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

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Manuscripts

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3 **1 Do physical therapists follow evidence-based guidelines when managing musculoskeletal**
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5 **2 conditions? A systematic review**
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3 10 **ABSTRACT**
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5 11 **Objectives:** Physicians often refer patients with musculoskeletal conditions to physical
6
7 12 therapy. However, it is unclear to what extent physical therapists' treatment choices align
8
9 13 with the evidence. The aim of this systematic review was to determine what percentage of
10
11 14 physical therapy treatment choices for musculoskeletal conditions agree with management
12
13 15 recommendations in evidence-based guidelines and systematic reviews.
14

15 16 **Design:** Systematic review
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17 17 **Setting:** We performed searches in MEDLINE, EMBASE, CINAHL, CENTRAL, AMED,
18
19 18 Scopus and Web of Science combining terms synonymous with "practice patterns" and
20
21 19 "physical therapy" from the earliest record to April 2018.
22
23

24 20 **Participants:** Studies that quantified physical therapy treatment choices for musculoskeletal
25
26 21 conditions through surveys of physical therapists, audits of clinical notes, and other methods
27
28 22 were eligible for inclusion.
29
30

31 23 **Primary and secondary outcomes:** Using medians and interquartile ranges, we summarised
32
33 24 the percentage of physical therapists who chose treatments that were recommended, not-
34
35 25 recommended and had no recommendation, and summarised the percentage of physical
36
37 26 therapy treatments provided for various musculoskeletal conditions within the categories of
38
39 27 recommended, not-recommended and no recommendation. Results were stratified by
40
41 28 condition and how treatment choices were assessed (surveys of physical therapists vs. audits
42
43 29 of clinical notes).
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45

46 30 **Results:** We included 94 studies. The median percentage of physical therapists who chose
47
48 31 recommended treatments for musculoskeletal conditions ranged from 54% (n=23 studies;
49
50 32 surveys) to 63% (n=8 studies; audits). For treatments not-recommended, the range was 27%
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52 33 (n=20; audits) to 43% (n=37; surveys). For treatments with no recommendation, the range
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54 34 was 45% (n=31; audits) to 81% (n=37; surveys).
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35 **Conclusions:** Many physical therapists seem not to follow evidence-based guidelines when
36 managing musculoskeletal conditions. There is considerable scope to increase use of
37 recommended treatments and reduce use of treatments that are not recommended.

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

For peer review only

43 **Strengths and limitations of this study**

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

61

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.

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3 86 The aim of this systematic review was to summarise the proportion of physical therapy
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5 87 treatment choices for musculoskeletal conditions that agree with management
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8 88 recommendations in evidence-based guidelines and systematic reviews.
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10 89 **2. Methods**

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12 90 This review was conducted in accordance with the “Preferred reporting items for systematic
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14 91 reviews and meta-analyses” (PRISMA) statement (9) and was prospectively registered on
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16
17 92 PROSPERO (CRD42018094979). Due to the size of the review, other research questions in
18
19 93 our registered protocol (including physical therapy treatment choices for cardiorespiratory
20
21 94 and neurological conditions) will be addressed in separate manuscripts.
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23

24 95 **2.1. Data Sources and Searches**

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26
27 96 We conducted a comprehensive keyword search in MEDLINE, EMBASE, Cumulative Index
28
29 97 to Nursing and Allied Health Literature, Cochrane Central Register of Controlled Trials,
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31 98 Allied and Complementary Medicine, Scopus and Web of Science, from the earliest record
32
33
34 99 until April 2018. Our search strategy combined terms relating to “practice patterns” and
35
36 100 “physical therapy” (Supplementary Table 1) and was designed to capture studies
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38 101 investigating physical therapy treatment choices for any condition (as per our registered
39
40 102 protocol). We performed citation tracking and reviewed the reference lists of included studies
41
42 103 to identify those missed by our initial database search.
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46 104 Two independent reviewers (JZ and MO) performed the selection of studies by subsequently
47
48 105 screening the title, abstract and full-text of studies retrieved through our electronic database
49
50 106 search. Any disagreements between the two reviewers were resolved through discussion.
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53 107 **2.2. Study Selection**

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56 108 We included any study that reported physical therapy treatment choices for musculoskeletal
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58 109 conditions through surveys of physical therapists (with or without vignettes), audits of
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3 110 clinical notes and other methods (e.g. surveys of patients). We only included full-text studies
4
5 111 in English. There was no restriction on the musculoskeletal condition treated (e.g. neck pain,
6
7 112 rehabilitation post-knee arthroplasty) or practice setting (e.g. private, public), but we
8
9 113 excluded studies that reported treatment choices for conditions where there were no known
10
11 114 effective or ineffective physical therapist-delivered treatments. We also excluded studies that
12
13 115 only quantified physical therapists' use of assessment procedures, outcome measures,
14
15 116 referrals, treatments without specifying a target condition, pharmacological treatments (e.g.
16
17 117 recommending paracetamol) or treatments outside the usual scope of physical therapy
18
19 118 practice (e.g. injections); and studies where physical therapy treatment choices were unable to
20
21 119 be separated from other healthcare providers.
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27 120 **2.3. Data Extraction and Quality Assessment**

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29 121 One reviewer (JZ) independently extracted individual study characteristics (e.g. condition,
30
31 122 country, participant demographics) and proportions that quantified physical therapy treatment
32
33 123 choices. A second reviewer (MO) double-checked the extracted data to ensure accuracy.
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35 124 Discrepancies were resolved by discussion between the two reviewers and re-checking data
36
37 125 against the original citation. We contacted authors when it appeared relevant data were not
38
39 126 reported.
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44 127 The methodological quality of included studies was assessed independently by two reviewers
45
46 128 (JZ and MO) using a modified version of the 'Downs and Black' checklist. Any
47
48 129 disagreements between the two reviewers were resolved through discussion. We modified the
49
50 130 original 27-item 'Downs and Black' checklist (10) and selected eight items that were relevant
51
52 131 to studies on treatment choices (Supplementary Table 2). For item eight, we considered the
53
54 132 following assessments of treatment choices as 'accurate': observation, audits of clinical
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56 133 notes, audits of billing codes, treatment recording forms and validated surveys.
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134 2.4. Data Synthesis

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

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

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

157 2.4.1. Assessments of treatment choices

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3 158 Data on physical therapy treatment choices were divided into two main categories (and
4
5 159 analysed separately) due to differences in how each category is interpreted:
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8 160 **2.4.2. Treatment choices assessed by surveys completed by physical therapists (with**
9
10 **or without vignettes)**
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12
13 162 *Interpretation.* Surveys completed by physical therapists' yielded data on the percentage of
14
15 163 physical therapists that provide (survey without vignette) or would provide (survey with
16
17 164 vignette) a particular treatment for a condition they frequently treat.
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20 165 *Survey without vignette.* Physical therapists outlined the treatments they provide for a
21
22 166 condition or rated how often they provide a particular treatment for a condition (e.g.
23
24 167 "frequently"; "sometimes"; "rarely"; or "never"). When studies reported how often
25
26 168 treatments were provided, we extracted the percentage of care that was provided at least
27
28 169 'sometimes'. We combined data when studies separated survey responses by different
29
30 170 samples of physical therapists (usually by country or practice setting). Some surveys were
31
32 171 completed by a senior physical therapist on behalf of the physical therapy department within
33
34 172 a hospital (e.g. management following knee arthroplasty).
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39 173 *Survey with vignette.* Physical therapists outlined the treatments they would provide for a
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41 174 particular case (vignette). For studies that included multiple vignettes, we took an average of
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43 175 physical therapists' responses across vignettes of equal sample sizes or used data from the
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45 176 vignette with the highest sample size.
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49 177 **2.4.3. Treatment choices assessed by audits of clinical notes, audits of billing codes,**
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51 **treatment recording forms, clinical observation, or surveys completed by**
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53 **patients**
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3 180 *Interpretation.* These assessment measures yielded data on the percentage of patients that
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5 181 received a particular physical therapy-delivered treatment in a single treatment session or
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7 182 throughout an episode of care (i.e. from initial consultation to discharge).
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11 183 Audits of clinical notes and billing codes were performed retrospectively in the included
12
13 184 studies. Treatment recording forms provided similar information to clinical notes, except they
14
15 185 were often implemented as part of a study or registry on treatment practices (prospective).
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17 186 Within a study, we combined data across samples that presented with the same condition (e.g.
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19 187 physical therapists from different countries treatment low back pain).
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23 188 **2.5. Analysis**

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25 189 We used counts and ranges to summarise study characteristics for each condition. We used
26
27 190 medians and interquartile ranges (IQR) to summarise the percentage of physical therapy
28
29 191 treatment choices that involved treatments that were recommended, not-recommended and
30
31 192 had no recommendation. We provided an overall result for all studies and then separately for
32
33 193 individual musculoskeletal conditions (e.g. low back pain). Since physical therapists can
34
35 194 provide multiple treatments for the same patient, and treatment choices were summarised
36
37 195 across studies, the percentage of treatment choices that involved treatments that were
38
39 196 recommended, not-recommended and had no recommendation do not sum to 100%. For
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41 197 example, 70% of physiotherapists might provide recommended treatments for low back pain,
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43 198 but the same percentage might also provide some treatments that are not-recommended or
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45 199 have no recommendation.
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51 200 **2.5.1. Treatment choices that involved treatments that were recommended, not-** 52 53 201 **recommended and had no recommendation**

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56 202 Where possible, recommended treatment was based on treatment choices involving all 'core'
57
58 203 treatments recommended in guidelines (i.e. physical therapists 'must' or 'should' provide).
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3 204 For example, the NICE guidelines for low back pain recommend that all patients receive
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5 205 advice and education to support self-management, reassurance, and advice to keep active (7).
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8 206 Since studies did not report combinations of treatments, we used the lowest value across all
9
10 207 ‘core’ treatments. For example, if 30% of physical therapists provide reassurance and 50%
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12 208 provide advice to stay active, we used 30% as the proportion of treatment choices that
13
14 209 involved recommended treatments. This is because no more than 30% of the sample could
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16 210 have provided both reassurance and advice to stay active (‘core’ treatments). If guidelines did
17
18 211 not mention ‘core’ treatments or if there were no guidelines for a condition, we used data
19
20 212 from the most frequently provided recommended treatment that ‘should be considered’ or
21
22 213 was found to be effective in a systematic review. We used data from the most frequently
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24 214 provided treatment that was not recommended and had no recommendation to provide an
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26 215 estimate of the percentage of physical therapists’ treatment choices that involve at least one
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28 216 treatment that is not-recommended and had no recommendation. For studies that reported
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30 217 treatment choices stratified by the duration of symptoms (acute vs. chronic) or different
31
32 218 settings (inpatient vs. outpatient), we used the highest value of treatments that were
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34 219 recommended, not-recommended and had no recommendation across the strata. We
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36 220 summarised the percentage of physical therapy treatment choices that were recommended,
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38 221 not-recommended and had no recommendation across all musculoskeletal conditions where
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40 222 guidelines recommended ‘core’ treatments.

223 **2.5.2. Physical therapy treatments provided for various musculoskeletal conditions**

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

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3 229 mobilisation, manipulation and massage should all be ‘considered’ (7). Hence, these were
4
5 230 grouped as ‘manual therapy’. Studies rarely reported combinations of physical therapy
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8 231 treatments, so we used data from the most frequently provided treatment where appropriate.
9
10 232 For example, if 67% of physical therapists provide massage for acute low back pain and 20%
11
12 233 provide mobilisation, we used 67% as the best estimate for the percentage of physical
13
14 234 therapists that provide manual therapy.

17 235 **2.6. Patient or Public Involvement**

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19 236 Patients and members of the public were not involved in the design of this study
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22 237

24 238 **3. Results**

25
26 239 After removing duplicates and screening 8,567 titles and abstracts and 254 full-texts reports,
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28 240 94 studies were included (Fig 1). Physical therapy treatment choices were investigated for
29
30 241 low back pain (n=48 studies) (11-58), knee pain (n=10) (32, 34, 57, 59-65), neck pain or
31
32 242 whiplash (n=11) (15, 18, 32, 34, 51, 66-71), foot or ankle pain (n=5) (72-76), shoulder pain
33
34 243 (n=7) (15, 51, 77-81), pre or post knee arthroplasty (n=6) (46, 82-86) (including one study of
35
36 244 hip and knee arthroplasty (86)), and other musculoskeletal or orthopaedic conditions (where
37
38 245 treatment choices were only reported in one study or where one of either recommended or
39
40 246 not-recommended treatments could not be inferred from guidelines or systematic reviews)
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42 247 (n=18) (87-104). We contacted 15 authors for data (regarding 18 studies); 12 responded and
43
44 248 five were able to provide the data we requested (regarding six studies) (15, 16, 22, 64, 89,
45
46 249 100). A summary of study characteristics across conditions is in Table 1. Characteristics of
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48 250 included studies is in Supplementary Table 4.
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57 252 Seven studies investigated treatment choices for shoulder pain; four (15, 78, 80, 81) focused
58
59 253 on subacromial pain syndrome (the most common form of shoulder pain (105)), two (77, 79)

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3 254 included patients with various diagnoses (including subacromial pain syndrome) and one (51)
4
5 255 did not specify a diagnosis (Supplementary Table 4). Evidence on the management of
6
7 256 subacromial pain syndrome was used to categorise treatment choices for all studies on
8
9
10 257 shoulder pain. Similarly, evidence on the management of lateral ankle sprains was used to
11
12 258 categorise treatment choices for all studies on acute ankle injuries (n=2/3 studies on lateral
13
14 259 ankle sprains (75, 76)) and evidence on the management of knee osteoarthritis for all studies
15
16
17 260 on knee pain (excluding one study on acute knee injuries (57) and another on a mixed sample
18
19 261 of hip and knee osteoarthritis (60) – see Supplementary Table 5).

