥])**	**Q1**	**Q3**	**N**
External support[b]	68			1	-			
Advice to use rest to relieve pain	51			1	-			
Acupuncture	24			1	-			
US, ES, TENS, IF	14			1	-			
Prescribed rest	6			1	-			
No-recommendation	**Median (%[€])**	**Q1**	**Q3**	**N**	**Median (%[¥])**	**Q1**	**Q3**	**N**
Other advice[c]	98			1	-			
Work-related/ergonomic interventions	88			1	-			
Cold therapy	8			1	-			

*classified as per acute low back pain in Appendix 2
[a]: includes massage, mobilisation or manipulation;
[b]: corsets, belts, braces, sticks or taping;
[c]: includes advice on posture and analgesics

KNEE OR HIP OSTEOARTHRITIS

	Assessed by surveys of physical therapists				**Assessed by clinical notes**			
Recommended	**Median (%[€])**	**Q1**	**Q3**	**N**	**Median (%[¥])**	**Q1**	**Q3**	**N**

Exercise	-				72			1
Manual therapy[a]	-				47			1
Advice or education	-				37			1
Electrotherapy	-				7			1

[a]: unspecified in the paper

ACUTE AND CHRONIC KNEE PAIN

	Assessed by surveys of physical therapists				Assessed by clinical notes			
No-recommendation	**Median (%[€])**	**Q1**	**Q3**	**N**	**Median (%[¥])**	**Q1**	**Q3**	**N**
Exercise	-				38			1
Manual therapy[a]	-				16			1
Electrotherapy	-				13			1
Advice or education	-				1			1

[a]: massage or mobilisation

OSTEOPOROSIS

	Assessed by surveys of physical therapists				Assessed by clinical notes			
Recommended	**Median (%[€])**	**Q1**	**Q3**	**N**	**Median (%[¥])**	**Q1**	**Q3**	**N**
SHOULD PROVIDE								
Strength and balance training	75	73	77	2				
No-recommendation	**Median (%[€])**	**Q1**	**Q3**	**N**	**Median (%[¥])**	**Q1**	**Q3**	**N**
Other exercise[a]	95	94	96	2	-			
Advice or education	97			1	-			
Electrotherapy	46			1	-			
Manual therapy[b]	45			1	-			

*classification based on The Royal Australian College of General Practitioners and Osteoporosis Australia. Osteoporosis prevention, diagnosis and management in postmenopausal women and men over 50 years of age. 2nd edn. East Melbourne, Vic: RACGP, 2017.

[a]: exercise that is neither strengthening nor balance

[b]: unspecified in the paper

PELVIC GIRDLE PAIN

Due to pregnancy	Assessed by surveys of physical therapists				Assessed by clinical notes			
No-recommendation	**Median (%[€])**	**Q1**	**Q3**	**N**	**Median (%[¥])**	**Q1**	**Q3**	**N**
Advice or education	62			1	-			
Exercise	48			1	-			
External support[a]	34			1	-			
Manual therapy[b]	33			1	-			
CBT	11			1	-			
Acupuncture	3			1	-			
Electrotherapy	1			1	-			
Due to a fall								

Exercise	51	1	-
Manual therapy[b]	37	1	-
Advice or education	18	1	-
CBT	11	1	-
External support[a]	5	1	-
Acupuncture	4	1	-
Electrotherapy	1	1	-

* classification based on Ferreira CWS et al. Physiother Theory Pract 2013; 29: 419–431 (all unknown value or have not been investigated in a systematic review)
[a]: includes tape, compression pants, belt, orthoses or a walking aid
[b]: includes any form of hands on therapy

COMBINED MUSCULOSKELETAL CONDITIONS*

	Assessed by surveys of physical therapists				Assessed by clinical notes			
No-recommendation	**Median (%[€])**	**Q1**	**Q3**	**N**	**Median (%[¥])**	**Q1**	**Q3**	**N**
Massage	-				24			1
Exercise	-				20			1
Electrotherapy	-				7			1
Heat or cold therapy	-				3			1
Advice or education	-				2			1

*includes low back pain, neck pain, shoulder pain, knee pain and acquired deformities of the spine so we were unable to classify the interventions

CHRONIC TENNIS ELBOW

	Assessed by surveys of physical therapists				Assessed by clinical notes			
Recommended	**Median (%[€])**	**Q1**	**Q3**	**N**	**Median (%[¥])**	**Q1**	**Q3**	**N**
Stretching and strengthening	62			1	-			
Not-recommended	**Median (%[€])**	**Q1**	**Q3**	**N**	**Median (%[¥])**	**Q1**	**Q3**	**N**
Deep friction massage	19			1	-			
No-recommendation	**Median (%[€])**	**Q1**	**Q3**	**N**	**Median (%[¥])**	**Q1**	**Q3**	**N**
Advice or education[a]	94			1	-			
Acupuncture	85			1	-			
Orthotic device[a]	51			1	-			
TENS	26			1	-			

*classification based on Hoogvliet P et al. Br J Sports Med 2013;47(17): 1112-1119
Dingemanse R et al. Br J Sports Med 2014;48(12): 957-965
Tang H et al. eCAM 2015;2015:861849
[a]: no review on advice or education, or orthotic devices

THUMB CMC PAIN

	Assessed by surveys of physical therapists				Assessed by clinical notes			
No-recommendation	**Median (%[€])**	**Q1**	**Q3**	**N**	**Median (%[¥])**	**Q1**	**Q3**	**N**

Advice or education	96			1	-			
Self-management	93			1	-			
Exercise	91			1	-			
Splinting	88			1	-			
PATELLA FEMORAL PAIN SYNDROME								
	Assessed by surveys of physical therapists				**Assessed by clinical notes**			
Recommended	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
Strengthening	-				100			
Stretching	-				20			
Not-recommended	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
IF, US	-				20			
Mobilisation	-				20			
No-recommendation	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
Tape	-				20			
Acupuncture	-				20			
Advice or education	-				20			
Cold therapy[a]	-				20			
*****classification based on Crossley KM et al. Br J Sports Med. 2016;50(14): 844-852.								
[a]: no review on cold therapy								
ACHILLES TENDINOPATHY								
	Assessed by surveys of physical therapists				**Assessed by clinical notes**			
Recommended	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
Eccentric strengthening	-				67			1
No-recommendation	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
Deep friction massage	-				100			1
Stretching	-				83			1
IF, US	-				50			1
Acupuncture	-				33			1
*classification based on Habets B et al. Scand J Med Sci Sports 2015;25(1): 3-15 (for eccentric exercises) Rowe V et al. (2012). Sports Med 2012;42(11): 941-967 (all other interventions)								
ORTHOPEDICS								
LUMBAR DISCECTOMY AND FUSION (surveys of physical therapists)								
	Inpatients				**Outpatients**			
Recommended	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
Discectomy								
High-intensity exercise[a]	81	81	81	1	-			

Rehabilitation starting 4-6 weeks post-surgery	-				15			1
Fusion								
Exercise and CBT	-				61			1

No-recommendation	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
Other exercises[b, c]	96	94	97	2	72	63	82	2
Advice, education or reassurance	86	79	92	2	68	53	83	2
Neural mobilisation	57			1	49	36	61	2
CBT	-				61			1
Rehabilitation starting 0-4 weeks post-surgery (discectomy)	-				49			

*classified based on
Oosterhuis T et al. Cochrane Database Syst Rev. 2014(3):Cd003007
Greenwood J et al. Spine (Phila Pa 1976). 2016;41(1):E28-36.
[a]: includes aerobic or strengthening exercise;
[b]: exercise that is neither aerobic Nor strengthening (for discectomy) or any exercise (fusion)
[c]: no reviews for other exercises, advice, education or reassurance, neural mobilisation and CBT (alone)

DISTAL RADIUS FRACTURE

	Assessed by surveys of physical therapists				**Assessed by clinical notes**			
No-recommendation	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
Exercise	-				97			1
Advice or education[a]	-				90			1
Manual therapy[b]	-				55			1
Compression	-				28			1
Heat or cold therapy	-				10			1
Walking aids[a]	-				1			1
Electrotherapy	-				0			1
Whirlpool	-				0			1
Wax baths[a]	-				0			1

*classification based on Handoll HH and Elliott J. Cochrane Database Syst Rev 2015;(9):Cd003324 (all unknown value)
[a]: no review for advice or education, wax baths, walking aids, heat or cold therapy
[b]: includes massage or mobilisation

POST PELVIC SURGERY

	Assessed by surveys of physical therapists				**Assessed by clinical notes**			
No-recommendation	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
Exercise	82			1	-			
Advice on activity restriction	75			1	-			

N=number of studies; Q1: first quartile; Q3: third quartile; CBT: cognitive behavioural therapy; CMC: carpometacarpal; ES: electrical stimulation; TENS: transcutaneous electrical

nerve stimulation; US: Ultrasound.

€: the percentage of physical therapists that report they provide (or would provide) high-value care, low-value care and care of unknown value for a given condition.

¥: the percentage of patients that received high-value care, low-value care or care of unknown value from a physical therapist for a particular condition as determined by audits of clinical notes, treatment recording forms, or surveys of patients.

Supplementary Table 6. Methodological quality ratings of included studies using a modified Downs and Black checklist

		Checklist items									
Author (year)	**Condition**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**Total**	**Assessment measure**
Armstrong MP (2003)	LBP	1	1	1	1	1	0	1	1	7	Audit of clinical notes
Artz N (2013)	TKR	1	1	0	1	1	1	1	0	6	Survey to department
Athanasopoulos S (2007)	Various musculoskeletal conditions (e.g. ligament sprain, osteoarthritis)	1	1	1	1	1	0	1	1	7	Treatment recording forms
Ayanniyi O (2007a)	Acute and chronic LBP	1	1	1	1	0	0	1	0	5	Survey with vignettes
Ayanniyi O (2007b)	Neck pain	1	1	1	1	1	0	1	1	7	Audit of clinical notes
Ayanniyi O (2016)	Shoulder pain	1	1	1	1	1	0	1	1	7	Audit of clinical notes
Ayanniyi O (2017)	Knee OA	1	1	1	1	1	0	1	0	6	Survey with vignettes
Barry S (2003)	TKR	1	1	1	1	1	0	1	0	6	Survey without vignettes
Barten DJ (2015)	Knee and hip OA	1	1	1	1	1	0	1	1	7	Treatment recording forms
Battie MC (1994)	Acute and chronic LBP	0	1	1	1	1	0	1	0	5	Survey with vignettes
Beales D (2015)	Pelvic girdle pain	1	1	1	1	0	0	1	0	5	Survey with vignettes
Bekkering GE (2005)	LBP	1	1	1	1	1	0	1	1	7	Survey without vignettes
Bernhardsson S (2015)	Subacute LBP, subacute neck pain and subacromial pain	1	1	1	1	1	0	1	0	6	Survey without vignettes
Bishop A (2008)	Acute LBP	1	1	1	1	1	0	1	0	6	Survey with vignettes

Bishop A (2016)	Pregnancy-related acute LBP	1	1	1	1	1	0	1	0	6	Survey with vignettes
Bruder AM (2013)	Distal radius fracture	1	1	1	1	0	0	1	1	6	Treatment recording forms
Byrne K (2006)	Acute and chronic LBP	1	1	1	1	1	0	1	0	6	Survey without vignettes
Carlesso LC (2013)	LBP and neck pain	1	1	1	1	1	0	1	0	6	Survey without vignettes
Carlesso LC (2015)	Acute and chronic neck pain and whiplash	1	1	1	1	1	0	1	0	6	Survey without vignettes
Carlesso LC (2014)	Acute and chronic neck pain and whiplash	1	1	1	1	1	0	1	0	6	Survey without vignettes
Casserley-Feeney SN (2008)	LBP	1	1	1	1	0	0	1	1	6	Audit of clinical notes
Corkery MB (2014)	Acute and chronic whiplash	1	1	1	1	1	0	1	0	6	Survey with vignettes
de Souza FS (2017)	Acute and subacute LBP	1	1	1	1	0	0	1	0	5	Survey with vignettes
Dekker J (1993)	LBP, neck pain, knee pain, shoulder pain	1	1	1	1	1	0	1	1	7	Treatment recording forms
Ehrmann-Feldman D (1996)	LBP	1	1	1	1	1	0	1	1	7	Audit of clinical notes
Evans DW (2010)	Acute LBP	1	1	1	1	1	1	1	0	7	Survey with vignettes
Fidvi N (2010)	LBP	1	1	1	1	1	0	1	0	6	Survey without vignettes
Foster NE (1999)	LBP	1	1	0	1	1	0	1	0	5	Survey without vignettes
Fraser JJ (2017)	Plantar fascitis	1	1	1	1	1	0	1	1	7	Audit of billing codes

Frawley HC (2005)	Pelvic surgery	1	0	1	1	1	0	1	0	5	Survey without vignettes
Freburger JK (2011)	Chronic LBP	1	1	1	1	1	0	1	0	6	Survey without vignettes
Gracey JH (2002)	LBP	1	0	1	1	1	0	1	1	6	Treatment recording forms
Grant ME (2014)	Various musculoskeletal conditions	1	1	1	1	1	0	1	1	7	Treatment recording forms
Grieve R (2017)	Plantar fascitis	1	1	0	1	1	0	1	0	5	Survey without vignettes
Groenendijk JJ (2007)	LBP	1	1	1	1	1	0	1	1	7	Treatment recording forms
Hamm L (2003)	Acute and chronic LBP	1	1	0	1	1	0	1	1	6	Treatment recording forms
Harte AA (2005)	LBP	1	1	1	1	1	0	1	0	6	Survey without vignettes
Hendrick P (2013)	LBP	1	1	1	1	1	0	1	0	6	Survey without vignettes
Holden MA (2008)	Knee OA	1	1	1	1	1	0	1	0	6	Survey with vignettes
Hurkmans EJ (2012)	Rheumatoid arthritis	1	0	1	1	1	0	1	0	5	Survey without vignettes
Jackson DA (2001)	LBP	1	1	1	1	1	0	1	1	7	Audit of clinical notes
Jamtvedt G (2008)	Knee OA	1	1	1	1	1	0	1	0	6	Survey without vignettes
Jette AM (1997)	LBP, neck pain and knee pain	1	1	1	1	0	0	1	1	6	Treatment recording forms
Jette AM (1994)	LBP	1	1	1	1	1	0	1	1	7	Treatment recording forms
Jette DU (1997)	LBP, neck pain and knee pain	1	1	1	1	1	0	1	1	7	Treatment recording forms

Johansson K (1999)	Subacromial pain	1	1	0	1	0	0	1	0	4	Survey with vignettes
Karel Y (2017)	Shoulder pain	1	1	1	1	0	0	1	1	6	Treatment recording forms
Keating JL (2016)	Acute and sub-acute LBP	1	1	1	1	1	0	1	0	6	Survey with vignettes
Kerssens JJ (1999)	LBP	1	1	1	1	1	0	1	1	7	Treatment recording forms
Kooijman MK (2011)	Lateral ankle sprains	1	1	1	1	1	0	1	1	7	Treatment recording forms
Ladeira CE (2015)	Acute and subacute LBP	1	1	1	1	0	0	1	0	5	Survey with vignettes
Ladeira CE (2017)	Acute and subacute LBP	1	1	1	1	1	1	1	0	7	Survey with vignettes
Leemrijse CJ (2006)	Lateral ankle sprains	1	1	1	1	1	0	1	0	6	Survey without vignettes
Li LC (2001)	Acute and sub-acute LBP	1	1	1	1	1	0	1	0	6	Survey with vignettes
Liddle SD (2009)	Chronic LBP	1	1	1	1	1	0	1	0	6	Survey without vignettes
Lineker SC (2006)	Rheumatoid arthritis	1	1	1	1	0	0	1	1	6	Treatment recording forms
Louw QA (2010)	LBP	1	1	1	1	1	0	1	1	7	Treatment recording forms
MacIntyre NJ (2013)	Knee OA	1	1	1	1	0	0	1	0	5	Survey without vignettes
Madson TJ (2015)	LBP	1	1	1	1	1	0	1	0	6	Survey with vignettes
Mielenz TJ (1997)	Acute LBP	1	1	1	1	1	0	1	1	7	Audit of clinical notes
Mikhail C (2005)	Acute LBP	1	1	1	1	1	1	1	0	7	Survey with vignettes
Moutzouri M (2017)	TKR	1	1	1	1	1	0	1	0	6	Survey without vignettes

Murray IR (2005)	Patella femoral pain and Achilles tendinopathy	1	1	1	1	0	0	1	1	6	Audit of clinical notes
Naylor J (2006)	TKR	1	0	1	1	1	0	1	0	5	Survey to department
Ng TS (2015)	Acute and chronic whiplash	1	1	1	1	0	0	1	0	5	Survey with vignettes
O'Brien VH (2014)	Thumb carpometacarpal joint pain	1	1	1	1	1	0	1	0	6	Survey without vignettes
Oppong-Yeboah B (2014)	LBP	1	0	1	1	1	0	1	0	5	Survey without vignettes
Owoeye OB (2009)	Various musculoskeletal conditions	1	1	1	1	1	0	1	1	7	Audit of clinical notes
Pensri P (2005)	LBP	1	1	1	1	1	0	1	0	6	Survey without vignettes
Peter WF (2014)	TKR and THR	1	1	1	1	1	0	1	0	6	Survey without vignettes
Peterson ML (2011)	Osteoporosis	1	1	1	1	1	0	1	0	6	Survey without vignettes
Peterson M (2005)	Chronic lateral epicondylitis	1	1	0	1	0	0	1	0	4	Survey without vignettes
Phadke V (2015)	Subacromial pain	1	1	1	1	0	0	1	0	5	Survey with vignettes
Pincus T (2011)	LBP	1	1	1	1	0	0	1	0	5	Survey without vignettes
Poitras S (2005)	LBP	1	1	1	1	1	0	1	1	7	Treatment recording forms
Rebbeck T (2006)	Acute whiplash	1	1	1	1	1	1	1	1	8	Survey without vignettes and audit of clinical notes
Reid D (2002)	Acute LBP	1	0	1	1	0	0	1	0	4	Survey with vignettes

Roebroeck ME (1998)	Lateral ankle sprains	1	1	1	1	1	0	1	1	7	Treatment recording forms
Rushton A (2014)	Lumbar fusion	1	0	1	1	1	0	1	0	5	Survey without vignettes
Serrano-Aguilar P (2011)	Chronic LBP, neck pain or shoulder pain	1	1	1	1	1	1	1	1	8	Audit of billing codes
Sparkes V (2005)	LBP	1	1	1	1	0	0	1	1	6	Audit of clinical notes
Spitaels D (2017)	Knee OA	1	1	1	1	0	0	1	0	5	Survey without vignettes
Sran MM (2005)	Osteoporosis	1	1	0	1	1	0	1	0	5	Survey without vignettes
Stevenson K (2006)	LBP	1	1	1	1	0	0	1	1	6	Treatment recording forms
Strand LI (2005)	LBP	1	1	1	1	0	0	1	1	6	Clinical observation
Struyf F (2012)	Subacromial pain	1	1	1	1	1	0	1	0	6	Survey without vignettes
Swinkels IC (2005)	Acute and chronic LBP	1	1	1	1	1	0	1	1	7	Treatment recording forms
Tomkins CC (2010)	Lumbar spine stenosis	1	1	1	1	0	0	1	0	5	Survey without vignettes and telephone interview of Pts
Tumilty S (2017)	Acute LBP	1	1	1	1	0	0	1	1	6	Treatment recording forms
Turner PA (1999)	LBP and TKR	1	1	0	1	0	0	1	1	5	Audit of clinical notes
van Baar ME (1998)	LBP and knee pain	1	1	1	1	0	0	1	1	6	Treatment recording forms
van der Valk RWA (1995)	Acute, subacute and chronic LBP	1	1	1	1	0	0	1	1	6	Treatment recording forms
Walsh NE (2009)	Knee OA	1	1	1	1	0	0	1	0	5	Survey to department
Williamson E (2007)	Lumbar discectomy	1	0	0	1	1	0	1	0	4	Survey to department

Number of studies scoring positive (/94)	93	86	85	94	67	6	94	39
% of studies scoring positive	99%	91%	90%	100%	71%	6%	100%	41%
Mean (SD) total score = 6.0 (0.9)								
Median (IQR) total score = 6 (5-7)								

IQR: inter quartile range; LBP: low back pain; OA: osteoarthritis; PTs: physical therapists; Pts: patients; SD: standard deviation; THR: total hip replacement; TKR: total knee replacement.