22 262 **3.1. Methodological quality**

23
24 263 Individual study scores ranged from 4-8 (out of a possible 8) with a mean score of 6.0
25
26
27 264 (median=6) (Supplementary Table 6). The most common methodological limitations
28
29 265 included failing to report that people who were prepared to participate were representative of
30
31 266 the population from which they were drawn (n=88/94) and not using an accurate assessment
32
33 267 of treatment choices (n=55/94). All studies clearly described their main findings and used
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35
36 268 appropriate statistical tests, and most scored positive on the remaining checklist items
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38
39 269 (Supplementary Table 6).

41 270 **3.2. Treatment choices that involved treatments that were recommended, not-** 42 43 271 **recommended and had no recommendation (all studies)**

44 272 **3.2.1. Treatment choices assessed by surveys completed by physical therapists (with** 45 46 273 **or without vignettes)**

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49
50 274 The median percentage of physical therapists that provide (or would provide) treatments that
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52 275 were recommended, not-recommended and had no recommendation was 54%, 43% and 81%
53
54 276 for all musculoskeletal conditions, respectively; 35%, 44% and 72% for low back pain; 85%,
55
56
57 277 38% and 97% for neck pain and whiplash; 93%, 90% and 79% for shoulder pain; 58%, 45%
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59 278 and 98% for knee pain; 39%, 14% and 7% for lateral ankle sprains; 29%, 43% and 98% for

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3 279 plantar fasciitis; and 93%, 52% and 62% following knee or hip arthroplasty (Table 2) (Figure
4
5 280 2).

8 281 **3.2.2. Treatment choices assessed by audits of clinical notes, audits of billing codes,**
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10 282 **treatment recording forms, clinical observation, or surveys completed by**
11
12
13 283 **patients**

15 284 The median percentage of patients that received physical therapy-delivered treatments that
16
17 285 were recommended, not-recommended and had no recommendation was 63%, 27% and 45%
18
19 286 for all musculoskeletal conditions, respectively; 50%, 18% and 43% for low back pain; 79%
20
21 287 (not-recommended) and 57% (no recommendation) for neck pain and whiplash; 76%, 8% and
22
23 288 62% for shoulder pain; 65%, 21% and 53% for knee pain; 45% (no recommendation) for
24
25 289 lateral ankle sprains; 87% (recommended) and 90% (no recommendation) for plantar
26
27 290 fasciitis; and 65%, 43% and 2% following knee or hip arthroplasty (Table 2) (Figure 2).

31 291 **3.3. Physical therapy treatment choices for various musculoskeletal**
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33 292 **conditions**

36 293 The results summarising the percentage of physical therapy treatments provided for various
37
38 294 musculoskeletal conditions that were recommended, not-recommended and had no
39
40 295 recommendation can be found in Table 3. For example, as assessed by surveys of physical
41
42 296 therapists, the most frequently provided recommended treatment for acute low back pain that
43
44 297 physical therapists 'must provide' was advice to stay active (median=32%, IQR: 13% to
45
46 298 55%, n=7 studies). The most frequently provided not-recommended treatment for acute low
47
48 299 back pain was McKenzie therapy (median=36%, IQR: 24% to 37%, n=6) (Table 3).

51
52 300 Treatment choices for conditions that were only reported in one study or where one of either
53
54 301 recommended or not-recommended treatments could not be inferred from guidelines or
55
56 302 systematic reviews can be found in Supplementary Table 5.
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58
59
60 303

304 **4. Discussion**

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

313 **4.1. Strengths and weaknesses of the study**

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

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

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3 327 reported reassurance (n=2) or advice and education to support self-management (n=2). This
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5 328 could have underestimated the proportion of recommended treatment choices.
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8 329 **4.2. Strengths and weaknesses in relation to other studies**

9
10 330 Our finding that approximately half of treatment choices involved recommended treatments
11
12 331 is similar to previous studies of healthcare. For example, the CareTrack study in Australia
13
14 332 found that 57% of healthcare provided by general practitioners, specialists, physiotherapists,
15
16 333 chiropractors, psychologists and counsellors was high-value (106), while the earlier
17
18 334 CareTrack study in the United States found a figure of 55% (107). The percentage of
19
20 335 recommended treatment choices for low back pain however was lower in our review (35-
21
22 336 50%) when compared to estimates from the Australian (72%) (106) and United States (69%)
23
24 337 CareTrack studies (107). One difference to our study is that the CareTrack studies used
25
26 338 consensus of experts to judge the value of care; whereas we based this decision upon
27
28 339 evidence-based practice guidelines and systematic reviews. Another difference is that the
29
30 340 CareTrack studies only assessed healthcare decisions through audits of clinical notes; we
31
32 341 used audit of clinical notes, surveys, vignettes, and clinical observation.
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39 342 **4.3. Meaning of the study**

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41 343 Our results suggest that physical therapy treatment choices for musculoskeletal conditions are
42
43 344 often not based upon research evidence. There was extensive use of not-recommended
44
45 345 treatments and treatments without recommendations; for some conditions treatments that
46
47 346 were not-recommended or had no recommendation were more common choices than
48
49 347 recommended treatments (Figure 2). As there are now over 42,000 clinical practice
50
51 348 guidelines, systematic reviews and clinical trials to guide physical therapy practice, the
52
53 349 challenge in physical therapy is applying this evidence to practice. Professional associations
54
55 350 have a potential role to play in this area. Unfortunately, recent marketing from professional
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57 351 associations, popular social media handles and leading journals have emphasised the
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3 352 importance of early referral to physical therapy (108) rather than the nature of physical
4
5 353 therapy care provided. The high percentage of non-evidence-based treatment choices in our
6
7 354 review suggests that referring patients with musculoskeletal conditions for early physical
8
9 355 therapy – without emphasising the importance of the type of non-pharmacological care they
10
11 356 receive – may be unwise.

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15 357 Treatment waste is another important issue highlighted in our review. Even when patients
16
17 358 receive recommended treatments they also usually receive not-recommended treatments and
18
19 359 treatments that have no recommendation to guide their use. With nearly \$100 billion spent on
20
21 360 physical therapy, optometry, podiatry, or chiropractic medicine each year in the United States
22
23 361 (109), the waste due to non-evidence-based physical therapy is likely enormous. Further,
24
25 362 billing patients for physical therapy treatments that are not evidence-based could also be
26
27 363 considered unethical; the Vision Statement of the American Physical Therapy Association
28
29 364 makes clear that there is an expectation that “*physical therapists and physical therapist*
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31 365 *assistants will render evidence-based services*” (110).

366 4.4. Unanswered questions and future research

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

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3 377 guidelines should inform the management of low back pain (survey of 274 physical
4
5 378 therapists) (113).
6
7
8 379 A recent initiative that could help physical therapists replace treatments that are not-
9
10 380 recommended with recommended treatments is *Choosing Wisely* (114). Over 225
11
12 381 professional societies worldwide endorse *Choosing Wisely* and have published lists of tests
13
14 382 and treatments that clinicians and their patients should question. This includes physical
15
16 383 therapy associations in Australia, the United States and Italy. Testing strategies to increase
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18 384 adoption of *Choosing Wisely* recommendations among physical therapists is important.
19
20 385 However, existing *Choosing Wisely* recommendations are likely not maximising the potential
21
22 386 of the campaign to reduce the use of physical therapy treatments that are not-recommended in
23
24 387 guidelines and systematic reviews. For example, half of the Australian Physiotherapy
25
26 388 Association *Choosing Wisely* recommendations target diagnostic testing that is not-
27
28 389 recommended, while other recommendations target treatments not part of routine physical
29
30 390 therapy care, such as whirlpools for wound management and bed rest following diagnosis of
31
32 391 acute deep vein thrombosis (American Physical Therapy Association). Our review
33
34 392 highlighted the most frequently provided not-recommended non-pharmacological physical
35
36 393 therapy treatments across a range of musculoskeletal conditions (Table 3) and could be used
37
38 394 to enhance the relevance of future *Choosing Wisely* recommendations. Further, in countries
39
40 395 where physical therapists bill for specific treatments (e.g. the United States), another
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42 396 approach could be to restrict funding for anything but recommended physical therapy
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44 397 treatments.
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56 399 **5. Conclusion**

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

405

For peer review only

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2
3 406 **Authors' contributions**
4

5 407 All authors critically revised the manuscript for important intellectual content and approved
6
7 408 the final manuscript. Please find below a detailed description of the role of each author:

- 8
9
10 409 - Joshua R Zadro: conception and design, analysis and interpretation of data, drafting
11
12 410 and revision of the manuscript, and final approval of the version to be published
13
14 411 - Mary O’Keeffe: conception and design, interpretation of data, drafting and revision of
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19
20 414 revision of the manuscript and final approval of the version to be published
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22

23
24 415 The Corresponding Author (JZ) attests that all listed authors meet authorship criteria and that
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Table 1. Summary of study characteristics by condition

Condition	N	Countries	Age range*; mean (SD) unless stated otherwise	Experience*; mean (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) <ul style="list-style-type: none"> 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 <ul style="list-style-type: none"> 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 fasciitis	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						

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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									
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									
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									
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									
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*

Recommended	Assessed by surveys of physical therapists**				Assessed by clinical notes				
	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	84	93	2	55	54	56	2
	(range of motion or flexibility only)							
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

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3 *: two studies combined physical therapy treatment choices for a variety of shoulder conditions
4 **: there is no high-quality evidence supporting a high-value physical therapy intervention for shoulder
5 pain
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7 a: includes massage, mobilisation or manipulation

8 b: including advice on posture and advice to rest or reduce activity

9 **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								
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								
Other exercise ^d	98	88	100	5	75			1
Balneotherapy	16			1	-			
Iontophoresis	-				8			1

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38 *: 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)

39 **: 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)

40 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

41 b: includes massage, mobilisation or manipulation

42 c: advice promoting bed rest or time off work

43 d: exercise that is neither aerobic nor strengthening

44 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)*

Recommended	Inpatients				Outpatients**			
	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.

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3 **Figure legend**
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5 Figure 1. PRISMA flow diagram
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8 Figure 2. Median percentage of physical therapy treatment choices that involved treatments
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10 that are recommended, not-recommended and had no recommendation
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Supplementary Tables

Supplementary Table 1. Search strategy

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

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

CBT: cognitive behavioural therapy; ES: electrical stimulation; NSAIDs: non-steroidal anti-inflammatory drugs; SWD: short wave diathermy; TENS: transcutaneous electrical nerve stimulation; US: Ultrasound.

Supplementary Table 4. Summary of study characteristics by condition

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.

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

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.

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

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.

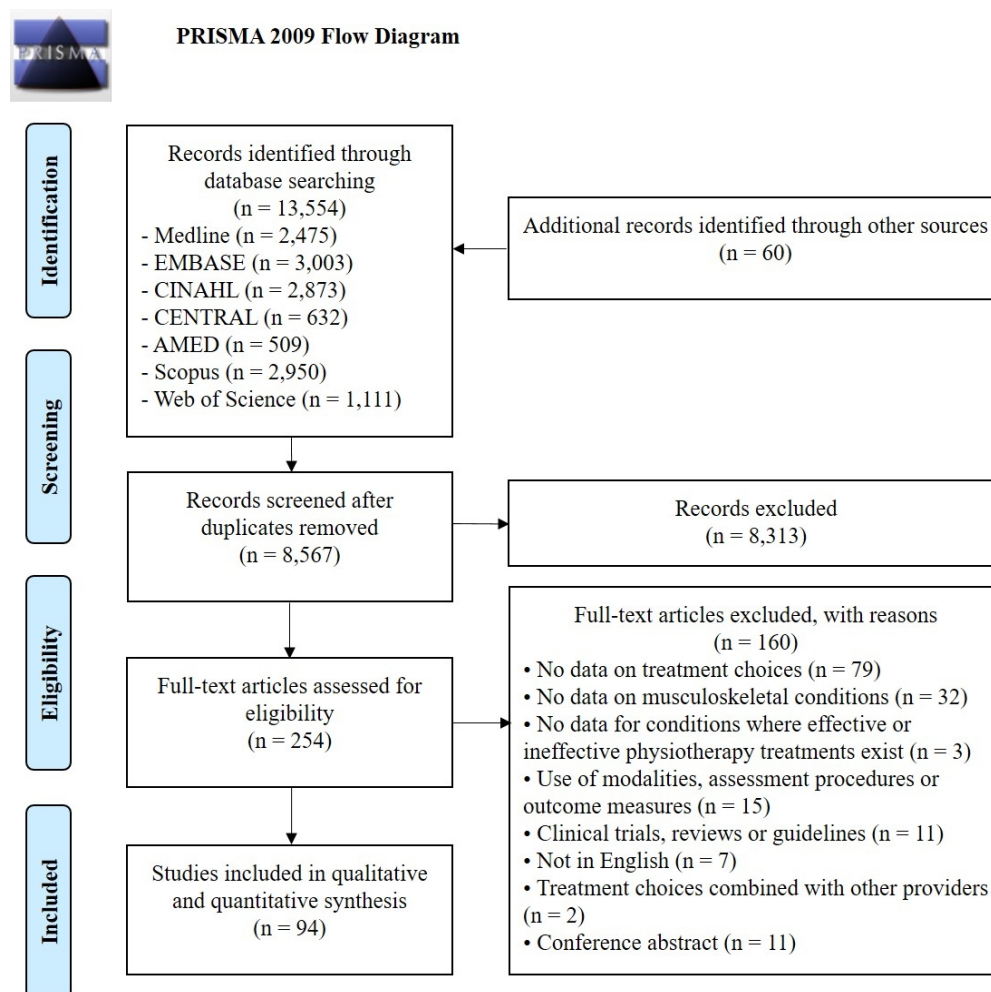
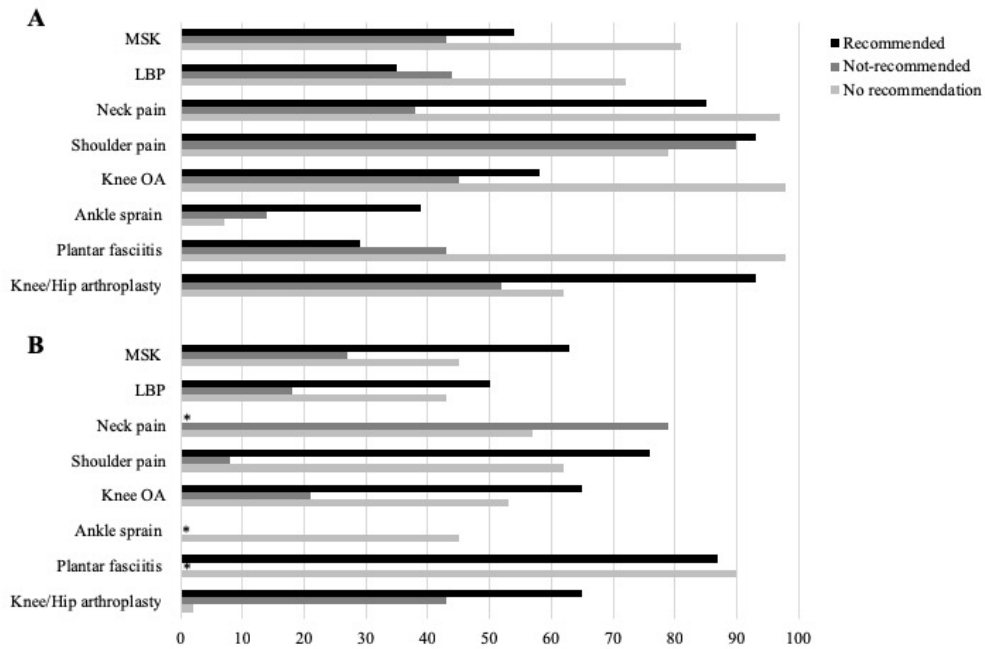


Figure 1. PRISMA flow diagram

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



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.

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)

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3 **Supplementary Table 1: Search Strategy**
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5 **MEDLINE via Ovid**
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	Searches
<p>9 Low-value 10 care 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56</p>	<p>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</p>

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	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	<ol style="list-style-type: none"> 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	<ol style="list-style-type: none"> 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	<ol style="list-style-type: none"> 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

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AMED via Ovid

	Searches
Low-value care	<ol style="list-style-type: none"> 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	<ol style="list-style-type: none"> 36. "physiotherap*".mp 37. exp Physical Therapy Modalities/ 38. "physical therap*".mp 39. 36 or 37 or 38

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Scopus

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Low-value care	<ol style="list-style-type: none"> 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

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Web of Science

	Searches
Low-value care	<ol style="list-style-type: none"> 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

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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? <ul style="list-style-type: none"> 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? <ul style="list-style-type: none"> 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? <ul style="list-style-type: none"> 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? <ul style="list-style-type: none"> 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? <ul style="list-style-type: none"> 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? <ul style="list-style-type: none"> 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) <ul style="list-style-type: none"> 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):	Primary guideline (1):	Secondary guideline (2):
	<i>MUST PROVIDE</i>	<ul style="list-style-type: none"> • US, ES, TENS, IF 	<ul style="list-style-type: none"> • Superficial heat (4) (chronic low back pain)
	<ul style="list-style-type: none"> • Advice and education to support self-management • Reassurance • Advice to keep active 	<ul style="list-style-type: none"> • Poor advice^b • Acupuncture • Traction • External support^c 	<ul style="list-style-type: none"> • Cold therapy (4) • SWD
	<i>CONSIDER PROVIDING</i>	Systematic reviews:	Systematic reviews:
	<ul style="list-style-type: none"> • Group exercise 	<ul style="list-style-type: none"> • McKenzie (acute or subacute low back pain) (3) 	<ul style="list-style-type: none"> • Pulse electromagnetic field therapy (5)
	<i>CONSIDER</i> combinations of two or more of:		<ul style="list-style-type: none"> • Laser (6)
	<ul style="list-style-type: none"> • Manual therapy^a • Exercise • Psychological therapy (with a CBT approach) 		<ul style="list-style-type: none"> • Work-related interventions (7) • Ergonomic interventions (8) • Back schools (9, 10) • Biofeedback (11) • Neural mobilisation (12) • Mulligan (13)
	Secondary guideline (2):		No reviews:
	<i>SHOULD PROVIDE</i>		<ul style="list-style-type: none"> • Infrared or Micro current therapy
	<ul style="list-style-type: none"> • Superficial heat (acute and sub-acute low back pain) 		<ul style="list-style-type: none"> • Cyriax manual therapy
	Systematic reviews:		<ul style="list-style-type: none"> • Magnet therapy
	<ul style="list-style-type: none"> • McKenzie (chronic low back pain) (3) 		<ul style="list-style-type: none"> • Electroacupuncture
			<ul style="list-style-type: none"> • Advice on heavy lifting, long standing, sitting habits, posture, avoiding painful movements
			<ul style="list-style-type: none"> • Relaxation therapy

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

Neck pain and whiplash	RECOMMENDED	NOT-RECOMMENDED	NO RECOMMENDATION*
	<p><u>Acute neck pain/whiplash</u> Primary guideline (14): <i>SHOULD PROVIDE</i></p> <ul style="list-style-type: none"> Information on nature, management and course Importance of maintaining activity and movement <p><i>CONSIDER</i> structured education in combination with:</p> <ul style="list-style-type: none"> Multimodal care^a Unsupervised range of motion/flexibility exercises <p><u>Chronic neck pain/whiplash</u> (not mentioned above) Primary guideline (14): <i>CONSIDER</i> structured education in combination with:</p> <ul style="list-style-type: none"> Range of motion/flexibility and strengthening exercises Strengthening combined exercise Yoga Clinical massage Laser 	<p><u>Acute neck pain/whiplash</u> Primary guideline (14):</p> <ul style="list-style-type: none"> Education alone Strain-counter strain therapy Relaxation massage Electroacupuncture ES Collar Clinic based heat Poor advice^b Heat therapy <p><u>Chronic neck pain/whiplash</u> Primary guideline (14):</p> <ul style="list-style-type: none"> Strengthening alone Strain-counter strain therapy Relaxation massage Electroacupuncture ES, TENS, SWD Relaxation therapy Clinic based heat Poor advice^b Heat therapy <p><u>All neck pain/whiplash</u></p>	<p><u>Acute neck pain/whiplash</u> Primary guideline (14):</p> <ul style="list-style-type: none"> Supervised combined exercise Supervised graded strengthening Yoga Strengthening alone Clinical massage Laser Acupuncture TENS, SWD Traction Relaxation therapy CBT <p><u>Chronic neck pain/whiplash</u> Primary guideline (14):</p> <ul style="list-style-type: none"> Education alone Supervised graded strengthening Acupuncture Traction Collar CBT <p><u>All neck pain</u> Systematic reviews:</p>

Systematic reviews:

- US (15)
- Cold therapy (15)

- Other exercise^c (16)
- Manual therapy alone^d (17)
- Neural mobilisation (12)
- Ergonomic interventions (8)

All whiplash

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

	RECOMMENDED	NOT-RECOMMENDED	NO RECOMMENDATION*
Subacromial pain syndrome or shoulder pain	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): <i>MUST PROVIDE</i> <ul style="list-style-type: none"> • 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): <ul style="list-style-type: none"> • Acupuncture • Poor advice^c Secondary guideline (28): <ul style="list-style-type: none"> • SWD • IF • US • Laser Systematic reviews:	Primary guideline (27): <ul style="list-style-type: none"> • Other exercise^d Systematic reviews: <ul style="list-style-type: none"> • 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):	Primary guideline (31):	No reviews:
	<i>SHOULD PROVIDE</i>	<ul style="list-style-type: none"> • US, ES, Laser 	<ul style="list-style-type: none"> • Advice or education
	<ul style="list-style-type: none"> • Exercise 	<ul style="list-style-type: none"> • Joint mobilisation 	<ul style="list-style-type: none"> • IF, SWD, Diadynamic current
	<i>CONSIDER PROVIDING</i>	<ul style="list-style-type: none"> • Heat or cold therapy alone 	
	<ul style="list-style-type: none"> • Short period of immobilisation 		
	<ul style="list-style-type: none"> • Rest, ice, compression and elevation 		
	<ul style="list-style-type: none"> • External support^a 		
	^a : includes braces, boots or taping		

Plantar fasciitis

	RECOMMENDED	NOT-RECOMMENDED	NO RECOMMENDATION*
	Primary guideline(32): SHOULD PROVIDE <ul style="list-style-type: none"> • Stretching • Night splints • Manual therapy^a • Taping MAY PROVIDE <ul style="list-style-type: none"> • Laser • Strengthening exercises and movement training • Education and counselling for weight loss • Rocker-bottom shoe and shoe rotation during the week 	Primary guideline (32): <ul style="list-style-type: none"> • Acupuncture • US, ES 	Primary guideline (32): <ul style="list-style-type: none"> • Shockwave No reviews: <ul style="list-style-type: none"> • 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: <ul style="list-style-type: none"> • Exercise (33-35) 	Systematic reviews: <ul style="list-style-type: none"> • Passive range of motion (36) • Cold therapy (37) 	Systematic reviews: <ul style="list-style-type: none"> • TENS (38) • Electrotherapy (39) • Acupuncture (39) No reviews: <ul style="list-style-type: none"> • Manual therapy^a • Advice or education • Biofeedback

^a: includes massage or mobilisation

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3 *: treatments that have not been mentioned in a clinical practice guideline or investigated in a systematic review do not have a citation.