PRISMA 2009 Checklist

Section/topic	#	Checklist item	Reported on page #
TITLE			
Title	1	Identify the report as a systematic review, meta-analysis, or both.	1: Title
ABSTRACT			
Structured summary	2	Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number.	2: Abstract
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known.	5: Introduction
Objectives	4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).	6: Final paragraph of introduction
METHODS			
Protocol and registration	5	Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number.	6: This review was conducted in accordance with the "Preferred reporting items for systematic reviews and meta-analyses" (PRISMA) statement (22) and was prospectively registered on PROSPERO (CRD42018094979).
Eligibility criteria	6	Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale.	6. 2.2. Study Selection
Information sources	7	Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.	6. 2.1 Data sources and searches
Search	8	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.	Supplementary Table 1.
Study selection	9	State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis).	6. 1st paragraph
Data collection process	10	Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators.	7. 2.3. Data extraction and Quality assessment

PRISMA 2009 Checklist

Data items	11	List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.	7. 2.3. Data extraction and Quality assessment and Table 1
Risk of bias in individual studies	12	Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.	7. 2.3. Data extraction and Quality assessment
Summary measures	13	State the principal summary measures (e.g., risk ratio, difference in means).	10. 2.5 Analysis (Medians and IQR)
Synthesis of results	14	Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., I^2) for each meta-analysis.	10-12. 2.5 Analysis

Section/topic	#	Checklist item	Reported on page #
Risk of bias across studies	15	Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies).	7. 2.3. Data extraction and Quality assessment “assessment of treatment choices”
Additional analyses	16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.	N/A.
RESULTS			
Study selection	17	Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram.	12 and Fig 1.
Study characteristics	18	For each study, present characteristics for which data were extracted (e.g., study size, PICOS, follow-up period) and provide the citations.	Table 1
Risk of bias within studies	19	Present data on risk of bias of each study and, if available, any outcome level assessment (see item 12).	13. 3.1 Methodological Quality and Supplementary Table 6.
Results of individual studies	20	For all outcomes considered (benefits or harms), present, for each study: (a) simple summary data for each intervention group (b) effect estimates and confidence intervals, ideally with a forest plot.	13-14. Table 2 and Figure 2
Synthesis of results	21	Present results of each meta-analysis done, including confidence intervals and measures of consistency.	Table 2 and Figure 2.
Risk of bias across studies	22	Present results of any assessment of risk of bias across studies (see Item 15).	13. 3.1 Methodological Quality and Supplementary Table 6.
Additional analysis	23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).	N/A.

PRISMA 2009 Checklist

DISCUSSION			
Summary of evidence	24	Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers).	14-15
Limitations	25	Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias).	15. 4.1. Strengths and weaknesses of the study
Conclusions	26	Provide a general interpretation of the results in the context of other evidence, and implications for future research.	15-16. 4.2 Strengths and weaknesses in relation to other studies and 4.3 Meaning of the study
FUNDING			
Funding	27	Describe sources of funding for the systematic review and other support (e.g., supply of data); role of funders for the systematic review.	20. None

From: Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. PLoS Med 6(7): e1000097. doi:10.1371/journal.pmed1000097

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Do physical therapists follow evidence-based guidelines when managing musculoskeletal conditions? A systematic review

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Do physical therapists follow evidence-based guidelines when managing musculoskeletal conditions? A systematic review

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ABSTRACT

Objectives: Physicians often refer patients with musculoskeletal conditions to physical therapy. However, it is unclear to what extent physical therapists' treatment choices align with the evidence. The aim of this systematic review was to determine what percentage of physical therapy treatment choices for musculoskeletal conditions agree with management recommendations in evidence-based guidelines and systematic reviews.

Design: Systematic review

Setting: We performed searches in MEDLINE, EMBASE, CINAHL, CENTRAL, AMED, Scopus and Web of Science combining terms synonymous with "practice patterns" and "physical therapy" from the earliest record to April 2018.

Participants: Studies that quantified physical therapy treatment choices for musculoskeletal conditions through surveys of physical therapists, audits of clinical notes, and other methods (e.g. audits of billing codes, clinical observation) were eligible for inclusion.

Primary and secondary outcomes: Using medians and interquartile ranges, we summarised the percentage of physical therapists who chose treatments that were recommended, not-recommended and had no recommendation, and summarised the percentage of physical therapy treatments provided for various musculoskeletal conditions within the categories of recommended, not-recommended and no recommendation. Results were stratified by condition and how treatment choices were assessed (surveys of physical therapists vs. audits of clinical notes).

Results: We included 94 studies. For musculoskeletal conditions, the median percentage of physical therapists who chose recommended treatments was 54% (n=23 studies; surveys completed by physical therapists) and the median percentage of patients that received recommended physical therapy-delivered treatments was 63% (n=8 studies; audits of clinical notes). For treatments not-recommended, these percentages were 43% (n=37; surveys) and

27% (n=20; audits). For treatments with no recommendation, these percentages were 81% (n=37; surveys) and 45% (n=31; audits).

Conclusions: Many physical therapists seem not to follow evidence-based guidelines when managing musculoskeletal conditions. There is considerable scope to increase use of recommended treatments and reduce use of treatments that are not recommended.

Keywords: Non-pharmacological; musculoskeletal; physical therapy; treatment choices; systematic review; recommended care.

Strengths and limitations of this study

- This is the first study to summarise the percentage of physical therapy treatment choices for musculoskeletal conditions that agree with management recommendations in evidence-based guidelines and systematic reviews
- We used a systematic approach to identify studies on physical therapy treatment choices and classified recommendations for physical therapy treatments according to evidence-based guidelines and systematic reviews
- Experts provided feedback to help refine our classification, and a second reviewer double-checked all the extracted data to ensure accuracy
- The main limitation is that primary studies only reported treatment choices for individual treatments and not for combinations of treatments.
- Recommended treatments such as advice and reassurance might not have been documented in clinical notes or listed in a survey because they may be viewed as a routine part of physical therapy; this could have underestimated the percentage of physical therapists that provided recommended treatments

1. Introduction

Musculoskeletal conditions (such as back and neck pain) have remained the leading cause of disability worldwide over the past two decades and the burden is increasing (1). Concerns about the harms of medicines such as opioids, and new evidence on the lack of effectiveness of common surgical procedures have shifted guideline recommendations for musculoskeletal conditions so there is now more explicit recommendation of non-pharmacological treatments such as those provided by physical therapists. For example, the Center for Disease Control and Prevention (CDC) recommends exercise therapy instead of opioids in the management of chronic pain (2). Similarly, the 2018 Royal Australian College of General Practitioners (RACGP) guideline for the management of hip and knee osteoarthritis discourages opioids and arthroscopy for knee osteoarthritis and recommends aquatic and land-based exercise (3).

Physicians often refer patients with musculoskeletal conditions to physical therapy for non-pharmacological care. In the United States, there are nearly 250,000 physical therapists (4) and in Australia there are now more practising physical therapists than general practitioners (5, 6). It is important to appreciate however that there are a range of non-pharmacological treatments that physical therapists can provide; some such as exercise are recommended in guidelines for musculoskeletal conditions while others such as electrotherapy are recommended against (7).

While there has been considerable attention in medicine on whether physicians are providing recommended care, there has been less attention on whether health services that physicians refer for involve recommended care (8). Determining whether physical therapists are providing treatments recommended in evidence-based guidelines when they manage musculoskeletal conditions is an important step towards ensuring evidence-based care across all health care settings.

The aim of this systematic review was to summarise the percentage of physical therapy treatment choices for musculoskeletal conditions that agree with management recommendations in evidence-based guidelines and systematic reviews.

2. Methods

This review was conducted in accordance with the "Preferred reporting items for systematic reviews and meta-analyses" (PRISMA) statement (9) and was prospectively registered on PROSPERO (CRD42018094979). Due to the size of the review, other research questions in our registered protocol (including physical therapy treatment choices for cardiorespiratory and neurological conditions) will be addressed in separate manuscripts. Other deviations to our registered protocol include using a modified version of the 'Downs and Black' checklist to rate study quality and changing the focus from 'high- and low-value care' to 'recommended and not-recommended care'.

2.1. Data Sources and Searches

We conducted a comprehensive keyword search in MEDLINE, EMBASE, Cumulative Index to Nursing and Allied Health Literature, Cochrane Central Register of Controlled Trials, Allied and Complementary Medicine, Scopus and Web of Science, from the earliest record until April 2018. Our search strategy combined terms relating to "practice patterns" and "physical therapy" (Supplementary Table 1) and was designed to capture studies investigating physical therapy treatment choices for any condition (as per our registered protocol). We performed citation tracking and reviewed the reference lists of included studies to identify those missed by our initial database search.

Two independent reviewers (JZ and MO) performed the selection of studies by subsequently screening the title, abstract and full-text of studies retrieved through our electronic database search. Any disagreements between the two reviewers were resolved through discussion.

2.2. Study Selection

We included any study that reported physical therapy treatment choices for musculoskeletal conditions through surveys of physical therapists (with or without vignettes), audits of clinical notes and other methods (e.g. surveys of patients). We only included full-text studies in English. There was no restriction on the musculoskeletal condition treated (e.g. neck pain, rehabilitation post-knee arthroplasty) or practice setting (e.g. private, public), but we excluded studies that reported treatment choices for conditions where there were no known effective or ineffective physical therapist-delivered treatments. We also excluded studies that only quantified physical therapists' use of assessment procedures, outcome measures, referrals, treatments without specifying a target condition, pharmacological treatments (e.g. recommending paracetamol) or treatments outside the usual scope of physical therapy practice (e.g. injections); and studies where physical therapy treatment choices were unable to be separated from other healthcare providers.

2.3. Data Extraction and Quality Assessment

One reviewer (JZ) independently extracted individual study characteristics (e.g. condition, country, participant demographics) and percentages that quantified physical therapy treatment choices (see sections 2.4 and 2.5). A second reviewer (MO) double-checked the extracted data to ensure accuracy. Discrepancies were resolved by discussion between the two reviewers and re-checking data against the original citation. We contacted authors when it appeared relevant data were not reported.

The methodological quality of included studies was assessed independently by two reviewers (JZ and MO) using a modified version of the 'Downs and Black' checklist. Any disagreements between the two reviewers were resolved through discussion. We modified the original 27-item 'Downs and Black' checklist (10) and selected eight items that were relevant to studies on treatment choices (Supplementary Table 2). For item eight, we considered the

following assessments of treatment choices as 'accurate': observation, audits of clinical notes, audits of billing codes, treatment recording forms and validated surveys.

2.4. Data Synthesis

The following definitions were used to classify treatments as recommended, not-recommended and no recommendation:

- **Recommended treatments** included physical therapy treatments endorsed in well-recognised evidence-based clinical practice guidelines (e.g. guidelines from the National Institute for Health and Care Excellence, NICE) or found to be effective in recent systematic reviews. Treatments recommended in guidelines were further categorised as those that 'must be provided' ('core' treatments) and those that 'should be considered'. When guidelines specified 'core' treatments, only these treatments were considered 'recommended' in our primary analysis (see 2.5.1). Otherwise, treatments that 'should be considered' were accepted as 'recommended'.
- **Not-recommended treatments** included physical therapy treatments not recommended in guidelines or found to be ineffective in recent systematic reviews
- **Treatments with no recommendation** included physical therapy treatments where guideline recommendations and evidence from systematic reviews was inconclusive; or where treatments had not been investigated in a systematic review.

We used one clinical practice guideline per condition to classify physical therapy treatments (primary guideline) and contacted leading experts to help us select our primary guideline and refine our classification for a number of conditions (see Acknowledgements). If we found a physical therapy treatment that was not mentioned in the primary guideline, we searched in other evidence-based clinical practice guidelines and systematic reviews to inform our

classification (Supplementary Table 3). We selected recently published high-quality systematic reviews where possible.

2.4.1. Assessments of treatment choices

Data on physical therapy treatment choices were divided into two main categories (and analysed separately) due to differences in how each category is interpreted:

2.4.2. Treatment choices assessed by surveys completed by physical therapists (with or without vignettes)

Interpretation. Surveys completed by physical therapists' yielded data on the percentage of physical therapists that provide (survey without vignette) or would provide (survey with vignette) a particular treatment for a condition they frequently treat.

Survey without vignette. Physical therapists outlined the treatments they provide for a condition or rated how often they provide a particular treatment for a condition (e.g. "frequently"; "sometimes"; "rarely"; or "never"). When studies reported how often treatments were provided, we extracted the percentage of treatments that were provided at least 'sometimes'. We combined data when studies separated survey responses by different samples of physical therapists (usually by country or practice setting). Some surveys were completed by a senior physical therapist on behalf of the physical therapy department within a hospital (e.g. management following knee arthroplasty).

Survey with vignette. Physical therapists outlined the treatments they would provide for a particular case (vignette). For studies that included multiple vignettes of the same condition, we took an average of physical therapists' responses across vignettes of equal sample sizes or used data from the vignette with the highest sample size.

2.4.3. Treatment choices assessed by audits of clinical notes, audits of billing codes, treatment recording forms, clinical observation, or surveys completed by patients

Interpretation. These assessment measures (reported as 'assessed by clinical notes' in the results tables) yielded data on the percentage of patients that received a particular physical therapy-delivered treatment in a single treatment session or throughout an episode of care (i.e. from initial consultation to discharge).

Audits of clinical notes and billing codes were performed retrospectively in the included studies. Treatment recording forms provided similar information to clinical notes, except they were often implemented as part of a study or registry on treatment practices (prospective). Within a study, we combined data across samples that presented with the same condition (e.g. physical therapists from different countries treatment low back pain).

2.5. Analysis

We used counts and ranges to summarise study characteristics for each condition. We used medians and interquartile ranges (IQR) to summarise the percentage of physical therapy treatment choices that involved treatments that were recommended, not-recommended and had no recommendation across studies. We provided an overall result for all studies and then separately for individual musculoskeletal conditions (e.g. low back pain). Since physical therapists can provide multiple treatments for the same patient, and treatment choices were summarised across studies, the percentage of treatment choices that involved treatments that were recommended, not-recommended and had no recommendation do not sum to 100%. For example, 70% of physiotherapists might provide recommended treatments for low back pain, but the same percentage might also provide some treatments that are not-recommended or have no recommendation.

2.5.1. Treatment choices that involved treatments that were recommended, not-recommended and had no recommendation

Where possible, recommended treatment was based on treatment choices involving all 'core' treatments recommended in guidelines (i.e. physical therapists 'must' or 'should' provide). For example, the NICE guidelines for low back pain recommend that all patients receive advice and education to support self-management, reassurance, and advice to keep active (7). Since studies did not report combinations of treatments, we used the lowest value across all 'core' treatments. For example, if 30% of physical therapists provide reassurance and 50% provide advice to stay active, we used 30% as the percentage of treatment choices that involved recommended treatments. This is because no more than 30% of the sample could have provided both reassurance and advice to stay active ('core' treatments). If guidelines did not mention 'core' treatments or if there were no guidelines for a condition, we used data from the most frequently provided recommended treatment that 'should be considered' or was found to be effective in a systematic review. We used data from the most frequently provided treatment that was not recommended and had no recommendation to provide an estimate of the percentage of physical therapists' treatment choices that involve at least one treatment that is not-recommended and had no recommendation. For studies that reported treatment choices stratified by the duration of symptoms (acute vs. chronic) or different settings (inpatient vs. outpatient), we used the highest value of treatments that were recommended, not-recommended and had no recommendation across the strata. We summarised the percentage of physical therapy treatment choices that were recommended, not-recommended and had no recommendation across all musculoskeletal conditions where guidelines recommended 'core' treatments.

2.5.2. Physical therapy treatments provided for various musculoskeletal conditions

We summarised the percentage of physical therapy treatments provided for various conditions within the categories of recommended, not-recommended and no recommendation. Treatments that were procedurally similar and had the same recommendation (i.e. recommended, not-recommended and no recommendation) were grouped together. For example, according to the NICE low back pain guidelines, mobilisation, manipulation and massage should all be 'considered' (7). Hence, these were grouped as 'manual therapy'. Studies rarely reported combinations of physical therapy treatments, so we used data from the most frequently provided treatment where appropriate. For example, if 67% of physical therapists provide massage for acute low back pain and 20% provide mobilisation, we used 67% as the best estimate for the percentage of physical therapists that provide manual therapy.

2.6. Patient or Public Involvement

Patients and members of the public were not involved in the design of this study

3. Results

After removing duplicates and screening 8,567 titles and abstracts and 254 full-texts reports, 94 studies were included (Fig 1). Physical therapy treatment choices were investigated for low back pain (n=48 studies) (11-58), knee pain (n=10) (32, 34, 57, 59-65), neck pain or whiplash (n=11) (15, 18, 32, 34, 51, 66-71), foot or ankle pain (n=5) (72-76), shoulder pain (n=7) (15, 51, 77-81), pre or post knee arthroplasty (n=6) (46, 82-86) (including one study of hip and knee arthroplasty (86)), and other musculoskeletal or orthopaedic conditions (where treatment choices were only reported in one study or where one of either recommended or not-recommended treatments could not be inferred from guidelines or systematic reviews) (n=18) (87-104). We contacted 15 authors for data (regarding 18 studies); 12 responded and five were able to provide the data we requested (regarding six studies) (15, 16, 22, 64, 89,

100). A summary of study characteristics across conditions is in Table 1. Characteristics of included studies is in Supplementary Table 4.

Seven studies investigated treatment choices for shoulder pain; four (15, 78, 80, 81) focused on subacromial pain syndrome (the most common form of shoulder pain (105)), two (77, 79) included patients with various diagnoses (including subacromial pain syndrome) and one (51) did not specify a diagnosis (Supplementary Table 4). Evidence on the management of subacromial pain syndrome was used to categorise treatment choices for all studies on shoulder pain. Similarly, evidence on the management of lateral ankle sprains was used to categorise treatment choices for all studies on acute ankle injuries (n=2/3 studies on lateral ankle sprains (75, 76)) and evidence on the management of knee osteoarthritis for all studies on knee pain (excluding one study on acute knee injuries (57) and another on a mixed sample of hip and knee osteoarthritis (60) – see Supplementary Table 5).

3.1. Methodological quality

Individual study scores ranged from 4-8 (out of a possible 8) with a mean score of 6.0 (median=6) (Supplementary Table 6). The most common methodological limitations included failing to report that physical therapists who were prepared to participate were representative of the population from which they were drawn (n=88/94) and not using an accurate assessment of treatment choices (n=55/94). All studies clearly described their main findings and used appropriate statistical tests, and most scored positive on the remaining checklist items (Supplementary Table 6).

3.2. Treatment choices that involved treatments that were recommended, not-recommended and had no recommendation (all studies)

3.2.1. Treatment choices assessed by surveys completed by physical therapists (with or without vignettes)

The median percentage of physical therapists that provide (or would provide) treatments that were recommended, not-recommended and had no recommendation was 54%, 43% and 81% for all musculoskeletal conditions, respectively; 35%, 44% and 72% for low back pain; 85%, 38% and 97% for neck pain and whiplash; 93%, 90% and 79% for shoulder pain; 58%, 45% and 98% for knee pain; 39%, 14% and 7% for lateral ankle sprains; 29%,43% and 98% for plantar fasciitis; and 93%, 52% and 62% following knee or hip arthroplasty (Table 2) (Figure 2).