4 CBT: cognitive behavioural therapy; ES: electrical stimulation; IF: interferential current; NSAIDs: non-steroidal anti-inflammatory drugs; SWD:
5 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

1 2 3 4 5 6 7 8	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
9 10 11	Mielenz 1997 (United States)	Acute LBP (<10 weeks)	Pts: 41 (13)	Not reported	Pts: 53%	1580 Pts	Audit of clinical notes
12 13 14 15 16 17	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
18 19 20 21	Opong-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
22 23 24 25	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
26 27 28 29	Pincus 2011 (United Kingdom)	Work-related LBP (duration not specified)	PTs: 47 (9.3)	24 (9.4)	Not reported	113 PTs	Survey without vignette
30 31 32 33 34 35 36 37	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
38 39 40 41 42 43 44 45 46	Reid 2002 (New Zealand)	Acute LBP (4 days)	Not reported	Not reported	Not reported	324 PTs	Survey with vignette

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2							
3	Serrano-Aguilar	Chronic LBP (≥ 12 weeks)	Pts: 53.9 (14.5)	Not reported	Pts: 73.3%	4693 Pts	Audit of
4	2011*						billing codes
5	(Spain)						
6	Sparkes 2005	Acute LBP (< 6 weeks) and	Not reported	Not reported	Not reported	130 Pts	Audit of
7	(United	chronic LBP (≥ 6 weeks) with					clinical
8	Kingdom)	or without radiation (unable to					notes
9		stratify by duration)					
10	Stevenson 2006	Acute, subacute and chronic	Not reported	Not reported	Not reported	306 Pts from	Treatment
11	(United	LBP (unable to stratify by				25 PTs	recording
12	Kingdom)	duration)					forms
13	Strand 2005	LBP (unable to stratify by	PTs: 43 (7)	10 (6)	PTs: 29%	42	Clinical
14	(Norway)	duration)	Pts: 37 (12)		Pts: 53%	consultations	observation
15						with 34 PTs	
16	Swinkels 2005	LBP without radiation (< 1	Pts: 48 (16)	15-24y (nearly	PTs: 41%	1254 Pts	Treatment
17	(Netherlands)	month and ≥ 1 month)		50%)	Pts: 54%	treated by 90	recording
18						PTs	forms
19	Tumilty 2017	Acute LBP (< 6 weeks)	Pts: 34.5 (17)	Not reported	Pts: 52%	199 Pts	Treatment
20	(New Zealand)						recording
21							forms
22	Turner 1999*	LBP (no duration specified)	Pts: 41.9 (no SD)	Not reported	Pts: 60.6%	345 Pts	Audit of
23	(United						clinical
24	Kingdom)						notes
25	van Baar 1998*	Acute and chronic LBP	PTs: < 35 y (60%).	Not reported	Pts: 58.9%	1,085 Pts	Treatment
26	(Netherlands)	without radiation (unable to	Pts: 43.5 (16.1)				recording
27		stratify by duration)					forms
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3	van der Valk	LBP (<1 week; ≥1 week and	Pts with LBP <1	Not reported	Pts with LBP	3,507 Pts
4	1995	<3 months; and ≥3 months)	week: 0-14y		<1 week:	
5	(Netherlands)		(0.6%); 15-24y		41.4%.	Treatment
6			(8.3%); 25-34y		Pts with LBP	recording
7			(21.5%); 35-44y		≥1 week and	forms
8			(25.4%); 45-54y		<3 months:	
9			(20.8%); 55-64y		47.1%.	
10			(13.9%); 65-74y		Pts with LBP	
11			(6.3%); >74y		≥3 months:	
12			(3.2%).		58.3%.	
13			Pts with LBP ≥1			
14			week and <3			
15			months: 0-14y			
16			(0.4%); 15-24y			
17			(11.0%); 25-34y			
18			(21.8%); 35-44y			
19			(23.8%); 45-54y			
20			(18.5%); 55-64y			
21			(12.0%); 65-74y			
22			(8.6%); >74y			
23			(3.9%).			
24			Pts with LBP ≥3			
25			months: 0-14y			
26			(0.7%); 15-24y			
27			(12.1%); 25-34y			
28			(21.7%); 35-44y			
29			(20.4%); 45-54y			
30			(18.9%); 55-64y			
31			(13.2%); 65-74y			
32			(8.2%); >74y			
33			(4.9%).			
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39	Neck pain or whiplash					
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1 2 3 4 5 6	Ayanniyi 2007 (Nigeria)	Neck pain (no duration specified)	Pts: 53.4 (11.2)	Not reported	Pts: 56.8%	532 Pts	Audit of clinical notes
7 8 9 10 11 12 13	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
14 15 16 17 18	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
19 20 21 22 23	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
24 25 26 27 28	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
29 30 31 32	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
33 34 35 36	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
37 38 39 40 41 42 43 44 45 46	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 (\geq 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	
Roebroek 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 fasciitis							
Fraser 2017 (United States)	Plantar fasciitis (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 fasciitis (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	

1 2 3 4 5 6 7 8 9	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
10 11 12 13	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
14 15 16 17 18 19 20 21 22	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
23 24 25 26	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
27 28 29	Hurkmans 2012 (Netherlands)	Rheumatoid arthritis	PTs: 43 (10.8)	19 (10.3)	PTs: 53%	233 PTs	Survey without vignette
30 31 32 33 34	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
35 36 37 38 39 40 41 42 43 44 45 46	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 \geq 40 years old)	Not reported	13.7 (10.8)	PTs: 77.1%	83 PTs	Survey without vignette
Peterson 2005 (Sweden)	Chronic epicondylitis (\geq 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

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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*

Recommended	Assessed by surveys of physical therapists				Assessed by clinical notes				
	Median (% [€])	Q1	Q3	N	Median (% [¥])	Q1	Q3	N	
<i>SHOULD PROVIDE</i>									
Aerobic or strengthening exercise	-				86				1
No-recommendation									
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*

No-recommendation	Assessed by surveys of physical therapists				Assessed by clinical notes			
	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*

No-recommendation	Assessed by surveys of physical therapists				Assessed by surveys of patients			
	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*

Recommended	Assessed by surveys of physical therapists				Assessed by clinical notes			
	Median (%[€])	Q1	Q3	N	Median (%[¥])	Q1	Q3	N
<i>MUST PROVIDE</i>								
Advice to keep active	87			1	-			
Advice and education to support self-management	85			1	-			
<i>CONSIDER PROVIDING</i>								
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

Recommended	Assessed by surveys of physical therapists				Assessed by clinical notes			
	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

No-recommendation	Assessed by surveys of physical therapists				Assessed by clinical notes			
	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

Recommended	Assessed by surveys of physical therapists				Assessed by clinical notes			
	Median (% [€])	Q1	Q3	N	Median (% [¥])	Q1	Q3	N
<i>SHOULD PROVIDE</i>								
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			
	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	-			
<i>Due to a fall</i>								

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*

No-recommendation	Assessed by surveys of physical therapists				Assessed by clinical notes			
	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

Recommended	Assessed by surveys of physical therapists				Assessed by clinical notes			
	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

No-recommendation	Assessed by surveys of physical therapists				Assessed by clinical notes			
	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

Recommended	Assessed by surveys of physical therapists				Assessed by clinical notes			
	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

Recommended	Assessed by surveys of physical therapists				Assessed by clinical notes			
	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)

ORTHOPEDECS

LUMBAR DISCECTOMY AND FUSION (surveys of physical therapists)

Recommended	Inpatients				Outpatients			
	Median (% [€])	Q1	Q3	N	Median (% [¥])	Q1	Q3	N
<i>Discectomy</i>								
High-intensity exercise ^a	81	81	81	1	-			

Rehabilitation starting 4-6 weeks post-surgery	-	15	1
<i>Fusion</i>			
Exercise and CBT	-	61	1
No-recommendation	Median (%[€])	Q1	Q3
Other exercises ^{b, c}	96	94	97
Advice, education or reassurance	86	79	92
Neural mobilisation	57		1
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

No-recommendation	Assessed by surveys of physical therapists				Assessed by clinical notes			
	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

No-recommendation	Assessed by surveys of physical therapists				Assessed by clinical notes			
	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

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3 nerve stimulation; US: Ultrasound.

4 €: the percentage of physical therapists that report they provide (or would provide) high-value
5 care, low-value care and care of unknown value for a given condition.

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7 ¥: the percentage of patients that received high-value care, low-value care or care of unknown
8 value from a physical therapist for a particular condition as determined by audits of clinical
9 notes, treatment recording forms, or surveys of patients.
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Supplementary Table 6. Methodological quality ratings of included studies using a modified Downs and Black checklist

Author (year)	Condition	Checklist items								Total	Assessment measure
		1	2	3	4	5	6	7	8		
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 fasciitis	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 fasciitis	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

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46
		Roebroek 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																																

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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.

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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. 1 st 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

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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

Page 1 of 2

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

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

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3 **1 Do physical therapists follow evidence-based guidelines when managing musculoskeletal**
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5 **2 conditions? A systematic review**
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7
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10 ABSTRACT

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

16 **Design:** Systematic review

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

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

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

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

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3 35 **Conclusions:** Many physical therapists seem not to follow evidence-based guidelines when
4
5 36 managing musculoskeletal conditions. There is considerable scope to increase use of
6
7 37 recommended treatments and reduce use of treatments that are not recommended.
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10 38 **Keywords:** Non-pharmacological; musculoskeletal; physical therapy; treatment choices;
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12 39 systematic review; recommended care.
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3 43 **Strengths and limitations of this study**
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5

- 6 44 - This is the first study to summarise the proportion of physical therapy treatment
7
8 45 choices for musculoskeletal conditions that agree with management recommendations
9
10 46 in evidence-based guidelines and systematic reviews
11
12
13 47 - We used a systematic approach to identify studies on physical therapy treatment
14
15 48 choices and classified recommendations for physical therapy treatments according to
16
17 49 evidence-based guidelines and systematic reviews
18
19
20 50 - Experts provided feedback to help refine our classification, and a second reviewer
21
22 51 double-checked all the extracted data to ensure accuracy
23
24 52 - The main limitation is that primary studies only reported treatment choices for
25
26 53 individual treatments and not for combinations of treatments.
27
28
29 54 - Recommended treatments such as advice and reassurance might not have been
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31 55 documented in clinical notes or listed in a survey because they may be viewed as a
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33 56 routine part of physical therapy; this could have underestimated the proportion of
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35 57 physical therapists that provided recommended treatments
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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.

1
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3 83 The aim of this systematic review was to summarise the proportion of physical therapy
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5 84 treatment choices for musculoskeletal conditions that agree with management
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8 85 recommendations in evidence-based guidelines and systematic reviews.
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10 86 **2. Methods**

11
12 87 This review was conducted in accordance with the “Preferred reporting items for systematic
13
14 88 reviews and meta-analyses” (PRISMA) statement (9) and was prospectively registered on
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16
17 89 PROSPERO (CRD42018094979). Due to the size of the review, other research questions in
18
19 90 our registered protocol (including physical therapy treatment choices for cardiorespiratory
20
21 91 and neurological conditions) will be addressed in separate manuscripts. Other deviations to
22
23 92 our registered protocol include using a modified version of the ‘Downs and Black’ checklist
24
25 93 to rate study quality and changing the focus from ‘high- and low-value care’ to
26
27 94 ‘recommended and not-recommended care’.
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30 31 95 **2.1. Data Sources and Searches**

32
33 96 We conducted a comprehensive keyword search in MEDLINE, EMBASE, Cumulative Index
34
35 97 to Nursing and Allied Health Literature, Cochrane Central Register of Controlled Trials,
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37 98 Allied and Complementary Medicine, Scopus and Web of Science, from the earliest record
38
39 99 until April 2018. Our search strategy combined terms relating to “practice patterns” and
40
41 100 “physical therapy” (Supplementary Table 1) and was designed to capture studies
42
43 101 investigating physical therapy treatment choices for any condition (as per our registered
44
45 102 protocol). We performed citation tracking and reviewed the reference lists of included studies
46
47 103 to identify those missed by our initial database search.
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52 104 Two independent reviewers (JZ and MO) performed the selection of studies by subsequently
53
54 105 screening the title, abstract and full-text of studies retrieved through our electronic database
55
56 106 search. Any disagreements between the two reviewers were resolved through discussion.
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107 **2.2. Study Selection**

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

120 **2.3. Data Extraction and Quality Assessment**

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

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

1
2
3 132 following assessments of treatment choices as ‘accurate’: observation, audits of clinical
4
5 133 notes, audits of billing codes, treatment recording forms and validated surveys.
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7

8 134 **2.4. Data Synthesis**

9
10 135 The following definitions were used to classify treatments as recommended, not-
11
12 recommended and no recommendation:
13 136

- 14
15
16 137 • **Recommended treatments** included physical therapy treatments endorsed in well-
17
18 138 recognised evidence-based clinical practice guidelines (e.g. guidelines from the
19
20 139 National Institute for Health and Care Excellence, NICE) or found to be effective in
21
22 recent systematic reviews. Treatments recommended in guidelines were further
23 140
24 categorised as those that ‘must be provided’ (‘core’ treatments) and those that ‘should
25 141
26 be considered’. When guidelines specified ‘core’ treatments, only these treatments
27 142
28 were considered ‘recommended’ in our primary analysis (see 2.5.1). Otherwise,
29 143
30 treatments that ‘should be considered’ were accepted as ‘recommended’.
31 144
- 32
33
34 145 • **Not-recommended treatments** included physical therapy treatments not
35
36 recommended in guidelines or found to be ineffective in recent systematic reviews
37 146
- 38
39 147 • **Treatments with no recommendation** included physical therapy treatments where
40
41 148 guideline recommendations and evidence from systematic reviews was inconclusive;
42
43 or where treatments had not been investigated in a systematic review.
44 149

45
46 150 We used one clinical practice guideline per condition to classify physical therapy treatments
47
48 (primary guideline) and contacted leading experts to help us select our primary guideline and
49 151
50 refine our classification for a number of conditions (see Acknowledgements). If we found a
51 152
52 physical therapy treatment that was not mentioned in the primary guideline, we searched in
53 153
54 other evidence-based clinical practice guidelines and systematic reviews to inform our
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3 155 classification (Supplementary Table 3). We selected recently published high-quality
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5 156 systematic reviews where possible.
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8 157 **2.4.1. Assessments of treatment choices**