3.2.2. Treatment choices assessed by audits of clinical notes, audits of billing codes, treatment recording forms, clinical observation, or surveys completed by patients

The median percentage of patients that received physical therapy-delivered treatments that were recommended, not-recommended and had no recommendation was 63%, 27% and 45% for all musculoskeletal conditions, respectively; 50%, 18% and 43% for low back pain; 79% (not-recommended) and 57% (no recommendation) for neck pain and whiplash; 76%, 8% and 62% for shoulder pain; 65%, 21% and 53% for knee pain; 45% (no recommendation) for lateral ankle sprains; 87% (recommended) and 90% (no recommendation) for plantar fasciitis; and 65%, 43% and 2% following knee or hip arthroplasty (Table 2) (Figure 2).

3.3. Physical therapy treatment choices for various musculoskeletal conditions

The results summarising the percentage of physical therapy treatments provided for various musculoskeletal conditions that were recommended, not-recommended and had no recommendation can be found in Table 3. For example, as assessed by surveys of physical therapists, the most frequently provided recommended treatment for acute low back pain that

physical therapists 'must provide' was advice to stay active (median=32%, IQR: 13% to 55%, n=7 studies). The most frequently provided not-recommended treatment for acute low back pain was McKenzie therapy (median=36%, IQR: 24% to 37%, n=6) (Table 3). Treatment choices for conditions that were only reported in one study or where one of either recommended or not-recommended treatments could not be inferred from guidelines or systematic reviews can be found in Supplementary Table 5.

4. Discussion

Many physical therapists seem not to follow evidence-based guidelines when managing musculoskeletal conditions. Our review highlights that there is considerable scope to increase the frequency with which physical therapists provide recommended treatments for musculoskeletal conditions and reduce the use of treatments that are not-recommended or have no recommendation to guide their use. Across all musculoskeletal conditions, 54% of physical therapists chose recommended treatments, 43% chose treatments that were not recommended and 81% chose treatments that have no recommendation (based on surveys completed by physical therapists). Based on audits of clinical notes, 63% of patients received recommended physical therapy-delivered treatments, 27% received treatments that were not recommended and 45% received treatments that have no recommendation.

4.1. Strengths and weaknesses of the study

The primary strength of this review is that we used a systematic approach to identify studies on physical therapy treatment choices and classified recommendations for physical therapy treatments according to evidence-based guidelines and systematic reviews (Supplementary Table 3). Experts provided feedback to help refine our classification, and a second reviewer double-checked all the extracted data to ensure accuracy.

The main weakness of this review is that primary studies only reported treatment choices for individual treatments and not combinations of treatments. As a result, we could not determine the percentage of physical therapists that provided only recommended treatments, only not-recommended treatments, only treatments with no recommendation, or other combinations of treatments. Second, it is possible that recommended treatments such as advice and reassurance were not documented in clinical notes or listed in a survey because they are viewed as a routine part of physical therapy. For example, only 12 out of the 48 studies on low back pain reported that physical therapists provide advice to stay active, while even less reported reassurance (n=2) or advice and education to support self-management (n=2). This could have underestimated the percentage of recommended treatment choices. Third, physical therapists' treatment choices may have changed over time so including older studies could limit the relevance of our findings. Nevertheless, we do not believe this is an important limitation because many guideline recommendations have remained largely consistent overtime. For example, although some studies on treatment choices for low back pain are from 1994, a comparison of low back pain guidelines between 1994 and 2000 found a high degree of consistency of recommendations, such as advice to stay active and avoid bed rest (106). This is consistent with current low back pain guidelines. Finally, most studies did not use an accurate assessment of treatment choices (n=55/94). However, we stratified our analysis by how treatment choices were assessed so the influence of having an accurate method of assessment is clear to readers.

4.2. Strengths and weaknesses in relation to other studies

Our finding that approximately half of treatment choices involved recommended treatments is similar to previous studies of healthcare. For example, the CareTrack study in Australia found that 57% of healthcare provided by general practitioners, specialists, physiotherapists, chiropractors, psychologists and counsellors was appropriate (107), while the earlier

CareTrack study in the United States found a figure of 55% (108). The percentage of recommended treatment choices for low back pain however was lower in our review (35-50%) when compared to estimates from the Australian (72%) (107) and United States (69%) CareTrack studies (108). A difference to our study is that the CareTrack studies used consensus of experts to judge the value of care; whereas we based this decision upon evidence-based practice guidelines and systematic reviews. Another difference is that the CareTrack studies only assessed healthcare decisions through audits of clinical notes; we used audit of clinical notes, surveys, vignettes, and clinical observation. Further, the Care Track studies reported primary data collected and were not systematic reviews.

4.3. Meaning of the study

Our results suggest that physical therapy treatment choices for musculoskeletal conditions are often not based upon research evidence. There was extensive use of not-recommended treatments and treatments without recommendations; for some conditions treatments that were not-recommended or had no recommendation were more common choices than recommended treatments (Figure 2). As there are now over 42,000 clinical practice guidelines, systematic reviews and clinical trials to guide physical therapy practice, the challenge in physical therapy is applying this evidence to practice. Professional associations have a potential role to play in this area. Unfortunately, recent marketing from professional associations, popular social media handles and leading journals have emphasised the importance of early referral to physical therapy (109) rather than the nature of physical therapy care provided. The high percentage of non-evidence-based treatment choices in our review suggests that referring patients with musculoskeletal conditions for early physical therapy – without emphasising the importance of the type of non-pharmacological care they receive – may be unwise.

Treatment waste is another important issue highlighted in our review. Even when patients receive recommended treatments they also usually receive not-recommended treatments and treatments that have no recommendation to guide their use. With nearly $100 billion spent on physical therapy, optometry, podiatry, or chiropractic medicine each year in the United States (110), the waste due to non-evidence-based physical therapy is likely enormous. Further, billing patients for physical therapy treatments that are not evidence-based could also be considered unethical; the Vision Statement of the American Physical Therapy Association makes clear that there is an expectation that "*physical therapists and physical therapist assistants will render evidence-based services"* (111).

4.4. Unanswered questions and future research

Understanding what drives poor patterns of physical therapy care is important as it will guide the design of strategies to ensure the use of treatments that are not-recommended for musculoskeletal conditions does not simply shift from medicine to allied health. One possible explanation is the large variation in physical therapists who receive training in evidence-based practice (21-82%) and can critically appraise research papers (48-70%) (systematic review of 12 studies (112)). Physical therapists with a poor understanding of evidence-based practice might be misled into providing treatments with weak supporting evidence. Another explanation is a lack of awareness of, and agreement with, evidence-based clinical practice guidelines. For example, only 12% of physical therapists are aware of clinical practice guidelines for low back pain (survey of 108 physical therapists) (113) and 46% agree that guidelines should inform the management of low back pain (survey of 274 physical therapists) (114).

A recent initiative that could help physical therapists replace treatments that are not-recommended with recommended treatments is *Choosing Wisely* (115). Over 225 professional societies worldwide endorse *Choosing Wisely* and have published lists of tests

and treatments that clinicians and their patients should question. This includes physical therapy associations in Australia, the United States and Italy. Testing strategies to increase adoption of *Choosing Wisely* recommendations among physical therapists is important. However, existing *Choosing Wisely* recommendations are likely not maximising the potential of the campaign to reduce the use of physical therapy treatments that are not-recommended in guidelines and systematic reviews. For example, half of the Australian Physiotherapy Association *Choosing Wisely* recommendations target diagnostic testing that is not-recommended, while other recommendations target treatments not part of routine physical therapy care, such as whirlpools for wound management and bed rest following diagnosis of acute deep vein thrombosis (American Physical Therapy Association). Our review highlighted the most frequently provided not-recommended non-pharmacological physical therapy treatments across a range of musculoskeletal conditions (Table 3) and could be used to enhance the relevance of future *Choosing Wisely* recommendations. Further, in countries where physical therapists bill for specific treatments (e.g. the United States), another approach could be to restrict funding for anything but recommended physical therapy treatments.

5. Conclusion

Our results suggest that that there is considerable scope to increase the contribution physical therapists could make to managing musculoskeletal conditions by increasing the frequency with which they provide treatments that are recommended in guidelines and systematic reviews and reduce their use of treatments that are not-recommended or have no recommendations to guide their use.

Authors' contributions

All authors critically revised the manuscript for important intellectual content and approved the final manuscript. Please find below a detailed description of the role of each author:

- Joshua R Zadro: conception and design, analysis and interpretation of data, drafting and revision of the manuscript, and final approval of the version to be published
- Mary O'Keeffe: conception and design, interpretation of data, drafting and revision of the manuscript and final approval of the version to be published
- Christopher G Maher: conception and design, interpretation of data, drafting and revision of the manuscript and final approval of the version to be published

The Corresponding Author (JZ) attests that all listed authors meet authorship criteria and that no others meeting the criteria have been omitted.

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Table 1. Summary of study characteristics by condition

Condition	**N**	**Countries**	**Age range*;** mean (SD) unless stated otherwise	**Experience*;** mean years (SD) unless stated otherwise **Low:** lowest values from studies **High:** highest values from studies	**Sample size range***	**Assessment measure**
Musculoskeletal						
Low back pain (one study did not contribute data) • Acute (n=18) • Subacute or chronic (n=17) • No duration specified or unable to stratify (n=26)	48	United States (n=9); UK (n=8); Netherlands (n=6); Ireland (n=6); Canada (n=5); New Zealand (n=3); Australia; Brazil; Denmark; Ghana; India; Nigeria Norway; South Africa; Spain; Sweden; Thailand	PTs: 32.6 (7.8) to 47 (9.3) Pts: 34.5 (17) to 53.9 (14.5).	**Low:** 2 (IQR 5) or 77.3% between 1-5y **High:** 24 (9.4) or 50% between 15-24y	PTs: 44-1239 Pts: 42-8714 Treatment sessions: 1151-12387	Survey with vignettes=12 Survey without vignette=11 Treatment recording forms=15 Audit of clinical notes=7 Survey of Pts=1 Audit of billing codes=1 Clinical observation=1
Neck pain and whiplash[a] • Neck pain (n=8) • Whiplash (n=3)	11	United States (n=3); Australia (n=2); various (n=2); Canada; Nigeria; Singapore; Spain; Sweden**	PTs: 32.6 (7.8) or 60% >40y Pts: 35.5 (11.5) to 53.9 (14.5)	**Low:** 8.4 (7.4) or 14.8% <3y **High:** 16 (12)or 38% ≥20y or median (range) 20y (1–47)	PTs: 27-278 Pts: 532-2491	Survey with vignettes=2 Survey without vignette=5 Treatment recording forms=2 Audit of clinical notes =2 Audit of billing codes=1 NB: one study included both a survey without vignette and audit of clinical notes

Subacromial pain or shoulder pain[b]	7	Sweden (n=2); Belgium; India; Netherlands; Nigeria; Spain	PTs: 29.1 (5.4) to 50.6 (26.2) Pts: 50 (13) to 53.9 (14.5)	**Low:** 4.9 (5.1) **High:** 14 (11.8)	PTs: 57-271 Pts: 121-365	Survey with vignettes=2 Survey without vignette=2 Treatment recording forms=1 Audit of clinical notes =1 Audit of billing codes=1
Knee osteoarthritis (one study combined knee and hip osteoarthritis)	7	UK (n=2); Belgium; Canada; Netherlands; Nigeria; Norway	PTs: 45.7 (11.7) to 66.7 (13.2)	**Low:** 8.4 (7.4) or 41.7% between 1-5y **High:** 21 (12) or median (range) 26 (1-45)	Departments: 83 PTs: 123-538 Pts: 870	Survey with vignettes=2 Survey without vignette=3 Survey to department=1 Treatment recording forms=1
Knee pain[c]	3	United States (n=2); Netherlands	PTs: 32.6 (7.8) or 60% <35y Pts: 36.2 (17.6) or 39% between to 41.2 (14.1) or 12% >60y	8.4 (7.4)	PTs: 141-462 Pts: 416-2491	Treatment recording forms=3
Lateral ankle sprains	3	Netherlands (n=3)	PTs: 43 (no SD) to 51 (9) Pts: 34.7% between 0-24y to 5.2% ≥65y or 33 (17)	4 (4) to 8 (15) (within the same study; two separate groups)	PTs: 83-332 Pts: 251-1413	Survey without vignette=1 Treatment recording forms=2
Plantar fascitis	2	UK; United States	Pts: 5.2% <20y to 11.3% ≥60y	5% between 0-2y 11% between 3-5y 27% ≥20y (within the same study)	PTs: 257 Pts: 57800	Survey without vignette=1 Audit of billing codes=1
Lumbar spine stenosis	1	Canada	Pts: 70 (11)	16.8 (no SD)	PTs: 76 Pts: 44	Survey without vignette and survey of Pts=1
Pregnancy-related acute low back pain	1	United Kingdom	No data	21.5 (10)	PTs: 499	Survey with vignettes=1

Pelvic girdle pain	1	Norway; Australia (within the same study)	PTs: 33.5 (9.3) (Norway) 37.9 (11.2) (Australia)	9.3 (9.3) (Norway) 15.4 (11.6) (Australia)	PTs: 142	Survey with vignettes=1
Chronic lateral epicondylitis	1	Sweden	No data	No data	PTs: 47	Survey without vignette=1
Thumb carpometacarpal joint pain	1	United States	No data	Hand therapy experience: 4.6% ≤5y; 13.9% between 6-10y; 64.3% ≥11y	PTs: 547	Survey without vignette=1
Rheumatoid arthritis	2	Canada; Netherlands	PTs: 43 (10.8) Pts: 59.2 (13.8)	**Low:** 19 (SD 10.3) **High:** 22.5 (no SD)	PTs: 26-233	Survey without vignette=1 Treatment recording forms=1
Osteoporosis	2	Canada; United States	No data	13.7 (10.8)	PTs: 67-83	Survey without vignette=2
Sports injuries	3	Greece; Nigeria; United Kingdom	Pts: 29.9 (10.8) to 35 (12.5)	No data	Pts: 171-1399	Treatment recording forms=2 Audit of clinical notes =1
Patella femoral pain syndrome and Achilles tendinopathy	1	United Kingdom	35 (12.5)	No data	Pts: 100	Audit of clinical notes =1
Combined musculoskeletal conditions (low back pain, neck pain, shoulder pain, knee pain and acquired deformities of the spine)	1	Netherlands	Pts: 46.1% ≥45y	No data	Pts: 8714 PTs: 74	Treatment recording forms=1
Orthopaedics						

Knee arthroplasty[d] (one study combined knee and hip arthroplasty)	6	UK (n=3); Australia; Greece; Netherlands	PTs: 40.4 (12.6) Pts: 71.4 (7.7)	**Low:** 34.1% <5y **High:** 37.9% ≥20y	Departments: 16-65 PTs: 132-303 Pts: 63	Survey without vignette=3 Survey to department=2 Audit of clinical notes =1
Lumbar surgery (fusion or discectomy)	2	UK (n=2)	No data	Condition specific experience: 10 (IQR: 3-15)	Departments: 75 PTs: 71	Survey without vignette=1 Survey to department=1
Pelvic surgery	1	Australia	No data	No data	PTs: 84	Survey without vignette=1
Distal radius fracture	1	Australia	PTs: median (IQR) 33.5 (23-40) Pts: 71% >51y	Median (IQR) 7 (0.8-11)	Pts: 70 Treatment sessions: 160	Treatment recording forms=1

N: number of studies; PTs: physical therapists or physiotherapists; Pts: patients; SD: standard deviation; IQR: interquartile range; COPD: chronic obstructive pulmonary disease; ICU: intensive care unit; y: years.

*: single values indicate that only one study provided data for this field

**: one study looked at data from more than one country

[a]: two studies also provided data on physical therapy treatment choices for low back pain and knee pain, two for low back pain and shoulder pain and one for low back pain only.

[b]: two studies also provided data on physical therapy treatment choices for low back pain and neck pain

[c]: two studies also provided data on physical therapy treatment choices for neck pain and low back pain, and one for low back pain only

[d]: one study also provided data on physical therapy treatment choices for low back pain

Table 2. Percentage (median and interquartile range) of physical therapy treatment choices that involved treatments that were recommended, not-recommended or had no recommendation.

	Assessed by surveys of physical therapists*				Assessed by clinical notes			
MUSCULOSKELETAL CONDITIONS[a]	**Median (%[c])**	**Q1**	**Q3**	**N**	**Median (%[d])**	**Q1**	**Q3**	**N**
Recommended	54	25	76	23	63	46	68	8
Not-recommended	43	34	61	37	27	13	45	20
No recommendation	81	49	96	37	45	31	85	31
LOW BACK PAIN	**Median (%[c])**	**Q1**	**Q3**	**N**	**Median (%[d])**	**Q1**	**Q3**	**N**
Recommended	35	16	56	9	50	32	62	5
Not-recommended	44	34	64	24	18	10	36	15
No recommendation	72	45	88	24	43	31	81	23
NECK PAIN AND WHIPLASH	**Median (%[c])**	**Q1**	**Q3**	**N**	**Median (%[d])**	**Q1**	**Q3**	**N**
Recommended	85	82	94	6	-			
Not-recommended	38	35	67	5	79	66	89	4
No recommendation	97	72	98	6	57	26	84	4
SHOULDER PAIN	**Median (%[c])**	**Q1**	**Q3**	**N**	**Median (%[d])**	**Q1**	**Q3**	**N**
Recommended[b]	93	90	94	4	76	68	79	3
Not-recommended	90			1	8			1
No recommendation	79	69	88	4	62	57	77	3
KNEE OSTEOARTHRITIS/PAIN	**Median (%[c])**	**Q1**	**Q3**	**N**	**Median (%[d])**	**Q1**	**Q3**	**N**
Recommended	58	49	65	5	65	65	66	2
Not-recommended	45	35	55	6	21			1
No recommendation	98	88	100	5	53	42	64	2

LATERAL ANKLE SPRAINS	Median (%[c])	Q1	Q3	N	Median (%[d])	Q1	Q3	N
Recommended	39	31	46	2	-			
Not-recommended	14			1	-			
No recommendation	7			1	45			1

PLANTAR FASCIITIS	Median (%[c])	Q1	Q3	N	Median (%[d])	Q1	Q3	N
Recommended	29			1	87			1
Not-recommended	43			1	-			
No recommendation	98			1	90			1

KNEE ARTHROPLASTY**	Median (%[c])	Q1	Q3	N	Median (%[d])	Q1	Q3	N
Recommended	93	83	95	5	65			1
Not-recommended	52	42	67	4	43			1
No recommendation	62	23	95	4	2			1

N=number of studies; Q1: first quartile; Q3: third quartile.

[a]: summary values excluded shoulder pain and knee arthroplasty as they did not have guidelines that recommended 'core' physical therapy treatments.

[b]: recommended care was based on delivering treatment that was 'likely to be beneficial' according to *'Kulkarni RN, Gibson JA, Brownson P, Thomas M, Rangan A, Carr AJ, Rees JL. Subacromial shoulder pain BESS/BOA Patient Care Pathways. Shoulder Elbow. 2015:0(0);1–9.'*

[c]: the percentage of physical therapists that report they provide (or would provide) treatments that were recommended, not-recommended and had no recommendation.

[d]: the percentage of patients that received treatments from a physical therapist that were recommended, not-recommended or had no recommendation for a given condition as determined by audits of clinical notes, audits of billing codes, treatment recording forms, clinical observation, or surveys completed by patients.

*: summary values for knee arthroplasty includes studies that assessed treatment choices by surveys to physical therapy departments

**: includes one study that combined treatment practices for knee and hip arthroplasty

Table 3. Percentage (median and interquartile range) of physical therapy treatment choices that involved treatments that were recommended, not-recommended or had no recommendation across different conditions.

MUSCULOSKELETAL								
ACUTE LOW BACK PAIN								
	Assessed by surveys of physical therapists				**Assessed by clinical notes**			
Recommended	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
MUST PROVIDE								
Advice to keep active	32	13	55	7	70			1
Reassurance	3			1	-			
CONSIDER PROVIDING								
Group exercise	14	7	20	2	-			
Combination of two or more of 1-3	39	35	60	9	50	47	52	6
1. Manual therapy[a]	45	39	68	9	60	47	78	6
2. Exercise	72	44	78	10	65	51	82	6
3. CBT	-				-			
Superficial heat	33	31	42	5	13	9	43	3
Not-recommended	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
Paracetamol	39			1	-			
McKenzie	36	24	37	6	53			1
US, ES, TENS, IF	34	29	49	7	16	13	29	4
Poor advice[b]	9	2	28	8	-			
Acupuncture	6	3	16	7	-			
Traction	5	4	28	9	16			1
External support[c]	2	2	16	5	-			
No recommendation	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
Other advice[d]	70	54	75	11	49	34	62	5
Cold therapy[e]	29	27	44	5	33	32	34	2
Other electrophysical agents[f]	16	5	27	5	14	12	20	3
Work-related/ergonomic interventions	16	10	28	7	-			
Back schools	11	7	18	5	-			
Other manual therapy[g]	8	8	20	3	7	7	9	3
Biofeedback	1	0	1	3	-			
SUB-ACUTE OR CHRONIC LOW BACK PAIN								
	Assessed by surveys of physical therapists				**Assessed by clinical notes**			

Recommended	Median (%€)	Q1	Q3	N	Median (%¥)	Q1	Q3	N
MUST PROVIDE								
Advice to keep active	56	35	76	4	-			
CONSIDER PROVIDING								
Group exercise	27	14	40	2	-			
Combination of two or more of 1-3	41	28	51	9	32	20	43	5
1. Manual therapy[a]	49	30	51	9	58	25	74	6
2. Exercise	64	51	78	10	64	32	75	5
3. CBT	10			1	-			
McKenzie	28	19	35	6	32			1
Not-recommended	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
US, ES, TENS, IF	38	23	46	6	18	16	32	5
Traction	9	4	22	10	6	6	7	2
Acupuncture	8	5	15	7	-			
External support[c]	2	2	9	5	24			1
Poor advice[b]	1	0	6	7	-			
No recommendation	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
Other advice[d]	68	57	86	9	-			
Superficial heat	38	27	47	4	51	38	55	3
Cold therapy[e]	24	14	34	6	32	18	37	3
Other electrophysical agents[f]	19	19	42	3	11	9	15	4
Work-related/ergonomic interventions	11	6	22	4	1			1
Other manual therapy[g]	10	7	20	3				
Back schools	6	5	26	5				
Biofeedback	1	1	1	2				
Iontophoresis	-				3			1

LOW BACK PAIN (duration not specified)

	Assessed by surveys of physical therapists				Assessed by clinical notes			
	Median (%€)	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
Recommended								
MUST PROVIDE								
Advice to keep active	35			1	50	30	56	3
Advice and education to support self-management	26	22	31	2	21	16	27	2
Reassurance	16			1	-			

CONSIDER PROVIDING								
Group exercise	-				76			1
Combination of two or more of 1-3	59	46	86	8	34	24	46	12
1. Manual therapy[a]	60	57	87	9	34	23	44	12
2. Exercise	89	52	91	8	69	61	81	13
3. CBT	-				47			1
McKenzie	47	36	56	7	58	11	71	5
Superficial heat	39	28	55	7	16	10	34	4

Not-recommended	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
US, ES, TENS, IF	67	37	75	8	14	8	30	5
Acupuncture	45			1	6	4	8	4
Traction	45	15	61	8	8	3	10	6
Poor advice[b]	26	6	57	4	23	12	33	3
External support[c]	23	14	31	2	2	2	2	4

No recommendation	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
Other advice[d]	89	77	93	4	68	33	91	9
Work-related/ergonomic interventions	71	52	87	4	26	23	29	2
Other manual therapy[g]	19	10	43	7	10	6	17	7
Other electrophysical agents[f]	15	9	41	8	23	17	40	8
Cold therapy[e]	7	5	17	4	13	6	49	3
Relaxation therapy	7			1	12			1
Back schools	-				45			1
Iontophoresis	-				3			1

[a]: includes massage, mobilisation or manipulation;
[b]: advice promoting bed rest or time off work;
[c]: corsets, belts, braces, sticks or taping;
[d]: includes advice on posture, heavy lifting, sitting or standing habits, avoiding painful movements, analgesics;
[e]: including where heat and cold therapy could not be separated;
[f]: including laser, infrared therapy, micro current therapy, SWD, etc.;
[g]: includes neural mobilisation, Mulligan, Cyriax, myofascial release, etc.

NECK PAIN*

	Assessed by surveys of physical therapists**				**Assessed by clinical notes**			
Recommended	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
SHOULD PROVIDE								
Importance of maintaining activity and movement	93	89	96	2	-			

CONSIDER structured education[a] in combination with 1, 2, 3 or 4								
1. Multimodal care[b]	51			1	65	57	73	2
2. Range of motion/flexibility and strengthening exercises	89 (range of motion or flexibility only)	84	93	2	55	54	56	2
3. Clinical massage	11			1	64	57	72	2
4. Laser	6			1	4			1

Not-recommended	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
Relaxation therapy	67			1	13			1
US, ES, TENS, SWD	27	23	31	2	32	25	39	3
Strengthening alone[c]	31			1	55	54	56	2
Heat or cold therapy	25			1	79	66	89	4
Poor advice[d]	12			1	-			
CBT	8			1	-			

No recommendation	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
Advice on posture	96			1	2			1
Other exercise[e]	82	73	90	2	59	44	73	2
Acupuncture	40	38	42	2	-			
McKenzie	35			1	-			
Manual therapy alone[f]	31	20	41	2	86	74	90	4
Neural mobilisation	22			1	-			
Traction	20			1	33	24	43	2
Magnetic field therapy	-				2			1
Collar	-				1			1
Biofeedback								

ACUTE WHIPLASH

	Assessed by surveys of physical therapists				**Assessed by clinical notes**			
Recommended	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
SHOULD PROVIDE								
Importance of maintaining activity and movement	81	44	87	3	-			
Information on nature, management and course	56	41	70	2	-			

CONSIDER structured education[a] in combination with 1 or 2								

1. Multimodal care[b]	81	79	84	2	-			
2. Range of motion/flexibility exercises	90	86	94	2	-			

Not-recommended	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
Heat or cold therapy	53	46	61	2	-			
Poor advice[d]	11	5	16	2	-			
Collar	7	4	10	2	-			
US, ES	4	2	7	2	-			

No recommendation	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
Other exercise[e]	96	91	97	3	-			
Clinical massage	86			1	-			
Manual therapy alone[f]	83	79	86	2	-			
Advice on posture or analgesics	53	32	74	2	-			
Work-related/ergonomic interventions	39			2	-			
Traction	30			1	-			
Laser, IF	24	18	30	2	-			
McKenzie	9			1	-			

CHRONIC WHIPLASH

	Assessed by surveys of physical therapists				**Assessed by clinical notes**			
Recommended	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
SHOULD PROVIDE								
Importance of maintaining activity and movement	80	79	80	2	-			
Information on nature, management and course	60			1	-			
CONSIDER structured education[a] in combination with 1, 2 or 3								
1. Multimodal care[b]	72			1	-			
2. Range of motion/flexibility and strengthening exercises	56			1	-			
3. Clinical massage	86			1	-			

Not-recommended	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
Strengthening alone[c]	56			1	-			

Heat or cold therapy	43	38	48	2	-			
US, ES, TENS, SWD	30	30	30	2	-			
Poor advice[d]	10	5	15	2	-			
No recommendation	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
Advice on posture	95			1	-			
Other exercise[e]	94	93	95	2	-			
Work-related/ergonomic interventions	74	71	78	2	-			
Manual therapy alone[e]	68	59	77	2	-			
McKenzie	10			1	-			
Collar	1	1	2	2	-			

*: insufficient data to stratify by symptom duration. We used the guidelines for chronic neck pain from Supplementary Table 3 as they classify a greater number of interventions as high- and low-value
**: included two studies that combined treatment choices for neck pain and whiplash
[a]: no study reported structured education so the below interventions are reported in isolation
[b]: includes mobilisation or manipulation and range of motion exercises
[c]: we were unable to determine the percentage of strengthening that was delivered in isolation
[d]: advice promoting bed rest or time off work
[e]: any exercise not included in the above categories
[f]: includes mobilisation or manipulation, but we were unable to determine the percentage of manual therapy that was delivered in isolation

SUBACROMIAL PAIN (surveys) OR SHOULDER PAIN* (clinical notes)

	Assessed by surveys of physical therapists				**Assessed by clinical notes**			
Recommended**	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
LIKELY TO BE BENEFICIAL								
Exercise	89	85	92	4	72	67	76	2
Manual therapy[a]	49	20	80	4	61	59	68	3
Laser	36	20	52	2	23	18	27	2
Not-recommended	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
IF, Magnetic field therapy	90			1	8			1
No recommendation	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
Any advice[b]	79	77	82	2	91			1
Tape	59	54	64	2	15			1
Acupuncture	53	51	54	2	-			
Shockwave, ES, US, SWD, TENS, microwave current	44	33	65	4	26	13	39	3
Heat or cold therapy	38	24	55	4	47	39	54	2
Body awareness	11			1	-			
CBT	4			1	-			
Iontophoresis	-				15			1

*: two studies combined physical therapy treatment choices for a variety of shoulder conditions
**:there is no high-quality evidence supporting a recommended physical therapy intervention for shoulder pain
[a]: includes massage, mobilisation or manipulation
[b]: including advice on posture and advice to rest or reduce activity

KNEE OSTEOARTHRITIS (surveys)* AND KNEE PAIN (clinical notes)**

	Assessed by surveys of physical therapists				Assessed by clinical notes			
Recommended	**Median (%[€])**	**Q1**	**Q3**	**N**	**Median (%[¥])**	**Q1**	**Q3**	**N**
MUST PROVIDE								
Advice to stay active	89	78	92	3	-			
Self-management strategies [a]	82	74	91	3	-			
Aerobic and strengthening	66	47	72	3	65	65	66	2
Advice on footwear	57			1	-			
Weight loss interventions	54	51	56	3	-			
Advice on weight loss	49			1	-			
CONSIDER PROVIDING								
Heat or cold therapy	62	15	73	5	69	63	74	2
Manual therapy [b], traction or stretching	60	54	76	5	79	78	79	2
TENS	52	32	54	3	21	21	21	1
Walking aids	8	5	38	3	-			
CBT	3			1	-			
Not-recommended	**Median (%[€])**	**Q1**	**Q3**	**N**	**Median (%[¥])**	**Q1**	**Q3**	**N**
ES, US, Laser, IF, SWD	43	20	55	6	21			1
Poor advice [c]	23	15	31	2	-			
Acupuncture	22	20	34	5	-			
No recommendation	**Median (%[€])**	**Q1**	**Q3**	**N**	**Median (%[¥])**	**Q1**	**Q3**	**N**
Other exercise [d]	98	88	100	5	75			1
Balneotherapy	16			1	-			
Iontophoresis	-				8			1

*: one study that combined physical therapy treatment choices for knee and hip osteoarthritis was not included in this table (Barten DJ, et al. 2015) (See Supplementary Table 3)
**: one study that combined physical therapy treatment choices for acute and chronic knee conditions was not included in this table (van Baar ME, et al. 1998) (See Supplementary Table 3)
[a]: includes exercise, weight loss, use of suitable footwear or pacing, but we were unable to assess the content of self-management strategies reported in the included studies
[b]: includes massage, mobilisation or manipulation
[c]: advice promoting bed rest or time off work
[d]: exercise that is neither aerobic nor strengthening
[e]: spa bath therapy (separate to hydrotherapy which is included within 'other exercise')

ACUTE LATERAL ANKLE SPRAINS

	Assessed by surveys of physical therapists				Assessed by clinical notes			
Recommended	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
SHOULD PROVIDE								
Exercise	39	31	46	2	-			
CONSIDER PROVIDING								
Rest, ice, compression and elevation[a]	12			1	-			
External support[b]	34			1	-			
Not-recommended	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
US, ES, Laser	14			1	-			
Joint mobilisation	3			1	-			
Heat or cold therapy	1			1	-			
No recommendation	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
Advice or education	22	12	33	2	-			
IF, SWD, Diadynamic current	7			1	45			1

[a]: only compression was mentioned in the included study
[b]: includes braces, boots or taping

PLANTAR FASCITIS

	Assessed by surveys of physical therapists				Assessed by clinical notes			
Recommended	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
SHOULD PROVIDE								
Stretching	100			1	-			
Manual therapy[a]	81			1	87			1
Night splints	29			1				
MAY PROVIDE								
Strengthening exercises and movement training	94			1	-			
Education and counselling for weight loss	89			1	-			
Laser, US, ES	43			1	-			
Not-recommended	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
Acupuncture	31			1	-			
No recommendation	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
Shockwave	10			1	-			

Heat or cold therapy	79	1	-	
Other exercise[b]	96	1	90	1
Other advice[c]	98	1	-	
Prefabricated orthotics[d]	70	1		

[a]: includes massage, mobilisation or manipulation
[b]: exercise that is neither strengthening or movement training
[c]: includes advice on self-management, pacing, ergonomics, etc.
[d]: custom orthotics were provided by 63% of physical therapists

ORTHOPAEDICS

KNEE OR HIP ARTHROPLASTY (surveys of physical therapists or physical therapy departments)*

	Inpatients				Outpatients**			
Recommended	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%€)**	**Q1**	**Q3**	**N**
Exercise	94	94	95	2	76	66	86	4
Not-recommended	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%€)**	**Q1**	**Q3**	**N**
Passive range of motion	69	57	81	2	1			1
Cold therapy	28	25	30	2	20	16	25	2
No recommendation	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%€)**	**Q1**	**Q3**	**N**
Manual therapy[a]	93			1	31			1
Advice or education	-				55	33	77	2
TENS, electrotherapy	-				0			1
Acupuncture	-				0			1

[a]: includes massage or mobilisation
*one study that reported physical therapy treatment choices as assessed by clinical notes is not included in this table but is represented in the summary table (Table 2)
**includes one study that reported physical therapy treatment choices for knee and hip arthroscopy combined

N=number of studies; Q1: first quartile; Q3: third quartile; CBT: cognitive behavioural therapy; ES: electrical stimulation; IF: interferential current; SWD: short wave diathermy; TENS: transcutaneous electrical nerve stimulation; US: Ultrasound.
€: the percentage of physical therapists that report they provide (or would provide) treatments that was recommended, not-recommended and had no recommendation for a given condition.
¥: the percentage of patients that received treatments from a physical therapist that were recommended, not-recommended, or had no recommendation for a given condition as determined by audits of clinical notes, audits of billing codes, treatment recording forms, clinical observation, or surveys completed by patients.

Figure legend

Figure 1. PRISMA flow diagram

Figure 2. Median percentage of physical therapy treatment choices that involved treatments that are recommended, not-recommended and had no recommendation

Supplementary Tables

PRISMA 2009 Flow Diagram

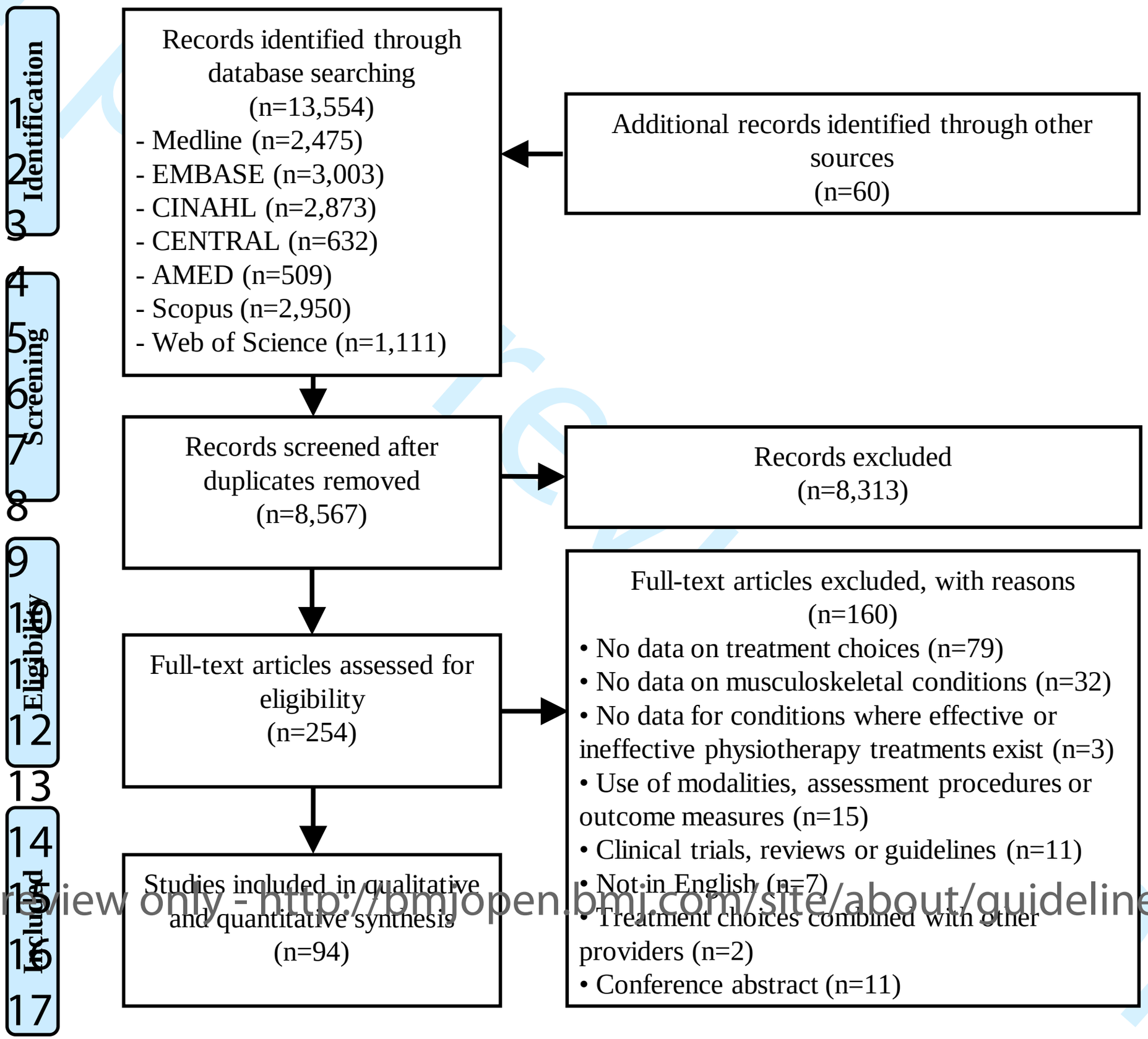
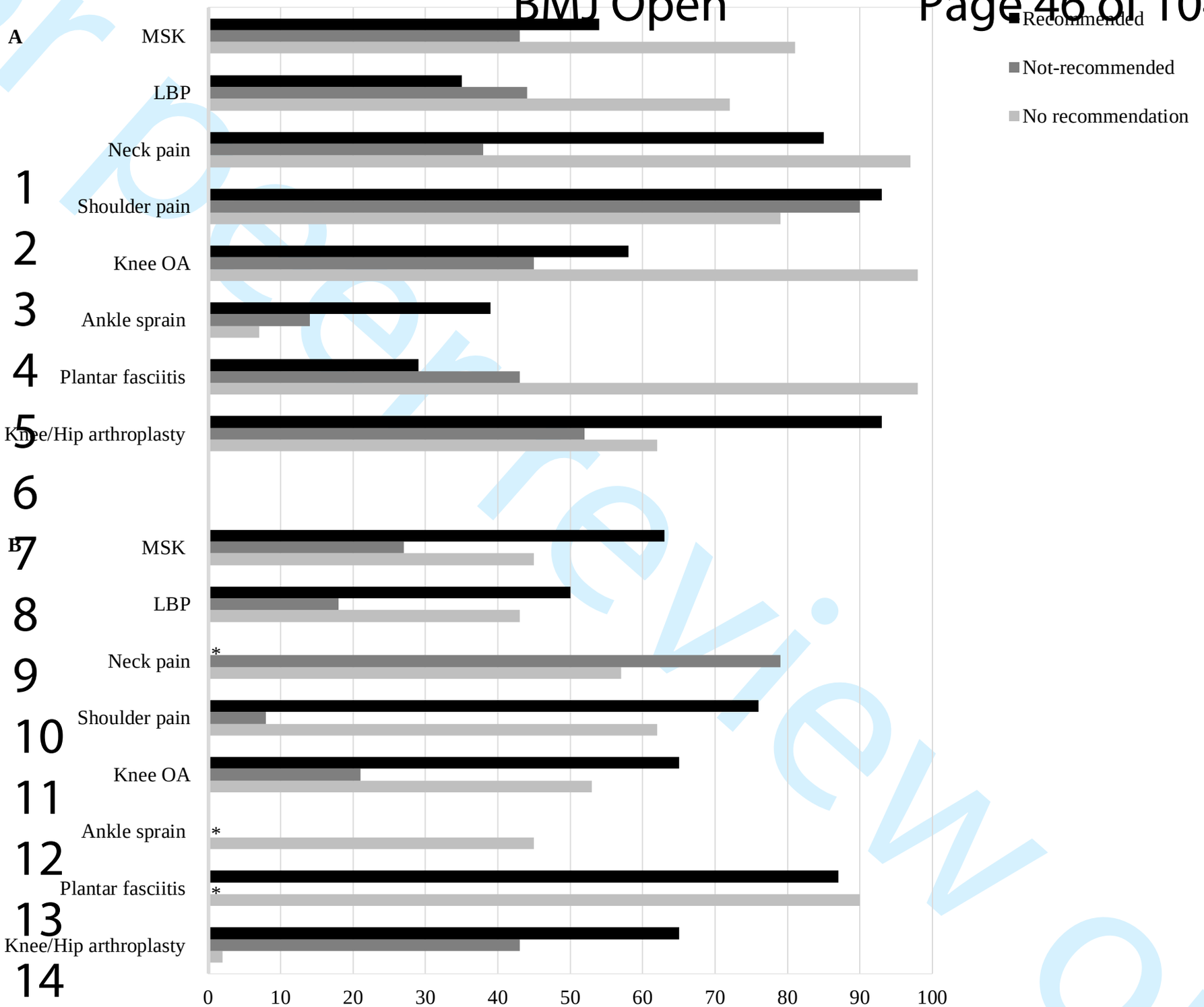


Figure 2. Median percentage of physical therapy treatment choices that involved treatments that are recommended, not-recommended and had no recommendation



A: The percentage of physical therapists that report they provide (or would provide) treatments that are recommended, not-recommended and had no recommendation for a given condition.