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10 158 Data on physical therapy treatment choices were divided into two main categories (and
11
12
13 159 analysed separately) due to differences in how each category is interpreted:
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16 160 **2.4.2. Treatment choices assessed by surveys completed by physical therapists (with 17 18 161 or without vignettes)**

19
20 162 *Interpretation.* Surveys completed by physical therapists' yielded data on the percentage of
21
22
23 163 physical therapists that provide (survey without vignette) or would provide (survey with
24
25 164 vignette) a particular treatment for a condition they frequently treat.
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28 165 *Survey without vignette.* Physical therapists outlined the treatments they provide for a
29
30 166 condition or rated how often they provide a particular treatment for a condition (e.g.
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32
33 167 "frequently"; "sometimes"; "rarely"; or "never"). When studies reported how often
34
35 168 treatments were provided, we extracted the percentage of treatments that were provided at
36
37 169 least 'sometimes'. We combined data when studies separated survey responses by different
38
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40 170 samples of physical therapists (usually by country or practice setting). Some surveys were
41
42 171 completed by a senior physical therapist on behalf of the physical therapy department within
43
44 172 a hospital (e.g. management following knee arthroplasty).
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47 173 *Survey with vignette.* Physical therapists outlined the treatments they would provide for a
48
49 174 particular case (vignette). For studies that included multiple vignettes of the same condition,
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52 175 we took an average of physical therapists' responses across vignettes of equal sample sizes or
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54 176 used data from the vignette with the highest sample size.
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3 177 **2.4.3. Treatment choices assessed by audits of clinical notes, audits of billing codes,**
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5 178 **treatment recording forms, clinical observation, or surveys completed by**
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8 179 **patients**
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10 180 *Interpretation.* These assessment measures yielded data on the percentage of patients that
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12 181 received a particular physical therapy-delivered treatment in a single treatment session or
13
14 182 throughout an episode of care (i.e. from initial consultation to discharge).
15

16
17 183 Audits of clinical notes and billing codes were performed retrospectively in the included
18
19 184 studies. Treatment recording forms provided similar information to clinical notes, except they
20
21 185 were often implemented as part of a study or registry on treatment practices (prospective).
22
23 186 Within a study, we combined data across samples that presented with the same condition (e.g.
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25 187 physical therapists from different countries treatment low back pain).
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30 188 **2.5. Analysis**
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32 189 We used counts and ranges to summarise study characteristics for each condition. We used
33
34 190 medians and interquartile ranges (IQR) to summarise the percentage of physical therapy
35
36 191 treatment choices that involved treatments that were recommended, not-recommended and
37
38 192 had no recommendation across studies. We provided an overall result for all studies and then
39
40 193 separately for individual musculoskeletal conditions (e.g. low back pain). Since physical
41
42 194 therapists can provide multiple treatments for the same patient, and treatment choices were
43
44 195 summarised across studies, the percentage of treatment choices that involved treatments that
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46 196 were recommended, not-recommended and had no recommendation do not sum to 100%. For
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48 197 example, 70% of physiotherapists might provide recommended treatments for low back pain,
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50 198 but the same percentage might also provide some treatments that are not-recommended or
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52 199 have no recommendation.
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3 200 **2.5.1. Treatment choices that involved treatments that were recommended, not-**
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5 201 **recommended and had no recommendation**

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8 202 Where possible, recommended treatment was based on treatment choices involving all ‘core’
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10 203 treatments recommended in guidelines (i.e. physical therapists ‘must’ or ‘should’ provide).
11
12 204 For example, the NICE guidelines for low back pain recommend that all patients receive
13
14 205 advice and education to support self-management, reassurance, and advice to keep active (7).
15
16 206 Since studies did not report combinations of treatments, we used the lowest value across all
17
18 207 ‘core’ treatments. For example, if 30% of physical therapists provide reassurance and 50%
19
20 208 provide advice to stay active, we used 30% as the proportion of treatment choices that
21
22 209 involved recommended treatments. This is because no more than 30% of the sample could
23
24 210 have provided both reassurance and advice to stay active (‘core’ treatments). If guidelines did
25
26 211 not mention ‘core’ treatments or if there were no guidelines for a condition, we used data
27
28 212 from the most frequently provided recommended treatment that ‘should be considered’ or
29
30 213 was found to be effective in a systematic review. We used data from the most frequently
31
32 214 provided treatment that was not recommended and had no recommendation to provide an
33
34 215 estimate of the percentage of physical therapists’ treatment choices that involve at least one
35
36 216 treatment that is not-recommended and had no recommendation. For studies that reported
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38 217 treatment choices stratified by the duration of symptoms (acute vs. chronic) or different
39
40 218 settings (inpatient vs. outpatient), we used the highest value of treatments that were
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42 219 recommended, not-recommended and had no recommendation across the strata. We
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44 220 summarised the percentage of physical therapy treatment choices that were recommended,
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46 221 not-recommended and had no recommendation across all musculoskeletal conditions where
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48 222 guidelines recommended ‘core’ treatments.
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57 223 **2.5.2. Physical therapy treatments provided for various musculoskeletal conditions**
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3 224 We summarised the percentage of physical therapy treatments provided for various
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5 225 conditions within the categories of recommended, not-recommended and no
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7 226 recommendation. Treatments that were procedurally similar and had the same
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9 227 recommendation (i.e. recommended, not-recommended and no recommendation) were
10
11 228 grouped together. For example, according to the NICE low back pain guidelines,
12
13 229 mobilisation, manipulation and massage should all be ‘considered’ (7). Hence, these were
14
15 230 grouped as ‘manual therapy’. Studies rarely reported combinations of physical therapy
16
17 231 treatments, so we used data from the most frequently provided treatment where appropriate.
18
19 232 For example, if 67% of physical therapists provide massage for acute low back pain and 20%
20
21 233 provide mobilisation, we used 67% as the best estimate for the percentage of physical
22
23 234 therapists that provide manual therapy.

28 235 **2.6. Patient or Public Involvement**

30 236 Patients and members of the public were not involved in the design of this study

36 238 **3. Results**

38 239 After removing duplicates and screening 8,567 titles and abstracts and 254 full-texts reports,
39
40 240 94 studies were included (Fig 1). Physical therapy treatment choices were investigated for
41
42 241 low back pain (n=48 studies) (11-58), knee pain (n=10) (32, 34, 57, 59-65), neck pain or
43
44 242 whiplash (n=11) (15, 18, 32, 34, 51, 66-71), foot or ankle pain (n=5) (72-76), shoulder pain
45
46 243 (n=7) (15, 51, 77-81), pre or post knee arthroplasty (n=6) (46, 82-86) (including one study of
47
48 244 hip and knee arthroplasty (86)), and other musculoskeletal or orthopaedic conditions (where
49
50 245 treatment choices were only reported in one study or where one of either recommended or
51
52 246 not-recommended treatments could not be inferred from guidelines or systematic reviews)
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54 247 (n=18) (87-104). We contacted 15 authors for data (regarding 18 studies); 12 responded and
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56 248 five were able to provide the data we requested (regarding six studies) (15, 16, 22, 64, 89,
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3 249 100). A summary of study characteristics across conditions is in Table 1. Characteristics of
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5 250 included studies is in Supplementary Table 4.
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8 251
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10 252 Seven studies investigated treatment choices for shoulder pain; four (15, 78, 80, 81) focused
11
12 253 on subacromial pain syndrome (the most common form of shoulder pain (105)), two (77, 79)
13
14 254 included patients with various diagnoses (including subacromial pain syndrome) and one (51)
15
16 255 did not specify a diagnosis (Supplementary Table 4). Evidence on the management of
17
18 256 subacromial pain syndrome was used to categorise treatment choices for all studies on
19
20 257 shoulder pain. Similarly, evidence on the management of lateral ankle sprains was used to
21
22 258 categorise treatment choices for all studies on acute ankle injuries (n=2/3 studies on lateral
23
24 259 ankle sprains (75, 76)) and evidence on the management of knee osteoarthritis for all studies
25
26 260 on knee pain (excluding one study on acute knee injuries (57) and another on a mixed sample
27
28 261 of hip and knee osteoarthritis (60) – see Supplementary Table 5).
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3.1. Methodological quality

34 262
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36 263 Individual study scores ranged from 4-8 (out of a possible 8) with a mean score of 6.0
37
38 264 (median=6) (Supplementary Table 6). The most common methodological limitations
39
40 265 included failing to report that physical therapists who were prepared to participate were
41
42 266 representative of the population from which they were drawn (n=88/94) and not using an
43
44 267 accurate assessment of treatment choices (n=55/94). All studies clearly described their main
45
46 268 findings and used appropriate statistical tests, and most scored positive on the remaining
47
48 269 checklist items (Supplementary Table 6).
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3.2. Treatment choices that involved treatments that were recommended, not-recommended and had no recommendation (all studies)

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3 272 **3.2.1. Treatment choices assessed by surveys completed by physical therapists (with**
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5 273 **or without vignettes)**
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8 274 The median percentage of physical therapists that provide (or would provide) treatments that
9
10 275 were recommended, not-recommended and had no recommendation was 54%, 43% and 81%
11
12 276 for all musculoskeletal conditions, respectively; 35%, 44% and 72% for low back pain; 85%,
13
14 277 38% and 97% for neck pain and whiplash; 93%, 90% and 79% for shoulder pain; 58%, 45%
15
16 278 and 98% for knee pain; 39%, 14% and 7% for lateral ankle sprains; 29%, 43% and 98% for
17
18 279 plantar fasciitis; and 93%, 52% and 62% following knee or hip arthroplasty (Table 2) (Figure
19
20
21 280 2).

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23
24 281 **3.2.2. Treatment choices assessed by audits of clinical notes, audits of billing codes,**
25
26 282 **treatment recording forms, clinical observation, or surveys completed by**
27
28 283 **patients**
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31 284 The median percentage of patients that received physical therapy-delivered treatments that
32
33 285 were recommended, not-recommended and had no recommendation was 63%, 27% and 45%
34
35 286 for all musculoskeletal conditions, respectively; 50%, 18% and 43% for low back pain; 79%
36
37 287 (not-recommended) and 57% (no recommendation) for neck pain and whiplash; 76%, 8% and
38
39 288 62% for shoulder pain; 65%, 21% and 53% for knee pain; 45% (no recommendation) for
40
41 289 lateral ankle sprains; 87% (recommended) and 90% (no recommendation) for plantar
42
43 290 fasciitis; and 65%, 43% and 2% following knee or hip arthroplasty (Table 2) (Figure 2).
44
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46
47 291 **3.3. Physical therapy treatment choices for various musculoskeletal**
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49 292 **conditions**
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52 293 The results summarising the percentage of physical therapy treatments provided for various
53
54 294 musculoskeletal conditions that were recommended, not-recommended and had no
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56 295 recommendation can be found in Table 3. For example, as assessed by surveys of physical
57
58 296 therapists, the most frequently provided recommended treatment for acute low back pain that
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3 297 physical therapists 'must provide' was advice to stay active (median=32%, IQR: 13% to
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5 298 55%, n=7 studies). The most frequently provided not-recommended treatment for acute low
6
7 299 back pain was McKenzie therapy (median=36%, IQR: 24% to 37%, n=6) (Table 3).
8
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10 300 Treatment choices for conditions that were only reported in one study or where one of either
11
12 301 recommended or not-recommended treatments could not be inferred from guidelines or
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14 302 systematic reviews can be found in Supplementary Table 5.
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19 304 **4. Discussion**

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21
22 305 Many physical therapists seem not to follow evidence-based guidelines when managing
23
24 306 musculoskeletal conditions. Our review highlights that there is considerable scope to increase
25
26 307 the frequency with which physical therapists provide recommended treatments for
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28 308 musculoskeletal conditions and reduce the use of treatments that are not-recommended or
29
30 309 have no recommendation to guide their use. Across all musculoskeletal conditions, 54% to
31
32 310 63% of physical therapy treatment choices involve recommended care, while 27% to 43%
33
34 311 involve at least one treatment that is not recommended and 45% to 81% at least one treatment
35
36 312 that has no recommendation.
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41 313 **4.1. Strengths and weaknesses of the study**

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43
44 314 The primary strength of this review is that we used a systematic approach to identify studies
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46 315 on physical therapy treatment choices and classified recommendations for physical therapy
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48 316 treatments according to evidence-based guidelines and systematic reviews (Supplementary
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50 317 Table 3). Experts provided feedback to help refine our classification, and a second reviewer
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52 318 double-checked all the extracted data to ensure accuracy.
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56 319 The main weakness of this review is that primary studies only reported treatment choices for
57
58 320 individual treatments and not combinations of treatments. As a result, we could not determine
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3 321 the percentage of physical therapists that provided only recommended treatments, only not-
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5 322 recommended treatments, only treatments with no recommendation, or other combinations of
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8 323 treatments. Second, it is possible that recommended treatments such as advice and
9
10 324 reassurance were not documented in clinical notes or listed in a survey because they are
11
12 325 viewed as a routine part of physical therapy. For example, only 12 out of the 48 studies on
13
14 326 low back pain reported that physical therapists provide advice to stay active, while even less
15
16 327 reported reassurance (n=2) or advice and education to support self-management (n=2). This
17
18 328 could have underestimated the proportion of recommended treatment choices. Third, physical
19
20 329 therapists' treatment choices may have changed over time so including older studies could
21
22 330 limit the relevance of our findings. Nevertheless, we do not believe this is an important
23
24 331 limitation because many guideline recommendations have remained largely consistent
25
26 332 overtime. For example, although some studies on treatment choices for low back pain are
27
28 333 from 1994, a comparison of low back pain guidelines between 1994 and 2000 found a high
29
30 334 degree of consistency of recommendations, such as advice to stay active and avoid bed rest
31
32 335 (106). This is consistent with current low back pain guidelines. Finally, most studies did not
33
34 336 use an accurate assessment of treatment choices (n=55/94). However, we stratified our
35
36 337 analysis by how treatment choices were assessed so the influence of having an accurate
37
38 338 method of assessment is clear to readers.