B: The percentage of patients that received treatments that were recommended, not-recommended and had no recommendation from a physical therapist for a given condition as determined by audits of clinical notes, audits of billing codes, treatment recording forms, clinical observation, or surveys completed by patients.

*: no treatment choices in this category(s) could be identified

MSK: all musculoskeletal conditions (excluding shoulder pain and knee/hip arthroplasty); LBP: low back pain; OA: osteoarthritis.

Supplementary Table 1: Search Strategy

MEDLINE via Ovid

	Searches
Low-value care	1. overdiagnosis.mp 2. "over diagnosis".mp 3. "overdiagnosed".mp 4. overtreatment.mp 5. "over treat*".mp 6. exp Unnecessary Procedures/ 7. "unnecessary".mp 8. "low value".mp 9. "lower value".mp 10. "high value".mp 11. "higher value".mp 12. overutilization.mp 13. "over utilization".mp 14. overutilisation.mp 15. "over utilisation".mp 16. ("overuse" not "overuse injur*").mp 17. exp Health Services Misuse/ 18. "Choosing Wisely".mp 19. exp Guideline Adherence/ 20. "adherence to guidelines".mp 21. "guideline adherence".mp 22. "guideline use".mp 23. "practice pattern*".mp 24. "variability in health care".mp 25. "high cost*".mp 26. "increased cost*".mp 27. "excess cost*".mp 28. "treatment package".mp 29. "transparency of care".mp 30. "resistance to change".mp 31. ineffective.mp 32. "non-evidence based".mp 33. Waste*.mp 34. Inappropriate.mp 35. "poor care".mp 36. "recommended care".mp 37. "right care".mp 38. "quality of care".mp 39. Uncertainty.mp 40. "disinvestment".mp 41. "value based care".mp

	42. 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22 or 23 or 24 or 25 or 26 or 27 or 28 or 29 or 30 or 31 or 32 or 33 or 34 or 35 or 36 or 37 or 38 or 39 or 40 or 41
Physiotherapist	43. "physiotherap*".mp 44. exp Physical Therapy Modalities/ 45. exp Physical Therapy Specialty/ 46. "physical therap*".mp 47. 43 or 44 or 45 or 46
	48. 42 and 47 49. Limit 48 to humans

CINHAL via EBSCOhost

	Searches
Low-value care	1. overdiagnosis 2. "over diagnosis" 3. "overdiagnosed" 4. overtreatment 5. "over treat*" 6. MM "Unnecessary Procedures" 7. "unnecessary" 8. "low value" 9. "lower value" 10. "high value" 11. "higher value" 12. overutilization 13. "over utilization" 14. overutilisation 15. "over utilisation" 16. ("overuse" not "overuse injur*") 17. MM "Health Services Misuse+" 18. MM "Guideline Adherence" 19. "Choosing Wisely" 20. "adherence to guidelines" 21. "guideline adherence" 22. "guideline use" 23. "practice pattern*" 24. "variability in health care" 25. "high cost*" 26. "increased cost*" 27. "excess cost*" 28. "treatment package" 29. "transparency of care" 30. "resistance to change" 31. ineffective 32. "non-evidence based" 33. Waste* 34. Inappropriate 35. "poor care" 36. "recommended care" 37. "right care" 38. Uncertainty 39. "disinvestment" 40. "value based care" 41. 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22

	or 23 or 24 or 25 or 26 or 27 or 28 or 29 or 30 or 31 or 32 or 33 or 34 or 35 or 36 or 37 or 38 or 39 or 40
Physiotherapist	42. "physiotherap*" 43. "physical therap*" 44. MM "Research, Physical Therapy" 45. MM "Physical Therapy Practice, Evidence-Based" 46. MM "Physical Therapy Practice" 47. MM "Physical Therapy Service" 48. MM "Physical Therapy Assessment" 49. MM "Physical Therapy Practice, Research-Based" 50. MM "Physical Therapy+" 51. 42 or 43 or 44 or 45 or 46 or 47 or 48 or 49 or 50
	52. 41 and 51

EMBASE via Ovid

	Searches
Low-value care	1. overdiagnosis.mp 2. "over diagnosis".mp 3. "overdiagnosed".mp 4. overtreatment.mp 5. "over treat*".mp 6. exp Unnecessary Procedures/ 7. "unnecessary".mp 8. "low value".mp 9. "lower value".mp 10. "high value".mp 11. "higher value".mp 12. overutilization.mp 13. "over utilization".mp 14. overutilisation.mp 15. "over utilisation".mp 16. ("overuse" not "overuse injur*").mp 17. "Choosing Wisely".mp 18. exp Guideline Adherence/ 19. "adherence to guidelines".mp 20. "guideline adherence".mp 21. "guideline use".mp 22. "practice pattern*".mp 23. "variability in health care".mp 24. "high cost*".mp 25. "increased cost*".mp 26. "excess cost*".mp 27. "treatment package".mp 28. "transparency of care".mp 29. "resistance to change".mp 30. ineffective.mp 31. "non-evidence based".mp 32. Waste*.mp 33. Inappropriate.mp 34. "poor care".mp 35. "recommended care".mp 36. "right care".mp 37. "quality of care".mp 38. Uncertainty.mp 39. "disinvestment".mp 40. "value based care".mp 41. 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22

	or 23 or 24 or 25 or 26 or 27 or 28 or 29 or 30 or 31 or 32 or 33 or 34 or 35 or 36 or 37 or 38 or 39 or 40
Physiotherapist	42. "physiotherap*".mp 43. exp Physical Therapy Modalities/ 44. exp Physical Therapy Specialty/ 45. "physical therap*".mp 46. 42 or 43 or 44 or 45
	47. 41 and 46 48. Limit 47 to humans

CENTRAL via Ovid

	Searches
Low-value care	1. overdiagnosis.mp 2. "over diagnosis".mp 3. "overdiagnosed".mp 4. overtreatment.mp 5. "over treat*".mp 6. exp Unnecessary Procedures/ 7. "unnecessary".mp 8. "low value".mp 9. "lower value".mp 10. "high value".mp 11. "higher value".mp 12. overutilization.mp 13. "over utilization".mp 14. "over utilisation".mp 15. ("overuse" not "overuse injur*").mp 16. exp Health Services Misuse/ 17. "Choosing Wisely".mp 18. exp Guideline Adherence/ 19. "adherence to guidelines".mp 20. "guideline adherence".mp 21. "guideline use".mp 22. "practice pattern*".mp 23. "variability in health care".mp 24. "high cost*".mp 25. "increased cost*".mp 26. "excess cost*".mp 27. "treatment package".mp 28. "resistance to change".mp 29. ineffective.mp 30. "non-evidence based".mp 31. Waste*.mp 32. Inappropriate.mp 33. "poor care".mp 34. "recommended care".mp 35. "right care".mp 36. "quality of care".mp 37. Uncertainty.mp 38. "disinvestment".mp 39. "value based care".mp 40. 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22 or 23

	or 24 or 25 or 26 or 27 or 28 or 29 or 30 or 31 or 32 or 33 or 34 or 35 or 36 or 37 or 38 or 39
Physiotherapist	41. "physiotherap*".mp 42. exp Physical Therapy Modalities/ 43. "physical therap*".mp 44. 41 or 42 or 43
	45. 40 and 44 46. Limit 45 to humans

AMED via Ovid

	Searches
Low-value care	1. overdiagnosis.mp 2. "over diagnosis".mp 3. "overdiagnosed".mp 4. overtreatment.mp 5. "over treat*".mp 6. "unnecessary".mp 7. "low value".mp 8. "lower value".mp 9. "high value".mp 10. "higher value".mp 11. overutilization.mp 12. "over utilization".mp 13. ("overuse" not "overuse injur*").mp 14. "Choosing Wisely".mp 15. "adherence to guidelines".mp 16. "guideline adherence".mp 17. "guideline use".mp 18. "practice pattern*".mp 19. "high cost*".mp 20. "increased cost*".mp 21. "excess cost*".mp 22. "treatment package".mp 23. "resistance to change".mp 24. ineffective.mp 25. "non-evidence based".mp 26. Waste*.mp 27. Inappropriate.mp 28. "poor care".mp 29. "recommended care".mp 30. "right care".mp 31. "quality of care".mp 32. Uncertainty.mp 33. "disinvestment".mp 34. "value based care".mp 35. 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22 or 23 or 24 or 25 or 26 or 27 or 28 or 29 or 30 or 31 or 32 or 33 or 34
Physiotherapist	36. "physiotherap*".mp 37. exp Physical Therapy Modalities/ 38. "physical therap*".mp 39. 36 or 37 or 38

	40. 35 and 39

Scopus

	Searches
Low-value care	1. TITLE-ABS-KEY (“overdiagnosis”) 2. TITLE-ABS-KEY (“over diagnosis”) 3. TITLE-ABS-KEY (“overdiagnosed”) 4. TITLE-ABS-KEY (“overtreatment”) 5. TITLE-ABS-KEY (“over treat*”) 6. TITLE-ABS-KEY (“low value”) 7. TITLE-ABS-KEY (“high value”) 8. TITLE-ABS-KEY (“lower value”) 9. TITLE-ABS-KEY (“higher value”) 10. TITLE-ABS-KEY (“unnecessary”) 11. TITLE-ABS-KEY (“overutilisation”) 12. TITLE-ABS-KEY (“over utilization”) 13. TITLE-ABS-KEY (“overutilization”) 14. TITLE-ABS-KEY (“over utilisation”) 15. TITLE-ABS-KEY (“Choosing Wisely”) 16. TITLE-ABS-KEY ("overuse" not "overuse injur*") 17. TITLE-ABS-KEY (“adherence to guidelines”) 18. TITLE-ABS-KEY (“guideline adherence”) 19. TITLE-ABS-KEY (“guideline use”) 20. TITLE-ABS-KEY (“inappropriate”) 21. TITLE-ABS-KEY (“transparency of care”) 22. TITLE-ABS-KEY (“variation in utilisation”) 23. TITLE-ABS-KEY (“practice pattern”) 24. TITLE-ABS-KEY (“variability in health care”) 25. TITLE-ABS-KEY (“increased cost*”) 26. TITLE-ABS-KEY (“excess cost*”) 27. TITLE-ABS-KEY (“high cost*”) 28. TITLE-ABS-KEY (“treatment package”) 29. TITLE-ABS-KEY (“resistance to change”) 30. TITLE-ABS-KEY (“ineffective”) 31. TITLE-ABS-KEY (“non-evidence based”) 32. TITLE-ABS-KEY (“waste”) 33. TITLE-ABS-KEY ("poor care") 34. TITLE-ABS-KEY ("recommended care") 35. TITLE-ABS-KEY ("right care") 36. TITLE-ABS-KEY (“quality of care") 37. TITLE-ABS-KEY (“uncertainty”) 38. TITLE-ABS-KEY ("disinvestment") 39. TITLE-ABS-KEY ("value based care") 40. 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22

	or 23 or 24 or 25 or 26 or 27 or 28 or 29 or 30 or 31 or 32 or 33 or 34 or 35 or 36 or 37 or 38 or 39
Physiotherapist	41. TITLE-ABS-KEY(“physiotherap*”) 42. TITLE-ABS-KEY(“physical therap*”) 43. 41 or 42
	44. 40 and 43

Web of Science

	Searches
Low-value care	1. TS= (“overdiagnosis”) 2. TS= (“over diagnosis”) 3. TS= (“overdiagnosed”) 4. TS= (“overtreatment”) 5. TS= (“over treat*”) 6. TS= (“unnecessary”) 7. TS= (“low value”) 8. TS= (“high value”) 9. TS= (“lower value”) 10. TS= (“higher value”) 11. TS= (“overutilization”) 12. TS= (“overutilisation”) 13. TS= (“over utilization”) 14. TS= (“over utilisation”) 15. TS= ("overuse" not "overuse injur*") 16. TS= (“Choosing Wisely”) 17. TS= (“adherence to guidelines”) 18. TS= (“guideline adherence”) 19. TS= (“guideline use”) 20. TS= (“inappropriate”) 21. TS= (“transparency of care”) 22. TS= (“practice pattern*”) 23. TS= (“variability in health care”) 24. TS= (“increased cost*”) 25. TS= (“excess cost*”) 26. TS= (“high cost*”) 27. TS= (“treatment package”) 28. TS= (“resistance to change”) 29. TS= (“ineffective”) 30. TS= (“non-evidence based”) 31. TS= (“waste*”) 32. TS= ("poor care") 33. TS= ("recommended care") 34. TS= ("right care") 35. TS= (“quality of care") 36. TS= (“uncertainty”) 37. TS= ("disinvestment") 38. TS= ("value based care") 39. 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22 or 23 or 24 or 25 or 26 or 27 or 28 or 29 or 30 or 31 or 32 or 33 or 34 or 35 or 36 or 37 or 38

Physiotherapist	40. TS=(“physiotherapy*”) 41. TS=(“physical therap*”) 42. 40 or 41
	43. 39 and 42 44. TS=(animals) NOT TS=(humans) 45. 43 NOT 44

Supplementary Table 2. Modified 'Downs and Black' checklist including descriptors*

Checklist item	Scoring system
1. Is the hypothesis/aim/objective of the study clearly described?	Yes or no (1,0)
2. Are the main outcomes to be measured clearly described in the Introduction or Methods section? • If the main outcomes are first mentioned in the Results section, the question should be answered no.	Yes or no (1,0)
3. Are the characteristics of the patients included in the study clearly described? • In cohort studies and trials, inclusion and/or exclusion criteria should be given. In case-control studies, a case-definition and the source for controls should be given.	Yes or no (1,0)
4. Are the main findings of the study clearly described? • Simple outcome data (including denominators and numerators) should be reported for all major findings so that the reader can check the major analyses and conclusions. (This question does not cover statistical tests which are considered below).	Yes or no (1,0)
5. Were the subjects asked to participate in the study representative of the entire population from which they were recruited? • The study must identify the source population for patients and describe how the patients were selected. Patients would be representative if they comprised the entire source population, an unselected sample of consecutive patients, or a random sample. Random sampling is only feasible where a list of all members of the relevant	Yes or no (1,0); 0 if unable to determine
6. Were those subjects who were prepared to participate representative of the entire population from which they were recruited? • The proportion of those asked who agreed should be stated. Validation that the sample was representative would include demonstrating that the distribution of the main confounding factors was the same in the study sample and the source population	Yes or no (1,0); 0 if unable to determine
7. Were the statistical tests used to assess the main outcomes appropriate? • The statistical techniques used must be appropriate to the data. For example, nonparametric methods should be used for small sample sizes. Where little statistical analysis has been undertaken but where there is no evidence of bias, the question should be answered yes. If the distribution of the data (normal or not) is not described it must be assumed that the estimates used were appropriate and the question should be answered yes.	Yes or no (1,0); 0 if unable to determine
8. Were the main outcome measures used accurate (valid and reliable) • For studies where the outcome measures are clearly described, the question should be answered yes. For studies which refer to other work or that demonstrates the outcome measures are accurate, the question should be answered as yes.	Yes or no (1,0); 0 if unable to determine

*descriptors from: Downs SH, Black N. The feasibility of creating a checklist for the assessment of the methodological quality both of randomised and non-randomised studies of health care interventions. *J Epidemiol Community Health*. 1998;52(6):377-84.

Supplementary Table 3. Classifying treatments as recommended, not-recommended and no recommendation

MUSCULOSKELETAL			
Low back pain	**RECOMMENDED**	**NOT-RECOMMENDED**	**NO RECOMMENDATION***
	Primary guideline (1): *MUST PROVIDE* • Advice and education to support self-management • Reassurance • Advice to keep active *CONSIDER PROVIDING* • Group exercise *CONSIDER* combinations of two or more of: • Manual therapy[a] • Exercise • Psychological therapy (with a CBT approach) **Secondary guideline (2):** *SHOULD PROVIDE* • Superficial heat (acute and sub-acute low back pain) **Systematic reviews:** • McKenzie (chronic low back pain) (3)	**Primary guideline (1):** • US, ES, TENS, IF • Poor advice[b] • Acupuncture • Traction • External support[c] **Systematic reviews:** • McKenzie (acute or subacute low back pain) (3)	**Secondary guideline (2):** • Superficial heat (4) (chronic low back pain) • Cold therapy (4) • SWD **Systematic reviews:** • Pulse electromagnetic field therapy (5) • Laser (6) • Work-related interventions (7) • Ergonomic interventions (8) • Back schools (9, 10) • Biofeedback (11) • Neural mobilisation (12) • Mulligan (13) **No reviews:** • Infrared or Micro current therapy • Cyriax manual therapy • Magnet therapy • Electroacupuncture • Advice on heavy lifting, long standing, sitting habits, posture, avoiding painful movements • Relaxation therapy

[a]: includes massage, mobilisation or manipulation;
[b]: advice promoting bed rest or time off work
[c]: corsets, belts, braces, sticks or taping

	RECOMMENDED	NOT-RECOMMENDED	NO RECOMMENDATION*
Neck pain and whiplash	**<u>Acute neck pain/whiplash</u>** **Primary guideline (14):** *SHOULD PROVIDE* • Information on nature, management and course • Importance of maintaining activity and movement *CONSIDER* structured education in combination with: • Multimodal care[a] • Unsupervised range of motion/flexibility exercises **<u>Chronic neck pain/whiplash</u>** (not mentioned above) **Primary guideline (14):** *CONSIDER* structured education in combination with: • Range of motion/flexibility and strengthening exercises • Strengthening combined exercise • Yoga • Clinical massage • Laser	**<u>Acute neck pain/whiplash</u>** **Primary guideline (14):** • Education alone • Strain-counter strain therapy • Relaxation massage • Electroacupuncture • ES • Collar • Clinic based heat • Poor advice[b] • Heat therapy **<u>Chronic neck pain/whiplash</u>** **Primary guideline (14):** • Strengthening alone • Strain-counter strain therapy • Relaxation massage • Electroacupuncture • ES, TENS, SWD • Relaxation therapy • Clinic based heat • Poor advice[b] • Heat therapy **<u>All neck pain/whiplash</u>**	**<u>Acute neck pain/whiplash</u>** **Primary guideline (14):** • Supervised combined exercise • Supervised graded strengthening • Yoga • Strengthening alone • Clinical massage • Laser • Acupuncture • TENS, SWD • Traction • Relaxation therapy • CBT **<u>Chronic neck pain/whiplash</u>** **Primary guideline (14):** • Education alone • Supervised graded strengthening • Acupuncture • Traction • Collar • CBT **<u>All neck pain</u>** **Systematic reviews:**

		Systematic reviews: • US (15) • Cold therapy (15)	• Other exercise[c] (16) • Manual therapy alone[d] (17) • Neural mobilisation (12) • Ergonomic interventions (8) **<u>All whiplash</u>** **Systematic reviews:** • Other exercise[c] (18) • Manual therapy alone[d] (19) **No reviews for neck pain/whiplash*:** • Advice on posture • McKenzie • Biofeedback **No reviews for neck pain*:** • Magnetic field therapy **No reviews for whiplash*:** • Neural mobilisation • Work-related/ergonomic interventions • Motor control[e]
	*: treatments were only listed here if the included studies reported them [a]: includes mobilisation or manipulation and unsupervised range of motion exercises [b]: advice promoting bed rest or time off work; [c]: includes any exercise not included in the above categories; [d]: includes mobilisation or manipulation; [e]: includes deep flexor strengthening or cervical kinaesthetic training		
Subacromial pain syndrome or shoulder pain	**RECOMMENDED** **Primary guideline (20):**	**NOT-RECOMMENDED** **Systematic reviews:**	**NO RECOMMENDATION*** **Primary guideline (20):**

	LIKELY TO BE BENEFICIAL • Exercise • Manual therapy[a] • Laser	• IF (21) • Magnetic field therapy (22)	• Shockwave • Acupuncture • ES, US • Cold therapy **Secondary guideline (23):** • CBT • Advice to reduce activity or rest **Systematic reviews:** • SWD, TENS or microwave current (23, 24) • Tape (25, 26) **No reviews:** • Advice on posture • Heat therapy • Body awareness
	[a]: includes massage, mobilisation or manipulation		
Knee osteoarthritis/pain	**RECOMMENDED**	**NOT-RECOMMENDED**	**NO RECOMMENDATION***
	Primary guideline (27): *MUST PROVIDE* • Advice to stay active • Advice on weight loss • Education • Reassurance • Self-management strategies [a] • Prescribe aerobic and strengthening • Offer weight loss interventions	**Primary guideline (27):** • Acupuncture • Poor advice[c] **Secondary guideline (28):** • SWD • IF • US • Laser **Systematic reviews:**	**Primary guideline (27):** • Other exercise[d] **Systematic reviews:** • Balneotherapy[e] (30)

		• ES (29) *CONSIDER PROVIDING* • Bracing/joint supports/insoles • Manual therapy[b]/traction or stretching • Assistive devices (e.g. stick) • Advice on footwear • TENS • Heat or cold therapy **Secondary guideline (28):** *CONSIDER PROVIDING* • CBT	
	[a]: included exercise, weight loss, use of suitable footwear or pacing; [b]: includes massage, mobilisation or manipulation; [c]: advice promoting bed rest or time off work; [d]: exercise that is neither aerobic nor strengthening; [e]: spa bath therapy (separate to hydrotherapy which is included within 'other exercise')		
Acute ankle sprain	**RECOMMENDED**	**NOT-RECOMMENDED**	**NO RECOMMENDATION***
	Primary guideline (31): *SHOULD PROVIDE* • Exercise *CONSIDER PROVIDING* • Short period of immobilisation • Rest, ice, compression and elevation • External support[a]	**Primary guideline (31):** • US, ES, Laser • Joint mobilisation • Heat or cold therapy alone	**No reviews:** • Advice or education • IF, SWD, Diadynamic current
	[a]: includes braces, boots or taping		

Plantar fascitis	**RECOMMENDED**	**NOT-RECOMMENDED**	**NO RECOMMENDATION***
	Primary guideline(32): *SHOULD PROVIDE* • Stretching • Night splints • Manual therapy[a] • Taping *MAY PROVIDE* • Laser • Strengthening exercises and movement training • Education and counselling for weight loss • Rocker-bottom show and shoe rotation during the week	**Primary guideline (32):** • Acupuncture • US, ES	**Primary guideline (32):** • Shockwave **No reviews:** • Heat or cold therapy • Other exercise[b] • Other advice[c] • Prefabricated or custom orthotics
	[a]: includes massage, mobilisation or manipulation; [b]: includes any exercise not included in the above categories; [c]: includes advice on self-management, pacing, ergonomics, etc.		
Total knee arthroplasty	**RECOMMENDED**	**NOT-RECOMMENDED**	**NO RECOMMENDATION***
	Systematic reviews: • Exercise (33-35)	**Systematic reviews:** • Passive range of motion (36) • Cold therapy (37)	**Systematic reviews:** • TENS (38) • Electrotherapy (39) • Acupuncture (39) **No reviews:** • Manual therapy[a] • Advice or education • Biofeedback
	[a]: includes massage or mobilisation		

*: treatments that have not been mentioned in a clinical practice guideline or investigated in a systematic review do not have a citation.
CBT: cognitive behavioural therapy; ES: electrical stimulation; IF: interferential current; NSAIDs: non-steroidal anti-inflammatory drugs; SWD: short wave diathermy; TENS: transcutaneous electrical nerve stimulation; US: Ultrasound.

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Supplementary Table 4. Summary of study characteristics by condition

Citation (country)	**Condition**	**Age:** mean (SD) unless stated otherwise	**Experience of PTs:** mean years (SD) unless stated otherwise	**Gender** (females)	**Sample size**	**Assessment measure**
Low back pain (LBP)						
Bernhardsson 2015* (Sweden)	Subacute LBP (3-12 weeks)	PTs: >40y (60%);	<3y (14.8%); 3-5y (12.2%); 6-10y (18.5%); 11-15y (16.2%); 16-20y (14.0%); >20y (24.4%)	PTs: 75.3%	271 PTs	Survey without vignette
Armstrong 2003 (Ireland)	LBP with or without radiation (unable to stratify by duration)	Pts: 26-35y (27%); 36-45y (25%)	>2y (61.5%); >10y (15.4%)	Pts: 57%	200 Pts treated by 25 PTs	Audit of clinical notes
Ayanniyi 2007 (Nigeria)	Acute LBP that is recurrent and non-recurrent, and chronic LBP (no duration specified)	PTs: Age: 35.7 (7.1)	10.1 (6.5)	Not reported	101 PTs	Survey with vignette
Battie 1994 (United States)	Acute LBP and sciatica (1 day), acute-recurrent back pain (1 week), and chronic LBP (6 months)	PTs: Age: 36.9 (SE 0.76)	10.7 (SE 0.65)	Not reported	186 PTs	Survey with vignette
Bekkering 2005 (Netherlands)	LBP (unable to stratify by duration)	PTs in the intervention group: 43.1 (8.6); PTs (control group): 38.7 (8.8). Pts in the intervention group: 46.2 (14.8); Pts in the	Intervention group: 15.7 (8.8). Control group: 14.1 (8.3)	PTs in the intervention group: 45.8%; Pts in the control group: 40.7%. Pts in the intervention group:	500 Pts treated by 113 PTs	Treatment recording forms

		control group: 44.4 (13.3)		53.4%; Pts in the control group: 50.2%		
Bishop 2008 (United Kingdom)	Acute LBP (4 weeks)	Not reported	15.2 (11.6)	PTs: 80.8%	580 PTs	Survey with vignette
Byrne 2006 (Ireland)	Acute LBP (<3 months) and chronic LBP (>3 months)	Not reported	1–3y (25%); 4–6y (25%); 7–10y (25%); >10y (25%).		87 PTs	Survey without vignette
Carlesso 2013* (Canada)	LBP (duration not specified)	Not reported	<5y (0.7%); 5-9y (14.0%); 10-14y (31.3%); 15-19y (23.7%); >19y (33.2%)	PTs: 55.8%	278 PTs	Survey without vignette
Casserley-Feeney 2008 (Ireland)	Acute LBP (≤12 weeks) and chronic LBP (>12 weeks) (unable to stratify by duration)	Pts in hospital: 46.0 (20.0). Pts in private practice: 36.0 (10.0)	PTs in hospital: 2.0 (IQR 5.0). PTs in private practice: 12 (IQR 14.8)	Pts in hospital: 66%. Pts in private practice: 50%	249 Pts	Audit of clinical notes
de Souza 2017 (Brazil)	Acute and subacute LBP (no duration specified)	PTs: 35.6 (7.77)	11.8 (6.8)	PTs: 24.9%	189 PTs	Survey with vignette
Ehrmann-Feldman 1996 (Canada)	LBP (no information on duration of symptoms)	Pts: 36.4 (no SD)	Not reported	Pts: 22%	389 Pts	Audit of clinical notes
Evans 2010 (United Kingdom)	Acute LBP (3 weeks) NB: PT characteristics are combined with characteristics of chiropractors and osteopaths	PTs in the intervention group: 41.6 (9.7). PTs in the control group: 41.2 (9.4)	Intervention group: 14 (IQR: 8–20); Control group: 14 (IQR 8–21).	PTs in the intervention group: 61%. PTs in the control group: 61%	824 PTs (409 in intervention group and 415 in control group)	Survey with vignette

Fidvi 2010 (India)	LBP (no duration specified)	Not reported	0-5y (38%); 5-10y (43%); >10y (19%)	Not reported	186 PTs	Survey without vignette
Foster 1999 (Ireland)	LBP (no duration specified)	PTs: 36-45y (47%); 46-55y (31.4%).	>10y (58.9%).	PTs: 53.6%	813 PTs	Survey without vignette
Freburger 2011 (United States)	Chronic LBP (>3 months or >24 episodes of activity limiting pain lasting >1 day in the last 12 months)	Pts: 53.9 (95% CI: 51.5–56.2)	Not reported	Pts: 65.8% (95% CI: 57.5–73.2)	126 Pts	Survey of Pts
Gracey 2002 (Northern Ireland)	Acute, subacute and chronic LBP (unable to stratify by duration)	Pts: <45y (65%); >45y (35%)	>2y (80%); >10y (36%).	Pts: 51%.	1062 Pts treated by 157 PTs	Treatment recording forms
Groenendijk 2007 (Netherlands)	Acute, subacute and chronic LBP without radiation (unable to stratify by duration)	Pts (1989-1992): 42.6 (14.8) Pts (2002-2003): 48.3 (16.2)	Not reported	Pts (1989-1992): 45.5% Pts (2002-2003): 54.5%	3148 Pts treated by 180 PTs	Treatment recording forms
Hamm 2003 (Denmark)	Acute LBP (<3 months) and chronic LBP (≥3 months) with and without radiation	PTs: Males 40 (no SD); Females 44 (no SD). Pts: 49 (no SD)	Males: 11 (no SD). Females: 18y (no SD)	PTs: 71% Pts: 65%	242 PTs recording 4725 treatments	Treatment recording forms
Harte 2005 (United Kingdom)	LBP (no duration specified)	Not reported	3-5y (2.6%); 6-10y (18.3%); >10y (79.1%)	Not reported	1239 PTs	Survey without vignette
Hendrick 2013 (New Zealand)	LBP (no duration specified)	PTs: 38.5 (11)	15.0 (11)	PTs: 64.7%	170 PTs	Survey without vignette
Jackson 2001 (United Kingdom)	LBP (no duration specified)	Pts: 40 (IQR 30-51)	Not reported	Pts: 47.5%	200 Pts	Audit of clinical notes

Jette AM 1997* (United States)	Acute, subacute and chronic LBP (unable to stratify by duration)	PTs: 32.6 (7.8) Pts: 40.8 (13.2)	8.4 (7.4).	PT: 70% Pts: 48%	1279 Pts treated by 141 PTs	Treatment recording forms
Jette AM 1994 (United States)	LBP (no duration specified)	Pts: 45.26 (17.0)	Not reported	Pts: 49%	2,328 Pts	Treatment recording forms
Jette DU 1997* (United States)	LBP (no duration specified)	Pts: 18-35y (40%); 36-59y (50%); >60y (10%).	Not reported	Pts: 49%	2,491 Pts treated by 462 PTs	Treatment recording forms
Keating 2016 (Australia)	Acute LBP (1-2 weeks) and subacute LBP (6-8 weeks)	PTs: 39 (12)	15 (11)	PTs: 61%	203 PTs	Survey with vignette
Kerssens 1999 (Netherlands)	LBP (no duration specified)	Pts: 42.8 (13.9)	Not reported	Pts: 58.3%	1,151 records including 132 Pts treated by 21 PTs	Treatment recording forms
Ladeira 2015 (United States)	Acute LBP (1 week) and subacute LBP (6 weeks)	PTs: 38 (9)	15.8 (8.2)	PTs: 61.2%	327 PTs	Survey with vignette
Ladeira 2017 (United States)	Acute LBP (1-2 weeks) and subacute LBP (6 weeks)	PTs: 42.9 (10.1)	17.2 (10.5)	PTs: 37.1%	410 PTs	Survey with vignette
Li 2001 (Canada)	Acute LBP (1 week), subacute LBP (6 weeks) and acute sciatica (4 days)	Not reported	14.7 (10.1)	PTs: 86.0%;	274 PTs	Survey with vignette
Liddle 2009 (Ireland)	Chronic LBP (12 weeks or 3 or episodes within 12 months)	Not reported	Experience treating LBP: >5y (78%); Total experience: >10y (44%)	Not reported	280 PTs	Survey without vignette
Louw 2010 (South Africa)	LBP (no duration specified)	Pts: 41.7 (13.3)	Not reported	Pts: 52.2%	50 Pts	Treatment recording forms

Madson 2015 (United States)	LBP (no duration specified)	PTs: 20-30y (18.9%); 31-40y (28.7%); 41-50y (22.5%); >50y (29.8%);	1-5y (22.1%); 6-10y (13.3%); 11-15y (16.5%); 16-20y (11.7%); >20y (36.3%)	PTs: 60%	1001 PTs	Survey with vignette
Mielenz 1997 (United States)	Acute LBP (<10 weeks)	Pts: 41 (13)	Not reported	Pts: 53%	1580 Pts	Audit of clinical notes
Mikhail 2005 (Canada)	Acute LBP (5 days)	Not reported	<1y (1.0%); 1-5y (20.0%); 6-10y (18.0%); 11-15y (24.0%); >15y (37.0%)	PTs: 67%;	100 PTs	Survey with vignette
Oppong-Yeboah 2014 (Ghana)	LBP (no duration specified)	Not reported	1-5y (77.3%); 5-10y (15.9%); >10y (6.8%)	Not reported	44 PTs	Survey without vignette
Pensri 2005 (Thailand)	LBP (no duration specified)	Not reported	<3y (18.7%); 3-5y (20.7%); 6-10y (29.5%); >10y (31.3%)	Not reported	502 PTs	Survey without vignette
Pincus 2011 (United Kingdom)	Work-related LBP (duration not specified)	PTs: 47 (9.3)	24 (9.4)	Not reported	113 PTs	Survey without vignette
Poitras 2005 (Canada)	Work-related LBP with or without radiation (no duration specified)	Pts with radiating pain: 41.6 (10.2). Pts with non-radiating pain: 38.7 (10.9)	9.3 (7.4)	PTs: 63.7% Pts with radiating pain: 35.3%. Pts with non-radiating pain: 30%	328 Pts (190 without radiation and 139 with radiation)	Treatment recording forms
Reid 2002 (New Zealand)	Acute LBP (4 days)	Not reported	Not reported	Not reported	324 PTs	Survey with vignette

Serrano-Aguilar 2011* (Spain)	Chronic LBP (≥12 weeks)	Pts: 53.9 (14.5)	Not reported	Pts: 73.3%	4693 Pts	Audit of billing codes
Sparkes 2005 (United Kingdom)	Acute LBP (<6 weeks) and chronic LBP (≥6 weeks) with or without radiation (unable to stratify by duration)	Not reported	Not reported	Not reported	130 Pts	Audit of clinical notes
Stevenson 2006 (United Kingdom)	Acute, subacute and chronic LBP (unable to stratify by duration)	Not reported	Not reported	Not reported	306 Pts from 25 PTs	Treatment recording forms
Strand 2005 (Norway)	LBP (unable to stratify by duration)	PTs: 43 (7) Pts: 37 (12)	10 (6)	PTs: 29% Pts: 53%	42 consultations with 34 PTs	Clinical observation
Swinkels 2005 (Netherlands)	LBP without radiation (<1 month and ≥1 month)	Pts: 48 (16)	15-24y (nearly 50%)	PTs: 41% Pts: 54%	1254 Pts treated by 90 PTs	Treatment recording forms
Tumilty 2017 (New Zealand)	Acute LBP (<6 weeks)	Pts: 34.5 (17)	Not reported	Pts: 52%	199 Pts	Treatment recording forms
Turner 1999* (United Kingdom)	LBP (no duration specified)	Pts: 41.9 (no SD)	Not reported	Pts: 60.6%	345 Pts	Audit of clinical notes
van Baar 1998* (Netherlands)	Acute and chronic LBP without radiation (unable to stratify by duration)	PTs: <35y (60%). Pts: 43.5 (16.1)	Not reported	Pts: 58.9%	1,085 Pts	Treatment recording forms

van der Valk 1995 (Netherlands)	LBP (<1 week; ≥1 week and <3 months; and ≥3 months)	Pts with LBP <1 week: 0-14y (0.6%); 15-24y (8.3%); 25-34y (21.5%); 35-44y (25.4%); 45-54y (20.8%); 55-64y (13.9%); 65-74y (6.3%); >74y (3.2%). Pts with LBP ≥1 week and <3 months: 0-14y (0.4%); 15-24y (11.0%); 25-34y (21.8%); 35-44y (23.8%); 45-54y (18.5%); 55-64y (12.0%); 65-74y (8.6%); >74y (3.9%). Pts with LBP ≥3 months: 0-14y (0.7%); 15-24y (12.1%); 25-34y (21.7%); 35-44y (20.4%); 45-54y (18.9%); 55-64y (13.2%); 65-74y (8.2%); >74y (4.9%).	Not reported	Pts with LBP <1 week: 41.4%. Pts with LBP ≥1 week and <3 months: 47.1%. Pts with LBP ≥3 months: 58.3%.	3,507 Pts	Treatment recording forms
Neck pain or whiplash						