339 **4.2. Strengths and weaknesses in relation to other studies**

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

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2
3 346 50%) when compared to estimates from the Australian (72%) (107) and United States (69%)
4
5 347 CareTrack studies (108). A difference to our study is that the CareTrack studies used
6
7 348 consensus of experts to judge the value of care; whereas we based this decision upon
8
9 349 evidence-based practice guidelines and systematic reviews. Another difference is that the
10
11 350 CareTrack studies only assessed healthcare decisions through audits of clinical notes; we
12
13 351 used audit of clinical notes, surveys, vignettes, and clinical observation. Further, the Care
14
15 352 Track studies reported primary data collected and were not systematic reviews.

20 353 **4.3. Meaning of the study**

21
22 354 Our results suggest that physical therapy treatment choices for musculoskeletal conditions are
23
24 355 often not based upon research evidence. There was extensive use of not-recommended
25
26 356 treatments and treatments without recommendations; for some conditions treatments that
27
28 357 were not-recommended or had no recommendation were more common choices than
29
30 358 recommended treatments (Figure 2). As there are now over 42,000 clinical practice
31
32 359 guidelines, systematic reviews and clinical trials to guide physical therapy practice, the
33
34 360 challenge in physical therapy is applying this evidence to practice. Professional associations
35
36 361 have a potential role to play in this area. Unfortunately, recent marketing from professional
37
38 362 associations, popular social media handles and leading journals have emphasised the
39
40 363 importance of early referral to physical therapy (109) rather than the nature of physical
41
42 364 therapy care provided. The high percentage of non-evidence-based treatment choices in our
43
44 365 review suggests that referring patients with musculoskeletal conditions for early physical
45
46 366 therapy – without emphasising the importance of the type of non-pharmacological care they
47
48 367 receive – may be unwise.

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50 368 Treatment waste is another important issue highlighted in our review. Even when patients
51
52 369 receive recommended treatments they also usually receive not-recommended treatments and
53
54 370 treatments that have no recommendation to guide their use. With nearly \$100 billion spent on

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3 371 physical therapy, optometry, podiatry, or chiropractic medicine each year in the United States
4
5 372 (110), the waste due to non-evidence-based physical therapy is likely enormous. Further,
6
7 373 billing patients for physical therapy treatments that are not evidence-based could also be
8
9 374 considered unethical; the Vision Statement of the American Physical Therapy Association
10
11 375 makes clear that there is an expectation that “*physical therapists and physical therapist*
12
13 376 *assistants will render evidence-based services*” (111).
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18 377 **4.4. Unanswered questions and future research**

19
20 378 Understanding what drives poor patterns of physical therapy care is important as it will guide
21
22 379 the design of strategies to ensure the use of treatments that are not-recommended for
23
24 380 musculoskeletal conditions does not simply shift from medicine to allied health. One possible
25
26 381 explanation is the large variation in physical therapists who receive training in evidence-
27
28 382 based practice (21-82%) and can critically appraise research papers (48-70%) (systematic
29
30 383 review of 12 studies (112)). Physical therapists with a poor understanding of evidence-based
31
32 384 practice might be misled into providing treatments with weak supporting evidence. Another
33
34 385 explanation is a lack of awareness of, and agreement with, evidence-based clinical practice
35
36 386 guidelines. For example, only 12% of physical therapists are aware of clinical practice
37
38 387 guidelines for low back pain (survey of 108 physical therapists) (113) and 46% agree that
39
40 388 guidelines should inform the management of low back pain (survey of 274 physical
41
42 389 therapists) (114).
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48 390 A recent initiative that could help physical therapists replace treatments that are not-
49
50 391 recommended with recommended treatments is *Choosing Wisely* (115). Over 225
51
52 392 professional societies worldwide endorse *Choosing Wisely* and have published lists of tests
53
54 393 and treatments that clinicians and their patients should question. This includes physical
55
56 394 therapy associations in Australia, the United States and Italy. Testing strategies to increase
57
58 395 adoption of *Choosing Wisely* recommendations among physical therapists is important.
59
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3 396 However, existing *Choosing Wisely* recommendations are likely not maximising the potential
4
5 397 of the campaign to reduce the use of physical therapy treatments that are not-recommended in
6
7 398 guidelines and systematic reviews. For example, half of the Australian Physiotherapy
8
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10 399 Association *Choosing Wisely* recommendations target diagnostic testing that is not-
11
12 400 recommended, while other recommendations target treatments not part of routine physical
13
14 401 therapy care, such as whirlpools for wound management and bed rest following diagnosis of
15
16 402 acute deep vein thrombosis (American Physical Therapy Association). Our review
17
18 403 highlighted the most frequently provided not-recommended non-pharmacological physical
19
20 404 therapy treatments across a range of musculoskeletal conditions (Table 3) and could be used
21
22 405 to enhance the relevance of future *Choosing Wisely* recommendations. Further, in countries
23
24 406 where physical therapists bill for specific treatments (e.g. the United States), another
25
26 407 approach could be to restrict funding for anything but recommended physical therapy
27
28 408 treatments.
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36 410 **5. Conclusion**

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39 411 Our results suggest that that there is considerable scope to increase the contribution physical
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41 412 therapists could make to managing musculoskeletal conditions by increasing the frequency
42
43 413 with which they provide treatments that are recommended in guidelines and systematic
44
45 414 reviews and reduce their use of treatments that are not-recommended or have no
46
47 415 recommendations to guide their use.
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2
3 417 **Authors' contributions**
4

5 418 All authors critically revised the manuscript for important intellectual content and approved
6
7 419 the final manuscript. Please find below a detailed description of the role of each author:

- 8
9
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11
12 421 and revision of the manuscript, and final approval of the version to be published
13
14 422 - Mary O’Keeffe: conception and design, interpretation of data, drafting and revision of
15
16 423 the manuscript and final approval of the version to be published
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19
20 425 revision of the manuscript and final approval of the version to be published
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22

23
24 426 The Corresponding Author (JZ) attests that all listed authors meet authorship criteria and that
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Table 1. Summary of study characteristics by condition

Condition	N	Countries	Age range*; mean (SD) unless stated otherwise	Experience*; mean (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) <ul style="list-style-type: none"> 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 <ul style="list-style-type: none"> 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 fasciitis	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						

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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.

MUSCULOSKELETAL CONDITIONS^a	Assessed by surveys of physical therapists*				Assessed by clinical notes			
	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									
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									
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								
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								
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*

Recommended	Assessed by surveys of physical therapists**				Assessed by clinical notes				
	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	84	93	2	55	54	56	2
	(range of motion or flexibility only)							
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								
Not-recommended	Median (% [€])	Q1	Q3	N	Median (% [¥])	Q1	Q3	N
IF, Magnetic field therapy	90			1	8			1
No recommendation								
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

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3 *: two studies combined physical therapy treatment choices for a variety of shoulder conditions
4 **:there is no high-quality evidence supporting a recommended physical therapy intervention for
5 shoulder pain
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7 a: includes massage, mobilisation or manipulation

8 b: including advice on posture and advice to rest or reduce activity

9 **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								
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								
Other exercise ^d	98	88	100	5	75			1
Balneotherapy	16			1	-			
Iontophoresis	-				8			1

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38 *: 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)

39 **: 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)

40 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

41 b: includes massage, mobilisation or manipulation

42 c: advice promoting bed rest or time off work

43 d: exercise that is neither aerobic nor strengthening

44 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)*

Recommended	Inpatients				Outpatients**			
	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.

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3 **Figure legend**
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5 Figure 1. PRISMA flow diagram
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8 Figure 2. Median percentage of physical therapy treatment choices that involved treatments
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10 that are recommended, not-recommended and had no recommendation
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Supplementary Tables

Supplementary Table 1. Search strategy

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

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

CBT: cognitive behavioural therapy; ES: electrical stimulation; NSAIDs: non-steroidal anti-inflammatory drugs; SWD: short wave diathermy; TENS: transcutaneous electrical nerve stimulation; US: Ultrasound.

Supplementary Table 4. Summary of study characteristics by condition

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.

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

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.

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

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.

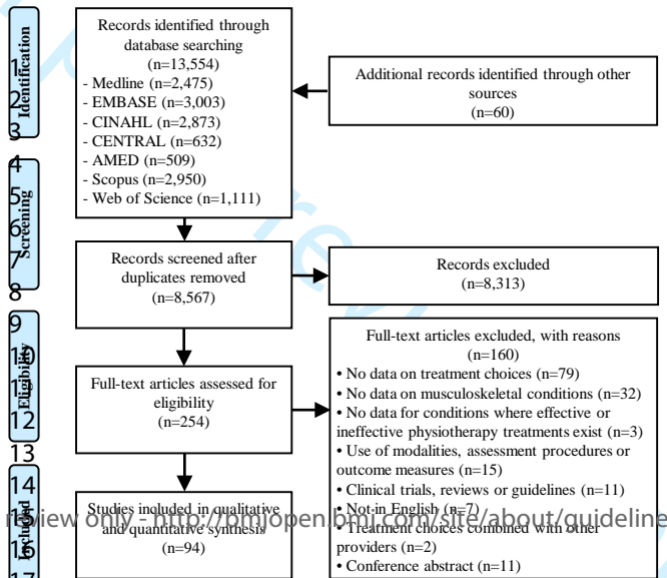
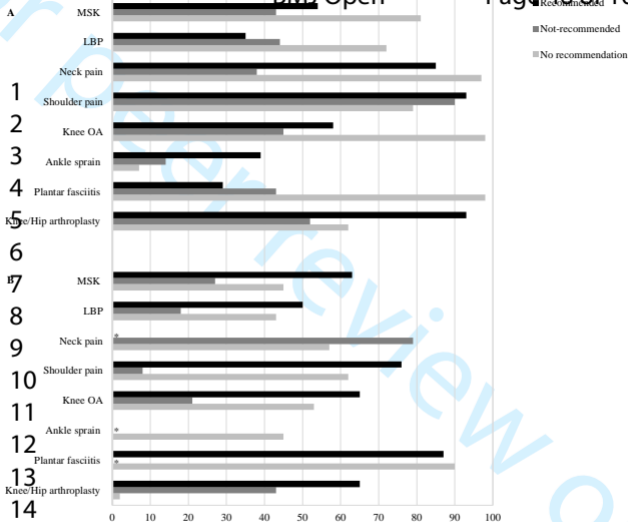


Figure 2. Median percentage of physical therapy treatment choices that are recommended, not-recommended and had no recommendation



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

16 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.