Ayanniyi 2007 (Nigeria)	Neck pain (no duration specified)	Pts: 53.4 (11.2)	Not reported	Pts: 56.8%	532 Pts	Audit of clinical notes
Bernhardsson 2015* (Sweden)	Subacute neck pain (3-12 weeks)	PTs: >40y (60%)	<3y (14.8%); 3-5y (12.2%); 6-10y (18.5%); 11-15y (16.2%); 16-20y (14.0%); >20y (24.4%)	PTs: 75.3%	271 PTs	Survey without vignette
Carlesso 2013* (Canada)	Neck pain (duration not specified)	Not reported	<5y (0.7%); 5-9y (14.0%); 10-14y (31.3%); 15-19y (23.7%); >19 (33.2%)	PTs: 55.8%	278 PTs	Survey without vignette
Carlesso 2015 (Various)	Acute and chronic neck pain and whiplash, and cervical radiculopathy (no duration specified)	Not reported	17 (12) (combined with chiropractors)	PTs: 60%	127 PTs	Survey without vignette
Carlesso 2014 (Various)	Acute and chronic neck pain and whiplash, and cervical radiculopathy (no duration specified)	Not reported	16 (12)	PTs: 59%	138 PTs	Survey without vignette
Corkery 2014 (United States)	Acute whiplash (4 weeks) and chronic whiplash (2 months)	Not reported	1-5y (9.3%); 6-10y (19.8%); 11-20y (31.6%); >20y (38.0%)	PTs: 34.2%	237 PTs	Survey with vignette
Jette AM 1997* (United States)	Acute, subacute and chronic neck pain (unable to stratify by duration)	PTs: 32.6 (7.8) Pts: 40.9 (12.6)	8.4 (7.4)	PT: 70% Pts: 64%	613 Pts treated by 141 PTs	Treatment recording forms
Jette DU 1997* (United States)	Neck pain (no duration specified)	Pts: 18-35y (38%); 36-59y	Not reported	Pts: 64%	2491 Pts treated by 462 PTs	Treatment recording forms

		(52%); >60y (10%).				
Ng 2015 (Australia and Singapore)	Acute and chronic whiplash (no duration specified)	Not reported	Median (range) Australia: 20 (1–47) Singapore: 6 (1–20)	PTs in Australia: 51%. PTs in Singapore: 65%	185 PTs (91 from Queensland and 94 from Singapore)	Survey with vignette
Rebbeck 2006 (Australia)	Whiplash (<6 weeks)	Pts (intervention group): 35.5 (11.5). Pts in control group: 36.1 (15.5).	Not reported	Pts (intervention group): (76%). Pts (control group): 89%.	99 Pts treated by 27 PTs (14 in intervention group, 13 in control group)	Survey without vignette and audit of clinical notes
Serrano-Aguilar 2011* (Spain)	Chronic neck pain (≥12 weeks)	Pts: 53.9 (14.5)	Not reported	Pts: 73.3%.	8308 Pts	Audit of billing codes
Shoulder pain						
Ayanniyi 2016 (Nigeria)	Shoulder pain (including: Impingement syndrome, Rotator syndrome, Fracture, Osteoarthritis, Dislocation, , Adhesive capsulitis, Calcific tendinitis of bicep) (no duration specified)	Pts: 50.6 (26.2)	Not reported	Pts: 56.2%	121 Pts	Audit of clinical notes
Bernhardsson 2015* (Sweden)	Subacromial pain (no duration specified)	PTs: >40y (60%)	<3y (14.8%); 3-5y (12.2%); 6-10y (18.5%); 11-15y (16.2%); 16-20y (14.0%); >20y (24.4%)	PTs: 75.3%	271 PTs	Survey without vignette

Johansson 1999 (Sweden)	Subacromial pain (a few weeks)	PTs: 40.8 (8.2)	8.4 (5.6)	PTs: 79%	57 PTs	Survey with vignette
Karel 2017 (Netherlands)	Shoulder pain (including: subacromial impingement, glenohumeral joint instability, biceps tendinopathy, frozen shoulder, and others) (no duration specified)	Pts: 50 (13) PTs: 39 (no SD)	Not reported	Pts: 57%	125 Pts	Treatment recording forms
Phadke 2015 (India)	Subacromial pain (6 weeks)	PTs: 29.1 (5.4)	4.9 (5.1)	PTs: 42.7%	211 PTs	Survey with vignette
Serrano-Aguilar 2011* (Spain)	Chronic shoulder pain (≥12 weeks)	Pts: 53.9 (14.5)	Not reported	Pts: 73.3%.	5035 Pts	Audit of billing codes
Struyf 2012 (Belgium)	Subacromial pain (no duration specified)	PTs: 38 (12)	14 (11.8)	Not reported	119 PTs	Survey without vignette
Knee pain						
Ayanniyi 2017 (Nigeria)	Knee osteoarthritis	Not reported	1-5y (41.7%)	PTs: 38.2%	267 PTs	Survey with vignette
Barten 2015 (Netherlands)	Knee and hip osteoarthritis	Pts: 66.7 (13.2)	Not reported	Pts: 67%	870 Pts	Treatment recording forms
Holden 2008 (United Kingdom)	Knee osteoarthritis	Not reported	1–3y (21%); 4–10y (25%); >10y (54%)	PTs: 87%	538 PTs	Survey with vignette
Jamtvedt 2008 (Norway)	Knee osteoarthritis	PTs: 47 (11)	21 (12)	PTs: 47%	297 PTs	Survey without vignette
Jette AM 1997* (United States)	Acute, subacute and chronic knee pain	PTs: 32.6 (7.8) Pts: 41.2 (14.1)	8.4 (7.4)	PT: 70% Pts: 52%	706 treated by 141 PTs	Treatment recording forms

Jette DU 1997* (United States)	Knee pain (no duration specified)	Pts: 18-35y (39%); 36-59y (49%); >60y (12%)	Not reported	Pts: 52%	2491 Pts treated by 462 PTs	Treatment recording forms
MacIntyre 2013 (Canada)	Knee osteoarthritis	Not reported	<5y (15.4%); 5-10y (17.1%); 11-20y (27.6%); >20y (39.8%)	PTs: 73.2%	123 PTs	Survey without vignette
Spitaels 2017 (Belgium)	Knee osteoarthritis	PTs: 45.7 (11.7)	Median (range): 26 (1-45)	PTs: 45%	284 PTs	Survey without vignette
van Baar 1998* (Netherlands)	Acute and chronic knee pain (unable to stratify by duration)	PTs: <35y (60%) Pts: 36.2 (17.6)	Not reported	Pts: 51.4%	416 Pts	Treatment recording forms
Walsh 2009 (United Kingdom)	Knee osteoarthritis	Not reported	Not reported	Not reported	83 departments	Survey to department
Acute ankle injuries						
Kooijman 2011 (Netherlands)	Ankle injuries (<4 weeks and ≥4 weeks)	PTs treating acute ankle injuries: 51 (9). PTs treating chronic ankle injuries: 51 (10). Pts with acute ankle injuries: 33 (17). Pts with chronic ankle injuries: 33 (17)	PTs treating acute ankle injuries: 8 (15). PTs treating chronic ankle injuries: 4 (4).	PTs treating acute ankle injuries: 37%. PTs treating chronic ankle injuries: 30%. Pts with acute ankle injuries: 49%.	1413 Pts treated by 117 PTs	Treatment recording forms

				Pts with chronic ankle injuries: 49%		
Leemrijse 2006 (Netherlands)	Acute lateral ankle sprains (no duration specified)	PTs: 43 (no SD)	Not reported	PTs: 49%	332 PTs	Survey without vignette
Roebroeck 1998 (Netherlands)	Lateral ankle sprains (unable to stratify by duration)	Pts: 0-14y (1.6%); 15-24y (33.1%); 25-34y (24.7%); 35-44y (16.7%); 45-54y (11.2%); 55-64y (7.6%); 65-74y (4.4%); >74y (0.8%)	Not reported	Pts: 45%	251 Pts treated by 83 PTs	Treatment recording forms
Plantar fascitis						
Fraser 2017 (United States)	Plantar fascitis (no duration specified)	Pts: <20y (5.2%); 20-29y (6.0%); 30-39y (17.7%); 40-49y (29.0%); 50-59y (30.8%); 60-69y (11.1%); >69y (0.2%)	Not reported	Pts: 59.8%	262643 treatments of 57800 Pts	Audit of billing codes
Grieve 2017 (United Kingdom)	Plantar fascitis (no duration specified)	Not reported	0-2y (5%); 3-5y (11%); 6-10y (21%); 11-15y (22%); 16-20y (14%); >20y (27%)	PTs: 66%	257 PTs	Survey without vignette
Other musculoskeletal conditions						
Athanasopoulos 2007 (Greece)	Various musculoskeletal conditions (e.g. ligament sprain, osteoarthritis)	Pts: 29.9 (10.8)	Not reported	Pts: 40.3%	457 Pts	Treatment recording forms

Beales 2015 (Australia and Norway)	Pregnancy-related pelvic girdle pain (6 weeks) and traumatic pelvic girdle pain (4 years)	PTs in Norway: 33.5 (9.3). PTs in Australia: 37.9 (11.2).	PTs in Norway: 9.3 (9.3) PTs in Australia: 15.4 (11.6)	PTs in Norway: 52.3%. PTs in Australia: 61%	142 PTs (65 from Norway, 77 from Australia)	Survey with vignette
Bishop 2016 (United Kingdom)	Pregnancy related acute LBP (began "a few weeks ago")	Not reported	21.5 (10)	PTs: 92%	499 PTs	Survey with vignette
Dekker 1993 (Netherlands)	LBP, neck pain, knee pain, shoulder pain, and scoliosis (no duration specified)	Pts: 0-14y (3.5%); 15-24y (11.6%); 25-34y (18.8%); 35-44y (20.0%); 45-54y (17.1%); 55-64y (13.3%); 65-74y (9.6%); >74y (6.1%)	Not reported	Pts: 53.2%	8714 Pts treated by 74 PTs	Treatment recording forms
Grant 2014 (United Kingdom)	Various musculoskeletal conditions stratified by muscle, joint and tendon injuries	Not reported	Not reported	Not reported	1399 Pts	Treatment recording forms
Hurkmans 2012 (Netherlands)	Rheumatoid arthritis	PTs: 43 (10.8)	19 (10.3)	PTs: 53%	233 PTs	Survey without vignette
Lineker 2006 (Canada)	Rheumatoid arthritis	Pts: 59.2 (13.8)	22.5 (22.0); 15.9 (9.3) treating rheumatoid arthritis	Pts: 80.4%	56 Pts treated by 26 PTs	Treatment recording forms
Murray 2005 (United Kingdom)	Various musculoskeletal conditions with a focus on patella femoral pain syndrome and Achilles tendinopathy	Pts: 35 (12.5)	Not reported	Pts: 37%	100 Pts	Audit of clinical notes

O'Brien 2014 (United States)	Thumb carpometacarpal joint pain	Not reported	Experience as a hand therapist: <5y (4.6%); 6-10y (13.9%); >10y (64.3%)	PTs: 73.8%	547 PTs	Survey without vignette
Owoeye 2009 (Nigeria)	Various musculoskeletal conditions (e.g. ligament sprain, muscle tears, contusions, overuse injury)	Not reported	Not reported	Pts: 33.4%	171 Pts	Audit of clinical notes
Peterson 2011 (United States)	Osteoporosis (females ≥40 years old)	Not reported	13.7 (10.8)	PTs: 77.1%	83 PTs	Survey without vignette
Peterson 2005 (Sweden)	Chronic epicondylitis (≥3 months)	Not reported	Not reported	Not reported	47 PTs	Survey without vignette
Sran 2005 (Canada)	Osteoporosis	Not reported	Not reported	Not reported	67 PTs	Survey without vignette
Tomkins 2010 (Canada)	Lumbar spine stenosis (no duration specified)	Pts: 70 (11)	16.8 (no SD)	Pts: 53%	76 PTs and 44 Pts	Survey without vignette and survey of Pts
Orthopaedic conditions						
Artz 2013 (United Kingdom)	Knee arthroplasty (outpatient)	Not reported	Not reported	Not reported	16 departments	Survey to department
Barry 2003 (United Kingdom)	Knee arthroplasty (inpatient)	Not reported	Not reported	Not reported	303 PTs	Survey without vignette

Bruder 2013 (Australia)	Distal radius fracture (outpatient)	PTs: 33.5 (IQR 23-40). Pts: 19-50y (25%); 51-65y (33%); 66-75y (25%); >75y (16%)	7 (IQR 0.8-11)	PTs: 50% Pts: 71%	160 records of 75 Pts treated by 14 PTs	Treatment recording forms
Frawley 2005 (Australia)	Any pelvic surgery (post-surgery inpatient)	Not reported	Not reported	Not reported	84 PTs	Survey without vignette
Moutzouri 2017 (Greece)	Knee arthroplasty (inpatient and outpatient)	Not reported	<5y (34.1%); 6-10y (30.3%); >10y (35.6%).	Not reported	132 PTs	Survey without vignette
Naylor 2006 (Australia)	Knee arthroplasty (inpatient and outpatient)	Not reported	Not reported	Not reported	65 departments	Survey to department
Peter 2014 (Netherlands)	Knee and hip arthroplasty (no timeframe specified)	PTs: 40.4 (12.6)	Experience: 0-5y (28.8%), 6-10y (14.6%), 11-15y (9.6%), 16-20y (9.1%), 20y+ (37.9%). Experience treating patients following hip or knee arthroplasty: 0-5y (29.7%), 6-10y (18.3%), 11-15y (10.5%), 16-20y (11.9%), >20y (29.6%)	PTs: 54.8%	219 PTs	Survey without vignette

Rushton 2014 (United Kingdom)	Lumbar fusion (post-surgery inpatient and outpatient)		Experience treating patients following lumbar spinal fusion: 10 (IQR: 3-15)		71 PTs	Survey without vignette
Turner 1999* (United Kingdom)	Knee arthroplasty (outpatient)	Pts: 71.4 (7.7)	Not reported	Pts: 66.7%	345 pts	Audit of clinical notes
Williamson 2007 (United Kingdom)	Lumbar discectomy (pre and post-surgery including inpatient and outpatient)	Not reported	Not reported	Not reported	75 departments	Survey to department

CI: confidence intervals; IQR: interquartile range; LBP: low back pain; PTs: physical therapists or physiotherapists; Pts: patients; SD: standard deviation; SE: standard error; y: years.
*: citation included for multiple conditions.

Supplementary Table 5. Percentage (median and interquartile range) of physical therapy treatment choices that involved treatments that were recommended, not-recommended or had no recommendation for 'other' conditions

MUSCULOSKELETAL

RHEUMATOID ARTHRITIS*

	Assessed by surveys of physical therapists				Assessed by clinical notes			
Recommended	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
SHOULD PROVIDE								
Aerobic or strengthening exercise	-				86			1
No-recommendation	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
Other exercise[a]	82			1	100			1
Advice or education[b]	82			1	-			
Manual therapy[c]	68			1	29			1
Superficial heat	57			1	-			
ES, US, TENS	35			1	95			1
Splinting/orthoses[b]	-				54			1
Walking aids[b]	-				63			1

*classification based on Hurkmans EJ et al. Acta Rheumatol Port. 2011;36(2):146-58.
[a]: exercise that is neither aerobic nor strengthening (not mentioned in the above guideline)
[b]: no review on advice or education, splinting/orthoses and walking aids
[c]: includes massage, mobilisation or manipulation

SPORTS INJURIES*

	Assessed by surveys of physical therapists				Assessed by clinical notes			
No-recommendation	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
Manual therapy[a]	-				20	19	22	2
Exercise	-				16	11	21	2
Electrotherapy	-				13	10	17	2
Heat or cold therapy	-				9	8	9	2
Tape	-				5	4	7	2
Advice or education	-				3			1

*includes two studies that did not specify the type of sports injury. Another study (Athanasopoulos et al. 2007) was not included in this table because of the way the data was reported
[a]: includes massage, mobilisation or manipulation

LUMBAR SPINE STENOSIS*

	Assessed by surveys of physical therapists				Assessed by surveys of patients			
No-recommendation	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
Exercise	97			1	55			1
Advice or education	96			1	11			1
Electrotherapy	90			1	27			1
Manual therapy[a]	87			1	48			1

Superficial heat	76			1	14			1
Acupuncture	63			1	23			1
Traction	61			1	5			1
External support[b]	45			1	11			1

*the same study assessed treatment choices by a survey of physical therapists and survey of patients
[a]: includes massage, mobilisation or manipulation
[b]: corsets, belts, braces, sticks or taping

PREGNANCY-RELATED ACUTE LOW BACK PAIN*

	Assessed by surveys of physical therapists				**Assessed by clinical notes**			
Recommended	**Median (%[€])**	**Q1**	**Q3**	**N**	**Median (%[¥])**	**Q1**	**Q3**	**N**
MUST PROVIDE								
Advice to keep active	87			1	-			
Advice and education to support self-management	85			1	-			
CONSIDER PROVIDING								
Combination of two or more of 1-3	48			1	-			
1. Manual therapy[a]	48			1	-			
2. Exercise	94			1	-			
3. CBT	-				-			
Superficial heat	33			1	-			
Not-recommended	**Median (%[€])**	**Q1**	**Q3**	**N**	**Median (%[¥])**	**Q1**	**Q3**	**N**
External support[b]	68			1	-			
Advice to use rest to relieve pain	51			1	-			
Acupuncture	24			1	-			
US, ES, TENS, IF	14			1	-			
Prescribed rest	6			1	-			
No-recommendation	**Median (%[€])**	**Q1**	**Q3**	**N**	**Median (%[¥])**	**Q1**	**Q3**	**N**
Other advice[c]	98			1	-			
Work-related/ergonomic interventions	88			1	-			
Cold therapy	8			1	-			

*classified as per acute low back pain in Appendix 2
[a]: includes massage, mobilisation or manipulation;
[b]: corsets, belts, braces, sticks or taping;
[c]: includes advice on posture and analgesics

KNEE OR HIP OSTEOARTHRITIS

	Assessed by surveys of physical therapists				**Assessed by clinical notes**			
Recommended	**Median (%[€])**	**Q1**	**Q3**	**N**	**Median (%[¥])**	**Q1**	**Q3**	**N**

Exercise	-				72			1
Manual therapy[a]	-				47			1
Advice or education	-				37			1
Electrotherapy	-				7			1

[a]: unspecified in the paper

ACUTE AND CHRONIC KNEE PAIN

	Assessed by surveys of physical therapists				Assessed by clinical notes			
No-recommendation	**Median (%[€])**	**Q1**	**Q3**	**N**	**Median (%[¥])**	**Q1**	**Q3**	**N**
Exercise	-				38			1
Manual therapy[a]	-				16			1
Electrotherapy	-				13			1
Advice or education	-				1			1

[a]: massage or mobilisation

OSTEOPOROSIS

	Assessed by surveys of physical therapists				Assessed by clinical notes			
Recommended	**Median (%[€])**	**Q1**	**Q3**	**N**	**Median (%[¥])**	**Q1**	**Q3**	**N**
SHOULD PROVIDE								
Strength and balance training	75	73	77	2				
No-recommendation	**Median (%[€])**	**Q1**	**Q3**	**N**	**Median (%[¥])**	**Q1**	**Q3**	**N**
Other exercise[a]	95	94	96	2	-			
Advice or education	97			1	-			
Electrotherapy	46			1	-			
Manual therapy[b]	45			1	-			

*classification based on The Royal Australian College of General Practitioners and Osteoporosis Australia. Osteoporosis prevention, diagnosis and management in postmenopausal women and men over 50 years of age. 2nd edn. East Melbourne, Vic: RACGP, 2017.

[a]: exercise that is neither strengthening nor balance

[b]: unspecified in the paper

PELVIC GIRDLE PAIN

Due to pregnancy	Assessed by surveys of physical therapists				Assessed by clinical notes			
No-recommendation	**Median (%[€])**	**Q1**	**Q3**	**N**	**Median (%[¥])**	**Q1**	**Q3**	**N**
Advice or education	62			1	-			
Exercise	48			1	-			
External support[a]	34			1	-			
Manual therapy[b]	33			1	-			
CBT	11			1	-			
Acupuncture	3			1	-			
Electrotherapy	1			1	-			
Due to a fall								

Exercise	51	1	-
Manual therapy[b]	37	1	-
Advice or education	18	1	-
CBT	11	1	-
External support[a]	5	1	-
Acupuncture	4	1	-
Electrotherapy	1	1	-

* classification based on Ferreira CWS et al. Physiother Theory Pract 2013; 29: 419–431 (all unknown value or have not been investigated in a systematic review)
[a]: includes tape, compression pants, belt, orthoses or a walking aid
[b]: includes any form of hands on therapy

COMBINED MUSCULOSKELETAL CONDITIONS*

	Assessed by surveys of physical therapists				Assessed by clinical notes			
No-recommendation	**Median (%[€])**	**Q1**	**Q3**	**N**	**Median (%[¥])**	**Q1**	**Q3**	**N**
Massage	-				24			1
Exercise	-				20			1
Electrotherapy	-				7			1
Heat or cold therapy	-				3			1
Advice or education	-				2			1

*includes low back pain, neck pain, shoulder pain, knee pain and acquired deformities of the spine so we were unable to classify the interventions

CHRONIC TENNIS ELBOW

	Assessed by surveys of physical therapists				Assessed by clinical notes			
Recommended	**Median (%[€])**	**Q1**	**Q3**	**N**	**Median (%[¥])**	**Q1**	**Q3**	**N**
Stretching and strengthening	62			1	-			
Not-recommended	**Median (%[€])**	**Q1**	**Q3**	**N**	**Median (%[¥])**	**Q1**	**Q3**	**N**
Deep friction massage	19			1	-			
No-recommendation	**Median (%[€])**	**Q1**	**Q3**	**N**	**Median (%[¥])**	**Q1**	**Q3**	**N**
Advice or education[a]	94			1	-			
Acupuncture	85			1	-			
Orthotic device[a]	51			1	-			
TENS	26			1	-			

*classification based on Hoogvliet P et al. Br J Sports Med 2013;47(17): 1112-1119
Dingemanse R et al. Br J Sports Med 2014;48(12): 957-965
Tang H et al. eCAM 2015;2015:861849
[a]: no review on advice or education, or orthotic devices

THUMB CMC PAIN

	Assessed by surveys of physical therapists				Assessed by clinical notes			
No-recommendation	**Median (%[€])**	**Q1**	**Q3**	**N**	**Median (%[¥])**	**Q1**	**Q3**	**N**

Advice or education	96			1	-			
Self-management	93			1	-			
Exercise	91			1	-			
Splinting	88			1	-			
PATELLA FEMORAL PAIN SYNDROME								
	Assessed by surveys of physical therapists				**Assessed by clinical notes**			
Recommended	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
Strengthening	-				100			
Stretching	-				20			
Not-recommended	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
IF, US	-				20			
Mobilisation	-				20			
No-recommendation	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
Tape	-				20			
Acupuncture	-				20			
Advice or education	-				20			
Cold therapy[a]	-				20			
*****classification based on Crossley KM et al. Br J Sports Med. 2016;50(14): 844-852.								
[a]: no review on cold therapy								
ACHILLES TENDINOPATHY								
	Assessed by surveys of physical therapists				**Assessed by clinical notes**			
Recommended	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
Eccentric strengthening	-				67			1
No-recommendation	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
Deep friction massage	-				100			1
Stretching	-				83			1
IF, US	-				50			1
Acupuncture	-				33			1
*classification based on Habets B et al. Scand J Med Sci Sports 2015;25(1): 3-15 (for eccentric exercises) Rowe V et al. (2012). Sports Med 2012;42(11): 941-967 (all other interventions)								
ORTHOPEDICS								
LUMBAR DISCECTOMY AND FUSION (surveys of physical therapists)								
	Inpatients				**Outpatients**			
Recommended	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
Discectomy								
High-intensity exercise[a]	81	81	81	1	-			

Rehabilitation starting 4-6 weeks post-surgery	-				15			1
Fusion								
Exercise and CBT	-				61			1

No-recommendation	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
Other exercises[b, c]	96	94	97	2	72	63	82	2
Advice, education or reassurance	86	79	92	2	68	53	83	2
Neural mobilisation	57			1	49	36	61	2
CBT	-				61			1
Rehabilitation starting 0-4 weeks post-surgery (discectomy)	-				49			

*classified based on
Oosterhuis T et al. Cochrane Database Syst Rev. 2014(3):Cd003007
Greenwood J et al. Spine (Phila Pa 1976). 2016;41(1):E28-36.
[a]: includes aerobic or strengthening exercise;
[b]: exercise that is neither aerobic Nor strengthening (for discectomy) or any exercise (fusion)
[c]: no reviews for other exercises, advice, education or reassurance, neural mobilisation and CBT (alone)

DISTAL RADIUS FRACTURE

	Assessed by surveys of physical therapists				**Assessed by clinical notes**			
No-recommendation	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
Exercise	-				97			1
Advice or education[a]	-				90			1
Manual therapy[b]	-				55			1
Compression	-				28			1
Heat or cold therapy	-				10			1
Walking aids[a]	-				1			1
Electrotherapy	-				0			1
Whirlpool	-				0			1
Wax baths[a]	-				0			1

*classification based on Handoll HH and Elliott J. Cochrane Database Syst Rev 2015;(9):Cd003324 (all unknown value)
[a]: no review for advice or education, wax baths, walking aids, heat or cold therapy
[b]: includes massage or mobilisation

POST PELVIC SURGERY

	Assessed by surveys of physical therapists				**Assessed by clinical notes**			
No-recommendation	**Median (%€)**	**Q1**	**Q3**	**N**	**Median (%¥)**	**Q1**	**Q3**	**N**
Exercise	82			1	-			
Advice on activity restriction	75			1	-			

N=number of studies; Q1: first quartile; Q3: third quartile; CBT: cognitive behavioural therapy; CMC: carpometacarpal; ES: electrical stimulation; TENS: transcutaneous electrical

nerve stimulation; US: Ultrasound.

€: the percentage of physical therapists that report they provide (or would provide) high-value care, low-value care and care of unknown value for a given condition.

¥: the percentage of patients that received high-value care, low-value care or care of unknown value from a physical therapist for a particular condition as determined by audits of clinical notes, treatment recording forms, or surveys of patients.

Supplementary Table 6. Methodological quality ratings of included studies using a modified Downs and Black checklist

		Checklist items									
Author (year)	**Condition**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**Total**	**Assessment measure**
Armstrong MP (2003)	LBP	1	1	1	1	1	0	1	1	7	Audit of clinical notes
Artz N (2013)	TKR	1	1	0	1	1	1	1	0	6	Survey to department
Athanasopoulos S (2007)	Various musculoskeletal conditions (e.g. ligament sprain, osteoarthritis)	1	1	1	1	1	0	1	1	7	Treatment recording forms
Ayanniyi O (2007a)	Acute and chronic LBP	1	1	1	1	0	0	1	0	5	Survey with vignettes
Ayanniyi O (2007b)	Neck pain	1	1	1	1	1	0	1	1	7	Audit of clinical notes
Ayanniyi O (2016)	Shoulder pain	1	1	1	1	1	0	1	1	7	Audit of clinical notes
Ayanniyi O (2017)	Knee OA	1	1	1	1	1	0	1	0	6	Survey with vignettes
Barry S (2003)	TKR	1	1	1	1	1	0	1	0	6	Survey without vignettes
Barten DJ (2015)	Knee and hip OA	1	1	1	1	1	0	1	1	7	Treatment recording forms
Battie MC (1994)	Acute and chronic LBP	0	1	1	1	1	0	1	0	5	Survey with vignettes
Beales D (2015)	Pelvic girdle pain	1	1	1	1	0	0	1	0	5	Survey with vignettes
Bekkering GE (2005)	LBP	1	1	1	1	1	0	1	1	7	Survey without vignettes
Bernhardsson S (2015)	Subacute LBP, subacute neck pain and subacromial pain	1	1	1	1	1	0	1	0	6	Survey without vignettes
Bishop A (2008)	Acute LBP	1	1	1	1	1	0	1	0	6	Survey with vignettes

Bishop A (2016)	Pregnancy-related acute LBP	1	1	1	1	1	0	1	0	6	Survey with vignettes
Bruder AM (2013)	Distal radius fracture	1	1	1	1	0	0	1	1	6	Treatment recording forms
Byrne K (2006)	Acute and chronic LBP	1	1	1	1	1	0	1	0	6	Survey without vignettes
Carlesso LC (2013)	LBP and neck pain	1	1	1	1	1	0	1	0	6	Survey without vignettes
Carlesso LC (2015)	Acute and chronic neck pain and whiplash	1	1	1	1	1	0	1	0	6	Survey without vignettes
Carlesso LC (2014)	Acute and chronic neck pain and whiplash	1	1	1	1	1	0	1	0	6	Survey without vignettes
Casserley-Feeney SN (2008)	LBP	1	1	1	1	0	0	1	1	6	Audit of clinical notes
Corkery MB (2014)	Acute and chronic whiplash	1	1	1	1	1	0	1	0	6	Survey with vignettes
de Souza FS (2017)	Acute and subacute LBP	1	1	1	1	0	0	1	0	5	Survey with vignettes
Dekker J (1993)	LBP, neck pain, knee pain, shoulder pain	1	1	1	1	1	0	1	1	7	Treatment recording forms
Ehrmann-Feldman D (1996)	LBP	1	1	1	1	1	0	1	1	7	Audit of clinical notes
Evans DW (2010)	Acute LBP	1	1	1	1	1	1	1	0	7	Survey with vignettes
Fidvi N (2010)	LBP	1	1	1	1	1	0	1	0	6	Survey without vignettes
Foster NE (1999)	LBP	1	1	0	1	1	0	1	0	5	Survey without vignettes
Fraser JJ (2017)	Plantar fascitis	1	1	1	1	1	0	1	1	7	Audit of billing codes

Frawley HC (2005)	Pelvic surgery	1	0	1	1	1	0	1	0	5	Survey without vignettes
Freburger JK (2011)	Chronic LBP	1	1	1	1	1	0	1	0	6	Survey without vignettes
Gracey JH (2002)	LBP	1	0	1	1	1	0	1	1	6	Treatment recording forms
Grant ME (2014)	Various musculoskeletal conditions	1	1	1	1	1	0	1	1	7	Treatment recording forms
Grieve R (2017)	Plantar fascitis	1	1	0	1	1	0	1	0	5	Survey without vignettes
Groenendijk JJ (2007)	LBP	1	1	1	1	1	0	1	1	7	Treatment recording forms
Hamm L (2003)	Acute and chronic LBP	1	1	0	1	1	0	1	1	6	Treatment recording forms
Harte AA (2005)	LBP	1	1	1	1	1	0	1	0	6	Survey without vignettes
Hendrick P (2013)	LBP	1	1	1	1	1	0	1	0	6	Survey without vignettes
Holden MA (2008)	Knee OA	1	1	1	1	1	0	1	0	6	Survey with vignettes
Hurkmans EJ (2012)	Rheumatoid arthritis	1	0	1	1	1	0	1	0	5	Survey without vignettes
Jackson DA (2001)	LBP	1	1	1	1	1	0	1	1	7	Audit of clinical notes
Jamtvedt G (2008)	Knee OA	1	1	1	1	1	0	1	0	6	Survey without vignettes
Jette AM (1997)	LBP, neck pain and knee pain	1	1	1	1	0	0	1	1	6	Treatment recording forms
Jette AM (1994)	LBP	1	1	1	1	1	0	1	1	7	Treatment recording forms
Jette DU (1997)	LBP, neck pain and knee pain	1	1	1	1	1	0	1	1	7	Treatment recording forms

Johansson K (1999)	Subacromial pain	1	1	0	1	0	0	1	0	4	Survey with vignettes
Karel Y (2017)	Shoulder pain	1	1	1	1	0	0	1	1	6	Treatment recording forms
Keating JL (2016)	Acute and sub-acute LBP	1	1	1	1	1	0	1	0	6	Survey with vignettes
Kerssens JJ (1999)	LBP	1	1	1	1	1	0	1	1	7	Treatment recording forms
Kooijman MK (2011)	Lateral ankle sprains	1	1	1	1	1	0	1	1	7	Treatment recording forms
Ladeira CE (2015)	Acute and subacute LBP	1	1	1	1	0	0	1	0	5	Survey with vignettes
Ladeira CE (2017)	Acute and subacute LBP	1	1	1	1	1	1	1	0	7	Survey with vignettes
Leemrijse CJ (2006)	Lateral ankle sprains	1	1	1	1	1	0	1	0	6	Survey without vignettes
Li LC (2001)	Acute and sub-acute LBP	1	1	1	1	1	0	1	0	6	Survey with vignettes
Liddle SD (2009)	Chronic LBP	1	1	1	1	1	0	1	0	6	Survey without vignettes
Lineker SC (2006)	Rheumatoid arthritis	1	1	1	1	0	0	1	1	6	Treatment recording forms
Louw QA (2010)	LBP	1	1	1	1	1	0	1	1	7	Treatment recording forms
MacIntyre NJ (2013)	Knee OA	1	1	1	1	0	0	1	0	5	Survey without vignettes
Madson TJ (2015)	LBP	1	1	1	1	1	0	1	0	6	Survey with vignettes
Mielenz TJ (1997)	Acute LBP	1	1	1	1	1	0	1	1	7	Audit of clinical notes
Mikhail C (2005)	Acute LBP	1	1	1	1	1	1	1	0	7	Survey with vignettes
Moutzouri M (2017)	TKR	1	1	1	1	1	0	1	0	6	Survey without vignettes

Murray IR (2005)	Patella femoral pain and Achilles tendinopathy	1	1	1	1	0	0	1	1	6	Audit of clinical notes
Naylor J (2006)	TKR	1	0	1	1	1	0	1	0	5	Survey to department
Ng TS (2015)	Acute and chronic whiplash	1	1	1	1	0	0	1	0	5	Survey with vignettes
O'Brien VH (2014)	Thumb carpometacarpal joint pain	1	1	1	1	1	0	1	0	6	Survey without vignettes
Oppong-Yeboah B (2014)	LBP	1	0	1	1	1	0	1	0	5	Survey without vignettes
Owoeye OB (2009)	Various musculoskeletal conditions	1	1	1	1	1	0	1	1	7	Audit of clinical notes
Pensri P (2005)	LBP	1	1	1	1	1	0	1	0	6	Survey without vignettes
Peter WF (2014)	TKR and THR	1	1	1	1	1	0	1	0	6	Survey without vignettes
Peterson ML (2011)	Osteoporosis	1	1	1	1	1	0	1	0	6	Survey without vignettes
Peterson M (2005)	Chronic lateral epicondylitis	1	1	0	1	0	0	1	0	4	Survey without vignettes
Phadke V (2015)	Subacromial pain	1	1	1	1	0	0	1	0	5	Survey with vignettes
Pincus T (2011)	LBP	1	1	1	1	0	0	1	0	5	Survey without vignettes
Poitras S (2005)	LBP	1	1	1	1	1	0	1	1	7	Treatment recording forms
Rebbeck T (2006)	Acute whiplash	1	1	1	1	1	1	1	1	8	Survey without vignettes and audit of clinical notes
Reid D (2002)	Acute LBP	1	0	1	1	0	0	1	0	4	Survey with vignettes

Roebroeck ME (1998)	Lateral ankle sprains	1	1	1	1	1	0	1	1	7	Treatment recording forms
Rushton A (2014)	Lumbar fusion	1	0	1	1	1	0	1	0	5	Survey without vignettes
Serrano-Aguilar P (2011)	Chronic LBP, neck pain or shoulder pain	1	1	1	1	1	1	1	1	8	Audit of billing codes
Sparkes V (2005)	LBP	1	1	1	1	0	0	1	1	6	Audit of clinical notes
Spitaels D (2017)	Knee OA	1	1	1	1	0	0	1	0	5	Survey without vignettes
Sran MM (2005)	Osteoporosis	1	1	0	1	1	0	1	0	5	Survey without vignettes
Stevenson K (2006)	LBP	1	1	1	1	0	0	1	1	6	Treatment recording forms
Strand LI (2005)	LBP	1	1	1	1	0	0	1	1	6	Clinical observation
Struyf F (2012)	Subacromial pain	1	1	1	1	1	0	1	0	6	Survey without vignettes
Swinkels IC (2005)	Acute and chronic LBP	1	1	1	1	1	0	1	1	7	Treatment recording forms
Tomkins CC (2010)	Lumbar spine stenosis	1	1	1	1	0	0	1	0	5	Survey without vignettes and telephone interview of Pts
Tumilty S (2017)	Acute LBP	1	1	1	1	0	0	1	1	6	Treatment recording forms
Turner PA (1999)	LBP and TKR	1	1	0	1	0	0	1	1	5	Audit of clinical notes
van Baar ME (1998)	LBP and knee pain	1	1	1	1	0	0	1	1	6	Treatment recording forms
van der Valk RWA (1995)	Acute, subacute and chronic LBP	1	1	1	1	0	0	1	1	6	Treatment recording forms
Walsh NE (2009)	Knee OA	1	1	1	1	0	0	1	0	5	Survey to department
Williamson E (2007)	Lumbar discectomy	1	0	0	1	1	0	1	0	4	Survey to department

Number of studies scoring positive (/94)	93	86	85	94	67	6	94	39
% of studies scoring positive	99%	91%	90%	100%	71%	6%	100%	41%
Mean (SD) total score = 6.0 (0.9)								
Median (IQR) total score = 6 (5-7)								

IQR: inter quartile range; LBP: low back pain; OA: osteoarthritis; PTs: physical therapists; Pts: patients; SD: standard deviation; THR: total hip replacement; TKR: total knee replacement.

PRISMA 2009 Checklist

Section/topic	#	Checklist item	Reported on page #
TITLE			
Title	1	Identify the report as a systematic review, meta-analysis, or both.	1: Title
ABSTRACT			
Structured summary	2	Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number.	2: Abstract
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known.	5: Introduction
Objectives	4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).	6: Final paragraph of introduction
METHODS			
Protocol and registration	5	Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number.	6: This review was conducted in accordance with the "Preferred reporting items for systematic reviews and meta-analyses" (PRISMA) statement (22) and was prospectively registered on PROSPERO (CRD42018094979).
Eligibility criteria	6	Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale.	6. 2.2. Study Selection
Information sources	7	Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.	6. 2.1 Data sources and searches
Search	8	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.	Supplementary Table 1.
Study selection	9	State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis).	6. 1st paragraph
Data collection process	10	Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators.	7. 2.3. Data extraction and Quality assessment

PRISMA 2009 Checklist

Data items	11	List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.	7. 2.3. Data extraction and Quality assessment and Table 1
Risk of bias in individual studies	12	Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.	7. 2.3. Data extraction and Quality assessment
Summary measures	13	State the principal summary measures (e.g., risk ratio, difference in means).	10. 2.5 Analysis (Medians and IQR)
Synthesis of results	14	Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., I^2) for each meta-analysis.	10-12. 2.5 Analysis

Section/topic	#	Checklist item	Reported on page #
Risk of bias across studies	15	Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies).	7. 2.3. Data extraction and Quality assessment “assessment of treatment choices”
Additional analyses	16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.	N/A.
RESULTS			
Study selection	17	Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram.	12 and Fig 1.
Study characteristics	18	For each study, present characteristics for which data were extracted (e.g., study size, PICOS, follow-up period) and provide the citations.	Table 1
Risk of bias within studies	19	Present data on risk of bias of each study and, if available, any outcome level assessment (see item 12).	13. 3.1 Methodological Quality and Supplementary Table 6.
Results of individual studies	20	For all outcomes considered (benefits or harms), present, for each study: (a) simple summary data for each intervention group (b) effect estimates and confidence intervals, ideally with a forest plot.	13-14. Table 2 and Figure 2
Synthesis of results	21	Present results of each meta-analysis done, including confidence intervals and measures of consistency.	Table 2 and Figure 2.
Risk of bias across studies	22	Present results of any assessment of risk of bias across studies (see Item 15).	13. 3.1 Methodological Quality and Supplementary Table 6.
Additional analysis	23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).	N/A.

PRISMA 2009 Checklist

DISCUSSION			
Summary of evidence	24	Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers).	14-15
Limitations	25	Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias).	15. 4.1. Strengths and weaknesses of the study
Conclusions	26	Provide a general interpretation of the results in the context of other evidence, and implications for future research.	15-16. 4.2 Strengths and weaknesses in relation to other studies and 4.3 Meaning of the study
FUNDING			
Funding	27	Describe sources of funding for the systematic review and other support (e.g., supply of data); role of funders for the systematic review.	20. None

From: Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. PLoS Med 6(7): e1000097. doi:10.1371/journal.pmed1000097

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