17 *No treatment choices in this category(s) could be identified

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

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3 **Supplementary Table 1: Search Strategy**
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5 **MEDLINE** via Ovid
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	Searches
<p>9 Low-value 10 care 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56</p>	<p>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</p>

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	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	<ol style="list-style-type: none"> 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	<ol style="list-style-type: none"> 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	<ol style="list-style-type: none"> 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

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AMED via Ovid

	Searches
Low-value care	<ol style="list-style-type: none"> 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	<ol style="list-style-type: none"> 36. "physiotherap*".mp 37. exp Physical Therapy Modalities/ 38. "physical therap*".mp 39. 36 or 37 or 38

	40. 35 and 39
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Scopus

	Searches
Low-value care	<ol style="list-style-type: none"> 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

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Web of Science

	Searches
Low-value care	<ol style="list-style-type: none"> 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

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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? <ul style="list-style-type: none"> 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? <ul style="list-style-type: none"> 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? <ul style="list-style-type: none"> 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? <ul style="list-style-type: none"> 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? <ul style="list-style-type: none"> 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? <ul style="list-style-type: none"> 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) <ul style="list-style-type: none"> 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	Primary guideline (1):	Secondary guideline (2):
	<ul style="list-style-type: none"> • Advice and education to support self-management • Reassurance • Advice to keep active 	<ul style="list-style-type: none"> • US, ES, TENS, IF • Poor advice^b • Acupuncture • Traction • External support^c 	<ul style="list-style-type: none"> • Superficial heat (4) (chronic low back pain) • Cold therapy (4) • SWD
	CONSIDER PROVIDING <ul style="list-style-type: none"> • Group exercise 	Systematic reviews: <ul style="list-style-type: none"> • McKenzie (acute or subacute low back pain) (3) 	Systematic reviews: <ul style="list-style-type: none"> • 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)
	CONSIDER combinations of two or more of: <ul style="list-style-type: none"> • Manual therapy^a • Exercise • Psychological therapy (with a CBT approach) 		
	Secondary guideline (2): SHOULD PROVIDE <ul style="list-style-type: none"> • Superficial heat (acute and sub-acute low back pain) 		No reviews: <ul style="list-style-type: none"> • 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
	Systematic reviews: <ul style="list-style-type: none"> • McKenzie (chronic low back pain) (3) 		

a: includes massage, mobilisation or manipulation;

b: advice promoting bed rest or time off work

c: corsets, belts, braces, sticks or taping

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Neck pain and whiplash

	RECOMMENDED	NOT-RECOMMENDED	NO RECOMMENDATION*
	<u>Acute neck pain/whiplash</u>	<u>Acute neck pain/whiplash</u>	<u>Acute neck pain/whiplash</u>
	Primary guideline (14):	Primary guideline (14):	Primary guideline (14):
	<i>SHOULD PROVIDE</i>	<ul style="list-style-type: none"> • Education alone • Strain-counter strain therapy • Relaxation massage • Electroacupuncture • ES • Collar • Clinic based heat • Poor advice^b • Heat therapy 	<ul style="list-style-type: none"> • Supervised combined exercise • Supervised graded strengthening • Yoga • Strengthening alone • Clinical massage • Laser • Acupuncture • TENS, SWD • Traction • Relaxation therapy • CBT
	<ul style="list-style-type: none"> • Information on nature, management and course • Importance of maintaining activity and movement <p><i>CONSIDER</i> structured education in combination with:</p> <ul style="list-style-type: none"> • Multimodal care^a • Unsupervised range of motion/flexibility exercises 		
	<u>Chronic neck pain/whiplash</u> (not mentioned above)	<u>Chronic neck pain/whiplash</u>	<u>Chronic neck pain/whiplash</u>
	Primary guideline (14):	Primary guideline (14):	Primary guideline (14):
	<i>CONSIDER</i> structured education in combination with:	<ul style="list-style-type: none"> • Strengthening alone • Strain-counter strain therapy • Relaxation massage • Electroacupuncture • ES, TENS, SWD • Relaxation therapy • Clinic based heat • Poor advice^b • Heat therapy 	<ul style="list-style-type: none"> • Education alone • Supervised graded strengthening • Acupuncture • Traction • Collar • CBT
	<ul style="list-style-type: none"> • Range of motion/flexibility and strengthening exercises • Strengthening combined exercise • Yoga • Clinical massage • Laser 		
		<u>All neck pain/whiplash</u>	<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)

All whiplash

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

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

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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): <i>MUST PROVIDE</i> <ul style="list-style-type: none"> • 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): <ul style="list-style-type: none"> • Acupuncture • Poor advice^c Secondary guideline (28): <ul style="list-style-type: none"> • SWD • IF • US • Laser Systematic reviews:	Primary guideline (27): <ul style="list-style-type: none"> • Other exercise^d Systematic reviews: <ul style="list-style-type: none"> • 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

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Plantar fasciitis

	RECOMMENDED	NOT-RECOMMENDED	NO RECOMMENDATION*
	Primary guideline(32): SHOULD PROVIDE <ul style="list-style-type: none"> • Stretching • Night splints • Manual therapy^a • Taping MAY PROVIDE <ul style="list-style-type: none"> • Laser • Strengthening exercises and movement training • Education and counselling for weight loss • Rocker-bottom shoe and shoe rotation during the week 	Primary guideline (32): <ul style="list-style-type: none"> • Acupuncture • US, ES 	Primary guideline (32): <ul style="list-style-type: none"> • Shockwave No reviews: <ul style="list-style-type: none"> • 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: <ul style="list-style-type: none"> • Exercise (33-35) 	Systematic reviews: <ul style="list-style-type: none"> • Passive range of motion (36) • Cold therapy (37) 	Systematic reviews: <ul style="list-style-type: none"> • TENS (38) • Electrotherapy (39) • Acupuncture (39) No reviews: <ul style="list-style-type: none"> • Manual therapy^a • Advice or education • Biofeedback

^a: includes massage or mobilisation

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3 *: treatments that have not been mentioned in a clinical practice guideline or investigated in a systematic review do not have a citation.

4 CBT: cognitive behavioural therapy; ES: electrical stimulation; IF: interferential current; NSAIDs: non-steroidal anti-inflammatory drugs; SWD:
5 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 (\leq 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

1 2 3 4 5 6 7 8	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
9 10 11	Mielenz 1997 (United States)	Acute LBP (<10 weeks)	Pts: 41 (13)	Not reported	Pts: 53%	1580 Pts	Audit of clinical notes
12 13 14 15 16 17	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
18 19 20 21	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
22 23 24 25	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
26 27 28 29	Pincus 2011 (United Kingdom)	Work-related LBP (duration not specified)	PTs: 47 (9.3)	24 (9.4)	Not reported	113 PTs	Survey without vignette
30 31 32 33 34 35 36 37	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
38 39 40 41 42 43 44 45 46	Reid 2002 (New Zealand)	Acute LBP (4 days)	Not reported	Not reported	Not reported	324 PTs	Survey with vignette

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3	Serrano-Aguilar	Chronic LBP (≥ 12 weeks)	Pts: 53.9 (14.5)	Not reported	Pts: 73.3%	4693 Pts	Audit of
4	2011*						billing codes
5	(Spain)						
6	Sparkes 2005	Acute LBP (< 6 weeks) and	Not reported	Not reported	Not reported	130 Pts	Audit of
7	(United	chronic LBP (≥ 6 weeks) with					clinical
8	Kingdom)	or without radiation (unable to					notes
9		stratify by duration)					
10	Stevenson 2006	Acute, subacute and chronic	Not reported	Not reported	Not reported	306 Pts from	Treatment
11	(United	LBP (unable to stratify by				25 PTs)	recording
12	Kingdom)	duration)					forms
13	Strand 2005	LBP (unable to stratify by	PTs: 43 (7)	10 (6)	PTs: 29%	42	Clinical
14	(Norway)	duration)	Pts: 37 (12)		Pts: 53%	consultations	observation
15						with 34 PTs	
16	Swinkels 2005	LBP without radiation (< 1	Pts: 48 (16)	15-24y (nearly	PTs: 41%	1254 Pts	Treatment
17	(Netherlands)	month and ≥ 1 month)		50%)	Pts: 54%	treated by 90	recording
18						PTs	forms
19	Tumilty 2017	Acute LBP (< 6 weeks)	Pts: 34.5 (17)	Not reported	Pts: 52%	199 Pts	Treatment
20	(New Zealand)						recording
21							forms
22	Turner 1999*	LBP (no duration specified)	Pts: 41.9 (no SD)	Not reported	Pts: 60.6%	345 Pts	Audit of
23	(United						clinical
24	Kingdom)						notes
25	van Baar 1998*	Acute and chronic LBP	PTs: < 35 y (60%).	Not reported	Pts: 58.9%	1,085 Pts	Treatment
26	(Netherlands)	without radiation (unable to	Pts: 43.5 (16.1)				recording
27		stratify by duration)					forms
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3	van der Valk	LBP (<1 week; ≥1 week and	Pts with LBP <1	Not reported	Pts with LBP	3,507 Pts
4	1995	<3 months; and ≥3 months)	week: 0-14y		<1 week:	
5	(Netherlands)		(0.6%); 15-24y		41.4%.	Treatment
6			(8.3%); 25-34y		Pts with LBP	recording
7			(21.5%); 35-44y		≥1 week and	forms
8			(25.4%); 45-54y		<3 months:	
9			(20.8%); 55-64y		47.1%.	
10			(13.9%); 65-74y		Pts with LBP	
11			(6.3%); >74y		≥3 months:	
12			(3.2%).		58.3%.	
13			Pts with LBP ≥1			
14			week and <3			
15			months: 0-14y			
16			(0.4%); 15-24y			
17			(11.0%); 25-34y			
18			(21.8%); 35-44y			
19			(23.8%); 45-54y			
20			(18.5%); 55-64y			
21			(12.0%); 65-74y			
22			(8.6%); >74y			
23			(3.9%).			
24			Pts with LBP ≥3			
25			months: 0-14y			
26			(0.7%); 15-24y			
27			(12.1%); 25-34y			
28			(21.7%); 35-44y			
29			(20.4%); 45-54y			
30			(18.9%); 55-64y			
31			(13.2%); 65-74y			
32			(8.2%); >74y			
33			(4.9%).			
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39	Neck pain or whiplash					
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1 2 3 4 5 6	Ayanniyi 2007 (Nigeria)	Neck pain (no duration specified)	Pts: 53.4 (11.2)	Not reported	Pts: 56.8%	532 Pts	Audit of clinical notes
7 8 9 10 11 12 13	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
14 15 16 17 18	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
19 20 21 22 23	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
24 25 26 27 28	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
29 30 31 32	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
33 34 35 36	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
37 38 39 40 41 42 43 44 45 46	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

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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
Roebroek 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 fasciitis						
Fraser 2017 (United States)	Plantar fasciitis (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 fasciitis (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

1 2 3 4 5 6 7 8 9	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
10 11 12 13	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
14 15 16 17 18 19 20 21 22	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
23 24 25 26	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
27 28 29	Hurkmans 2012 (Netherlands)	Rheumatoid arthritis	PTs: 43 (10.8)	19 (10.3)	PTs: 53%	233 PTs	Survey without vignette
30 31 32 33 34	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
35 36 37 38 39 40 41 42 43 44 45 46	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 \geq 40 years old)	Not reported	13.7 (10.8)	PTs: 77.1%	83 PTs	Survey without vignette
Peterson 2005 (Sweden)	Chronic epicondylitis (\geq 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

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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*

Recommended	Assessed by surveys of physical therapists				Assessed by clinical notes				
	Median (% [€])	Q1	Q3	N	Median (% [¥])	Q1	Q3	N	
<i>SHOULD PROVIDE</i>									
Aerobic or strengthening exercise	-				86				1
No-recommendation									
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*

No-recommendation	Assessed by surveys of physical therapists				Assessed by clinical notes			
	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*

No-recommendation	Assessed by surveys of physical therapists				Assessed by surveys of patients			
	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*

Recommended	Assessed by surveys of physical therapists				Assessed by clinical notes				
	Median (%[€])	Q1	Q3	N	Median (%[¥])	Q1	Q3	N	
<i>MUST PROVIDE</i>									
Advice to keep active	87			1	-				
Advice and education to support self-management	85			1	-				
<i>CONSIDER PROVIDING</i>									
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									
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									
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

Recommended	Assessed by surveys of physical therapists				Assessed by clinical notes			
	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

No-recommendation	Assessed by surveys of physical therapists				Assessed by clinical notes			
	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

Recommended	Assessed by surveys of physical therapists				Assessed by clinical notes			
	Median (% [€])	Q1	Q3	N	Median (% [¥])	Q1	Q3	N
<i>SHOULD PROVIDE</i>								
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			
	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	-			
<i>Due to a fall</i>								

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*

No-recommendation	Assessed by surveys of physical therapists				Assessed by clinical notes			
	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

Recommended	Assessed by surveys of physical therapists				Assessed by clinical notes			
	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

Dingemans 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

No-recommendation	Assessed by surveys of physical therapists				Assessed by clinical notes			
	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

Recommended	Assessed by surveys of physical therapists				Assessed by clinical notes			
	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

Recommended	Assessed by surveys of physical therapists				Assessed by clinical notes			
	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)

ORTHOPEDECS

LUMBAR DISCECTOMY AND FUSION (surveys of physical therapists)

Recommended	Inpatients				Outpatients			
	Median (% [€])	Q1	Q3	N	Median (% [¥])	Q1	Q3	N
<i>Discectomy</i>								
High-intensity exercise ^a	81	81	81	1	-			

Rehabilitation starting 4-6 weeks post-surgery	-	15	1
<i>Fusion</i>			
Exercise and CBT	-	61	1
No-recommendation	Median (%[€])	Q1	Q3
Other exercises ^{b, c}	96	94	97
Advice, education or reassurance	86	79	92
Neural mobilisation	57		1
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

No-recommendation	Assessed by surveys of physical therapists				Assessed by clinical notes			
	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

No-recommendation	Assessed by surveys of physical therapists				Assessed by clinical notes			
	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

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3 nerve stimulation; US: Ultrasound.

4 €: the percentage of physical therapists that report they provide (or would provide) high-value
5 care, low-value care and care of unknown value for a given condition.

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7 ¥: the percentage of patients that received high-value care, low-value care or care of unknown
8 value from a physical therapist for a particular condition as determined by audits of clinical
9 notes, treatment recording forms, or surveys of patients.
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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 fasciitis	1	1	1	1	1	0	1	1	7	Audit of billing codes

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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 fasciitis	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

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46
Roebroek 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																																		

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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.

For peer review only



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. 1 st 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

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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

Page 1 of 2

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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BMJ Open

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

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3 **1 Do physical therapists follow evidence-based guidelines when managing musculoskeletal**
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5 **2 conditions? A systematic review**
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7
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10 ABSTRACT

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

16 **Design:** Systematic review

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

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

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

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

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3 35 27% (n=20; audits). For treatments with no recommendation, these percentages were 81%
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6 36 (n=37; surveys) and 45% (n=31; audits).

7
8 37 **Conclusions:** Many physical therapists seem not to follow evidence-based guidelines when
9
10 38 managing musculoskeletal conditions. There is considerable scope to increase use of
11
12 39 recommended treatments and reduce use of treatments that are not recommended.

14
15 40 **Keywords:** Non-pharmacological; musculoskeletal; physical therapy; treatment choices;
16
17 41 systematic review; recommended care.

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For peer review only

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3 45 **Strengths and limitations of this study**
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- 6 46 - This is the first study to summarise the percentage of physical therapy treatment
7
8 47 choices for musculoskeletal conditions that agree with management recommendations
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10 48 in evidence-based guidelines and systematic reviews
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12
13 49 - We used a systematic approach to identify studies on physical therapy treatment
14
15 50 choices and classified recommendations for physical therapy treatments according to
16
17 51 evidence-based guidelines and systematic reviews
18
19
20 52 - Experts provided feedback to help refine our classification, and a second reviewer
21
22 53 double-checked all the extracted data to ensure accuracy
23
24 54 - The main limitation is that primary studies only reported treatment choices for
25
26 55 individual treatments and not for combinations of treatments.
27
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29 56 - Recommended treatments such as advice and reassurance might not have been
30
31 57 documented in clinical notes or listed in a survey because they may be viewed as a
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33 58 routine part of physical therapy; this could have underestimated the percentage of
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35 59 physical therapists that provided recommended treatments
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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.

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3 85 The aim of this systematic review was to summarise the percentage of physical therapy
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5 86 treatment choices for musculoskeletal conditions that agree with management
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8 87 recommendations in evidence-based guidelines and systematic reviews.
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10 88 **2. Methods**

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12 89 This review was conducted in accordance with the “Preferred reporting items for systematic
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14 90 reviews and meta-analyses” (PRISMA) statement (9) and was prospectively registered on
15
16 91 PROSPERO (CRD42018094979). Due to the size of the review, other research questions in
17
18 92 our registered protocol (including physical therapy treatment choices for cardiorespiratory
19
20 93 and neurological conditions) will be addressed in separate manuscripts. Other deviations to
21
22 94 our registered protocol include using a modified version of the ‘Downs and Black’ checklist
23
24 95 to rate study quality and changing the focus from ‘high- and low-value care’ to
25
26 96 ‘recommended and not-recommended care’.
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30 97 **2.1. Data Sources and Searches**

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32 98 We conducted a comprehensive keyword search in MEDLINE, EMBASE, Cumulative Index
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34 99 to Nursing and Allied Health Literature, Cochrane Central Register of Controlled Trials,
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36 100 Allied and Complementary Medicine, Scopus and Web of Science, from the earliest record
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38 101 until April 2018. Our search strategy combined terms relating to “practice patterns” and
39
40 102 “physical therapy” (Supplementary Table 1) and was designed to capture studies
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42 103 investigating physical therapy treatment choices for any condition (as per our registered
43
44 104 protocol). We performed citation tracking and reviewed the reference lists of included studies
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46 105 to identify those missed by our initial database search.
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52 106 Two independent reviewers (JZ and MO) performed the selection of studies by subsequently
53
54 107 screening the title, abstract and full-text of studies retrieved through our electronic database
55
56 108 search. Any disagreements between the two reviewers were resolved through discussion.
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109 **2.2. Study Selection**

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

122 **2.3. Data Extraction and Quality Assessment**

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

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

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3 134 following assessments of treatment choices as ‘accurate’: observation, audits of clinical
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5 135 notes, audits of billing codes, treatment recording forms and validated surveys.
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8 136 **2.4. Data Synthesis**

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10 137 The following definitions were used to classify treatments as recommended, not-
11
12 recommended and no recommendation:
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- 15
16 139 • **Recommended treatments** included physical therapy treatments endorsed in well-
17
18 140 recognised evidence-based clinical practice guidelines (e.g. guidelines from the
19
20 141 National Institute for Health and Care Excellence, NICE) or found to be effective in
21
22 142 recent systematic reviews. Treatments recommended in guidelines were further
23
24 143 categorised as those that ‘must be provided’ (‘core’ treatments) and those that ‘should
25
26 144 be considered’. When guidelines specified ‘core’ treatments, only these treatments
27
28 145 were considered ‘recommended’ in our primary analysis (see 2.5.1). Otherwise,
29
30 146 treatments that ‘should be considered’ were accepted as ‘recommended’.
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34 147 • **Not-recommended treatments** included physical therapy treatments not
35
36 148 recommended in guidelines or found to be ineffective in recent systematic reviews
37
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39 149 • **Treatments with no recommendation** included physical therapy treatments where
40
41 150 guideline recommendations and evidence from systematic reviews was inconclusive;
42
43
44 151 or where treatments had not been investigated in a systematic review.
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46
47 152 We used one clinical practice guideline per condition to classify physical therapy treatments
48
49 153 (primary guideline) and contacted leading experts to help us select our primary guideline and
50
51 154 refine our classification for a number of conditions (see Acknowledgements). If we found a
52
53 155 physical therapy treatment that was not mentioned in the primary guideline, we searched in
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56 156 other evidence-based clinical practice guidelines and systematic reviews to inform our
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3 157 classification (Supplementary Table 3). We selected recently published high-quality
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5 158 systematic reviews where possible.
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8 159 **2.4.1. Assessments of treatment choices**

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10 160 Data on physical therapy treatment choices were divided into two main categories (and
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12
13 161 analysed separately) due to differences in how each category is interpreted:
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16 162 **2.4.2. Treatment choices assessed by surveys completed by physical therapists (with** 17 18 163 **or without vignettes)**

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20 164 *Interpretation.* Surveys completed by physical therapists' yielded data on the percentage of
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22
23 165 physical therapists that provide (survey without vignette) or would provide (survey with
24
25 166 vignette) a particular treatment for a condition they frequently treat.
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28 167 *Survey without vignette.* Physical therapists outlined the treatments they provide for a
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30 168 condition or rated how often they provide a particular treatment for a condition (e.g.
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32
33 169 "frequently"; "sometimes"; "rarely"; or "never"). When studies reported how often
34
35 170 treatments were provided, we extracted the percentage of treatments that were provided at
36
37 171 least 'sometimes'. We combined data when studies separated survey responses by different
38
39 172 samples of physical therapists (usually by country or practice setting). Some surveys were
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41 173 completed by a senior physical therapist on behalf of the physical therapy department within
42
43 174 a hospital (e.g. management following knee arthroplasty).
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47 175 *Survey with vignette.* Physical therapists outlined the treatments they would provide for a
48
49 176 particular case (vignette). For studies that included multiple vignettes of the same condition,
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51 177 we took an average of physical therapists' responses across vignettes of equal sample sizes or
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53 178 used data from the vignette with the highest sample size.
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3 179 **2.4.3. Treatment choices assessed by audits of clinical notes, audits of billing codes,**
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5 180 **treatment recording forms, clinical observation, or surveys completed by**
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8 181 **patients**
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10 182 *Interpretation.* These assessment measures (reported as ‘assessed by clinical notes’ in the
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12 183 results tables) yielded data on the percentage of patients that received a particular physical
13
14 184 therapy-delivered treatment in a single treatment session or throughout an episode of care
15
16
17 185 (i.e. from initial consultation to discharge).
18

19
20 186 Audits of clinical notes and billing codes were performed retrospectively in the included
21
22 187 studies. Treatment recording forms provided similar information to clinical notes, except they
23
24 188 were often implemented as part of a study or registry on treatment practices (prospective).
25
26
27 189 Within a study, we combined data across samples that presented with the same condition (e.g.
28
29 190 physical therapists from different countries treatment low back pain).
30
31

32 191 **2.5. Analysis**
33

34 192 We used counts and ranges to summarise study characteristics for each condition. We used
35
36 193 medians and interquartile ranges (IQR) to summarise the percentage of physical therapy
37
38 194 treatment choices that involved treatments that were recommended, not-recommended and
39
40 195 had no recommendation across studies. We provided an overall result for all studies and then
41
42 196 separately for individual musculoskeletal conditions (e.g. low back pain). Since physical
43
44 197 therapists can provide multiple treatments for the same patient, and treatment choices were
45
46 198 summarised across studies, the percentage of treatment choices that involved treatments that
47
48 199 were recommended, not-recommended and had no recommendation do not sum to 100%. For
49
50 200 example, 70% of physiotherapists might provide recommended treatments for low back pain,
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52 201 but the same percentage might also provide some treatments that are not-recommended or
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54 202 have no recommendation.
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3 203 **2.5.1. Treatment choices that involved treatments that were recommended, not-**
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5 204 **recommended and had no recommendation**

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8 205 Where possible, recommended treatment was based on treatment choices involving all ‘core’
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10 206 treatments recommended in guidelines (i.e. physical therapists ‘must’ or ‘should’ provide).
11
12 207 For example, the NICE guidelines for low back pain recommend that all patients receive
13
14 208 advice and education to support self-management, reassurance, and advice to keep active (7).
15
16 209 Since studies did not report combinations of treatments, we used the lowest value across all
17
18 210 ‘core’ treatments. For example, if 30% of physical therapists provide reassurance and 50%
19
20 211 provide advice to stay active, we used 30% as the percentage of treatment choices that
21
22 212 involved recommended treatments. This is because no more than 30% of the sample could
23
24 213 have provided both reassurance and advice to stay active (‘core’ treatments). If guidelines did
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26 214 not mention ‘core’ treatments or if there were no guidelines for a condition, we used data
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28 215 from the most frequently provided recommended treatment that ‘should be considered’ or
29
30 216 was found to be effective in a systematic review. We used data from the most frequently
31
32 217 provided treatment that was not recommended and had no recommendation to provide an
33
34 218 estimate of the percentage of physical therapists’ treatment choices that involve at least one
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36 219 treatment that is not-recommended and had no recommendation. For studies that reported
37
38 220 treatment choices stratified by the duration of symptoms (acute vs. chronic) or different
39
40 221 settings (inpatient vs. outpatient), we used the highest value of treatments that were
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42 222 recommended, not-recommended and had no recommendation across the strata. We
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44 223 summarised the percentage of physical therapy treatment choices that were recommended,
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46 224 not-recommended and had no recommendation across all musculoskeletal conditions where
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48 225 guidelines recommended ‘core’ treatments.
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57 226 **2.5.2. Physical therapy treatments provided for various musculoskeletal conditions**
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3 227 We summarised the percentage of physical therapy treatments provided for various
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5 228 conditions within the categories of recommended, not-recommended and no
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7 229 recommendation. Treatments that were procedurally similar and had the same
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9 230 recommendation (i.e. recommended, not-recommended and no recommendation) were
10
11 231 grouped together. For example, according to the NICE low back pain guidelines,
12
13 232 mobilisation, manipulation and massage should all be ‘considered’ (7). Hence, these were
14
15 233 grouped as ‘manual therapy’. Studies rarely reported combinations of physical therapy
16
17 234 treatments, so we used data from the most frequently provided treatment where appropriate.
18
19 235 For example, if 67% of physical therapists provide massage for acute low back pain and 20%
20
21 236 provide mobilisation, we used 67% as the best estimate for the percentage of physical
22
23 237 therapists that provide manual therapy.

28 238 **2.6. Patient or Public Involvement**

29 239 Patients and members of the public were not involved in the design of this study

30 240

31 241 **3. Results**

32 242 After removing duplicates and screening 8,567 titles and abstracts and 254 full-texts reports,
33
34 243 94 studies were included (Fig 1). Physical therapy treatment choices were investigated for
35
36 244 low back pain (n=48 studies) (11-58), knee pain (n=10) (32, 34, 57, 59-65), neck pain or
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38 245 whiplash (n=11) (15, 18, 32, 34, 51, 66-71), foot or ankle pain (n=5) (72-76), shoulder pain
39
40 246 (n=7) (15, 51, 77-81), pre or post knee arthroplasty (n=6) (46, 82-86) (including one study of
41
42 247 hip and knee arthroplasty (86)), and other musculoskeletal or orthopaedic conditions (where
43
44 248 treatment choices were only reported in one study or where one of either recommended or
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46 249 not-recommended treatments could not be inferred from guidelines or systematic reviews)
47
48 250 (n=18) (87-104). We contacted 15 authors for data (regarding 18 studies); 12 responded and
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50 251 five were able to provide the data we requested (regarding six studies) (15, 16, 22, 64, 89,
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3 252 100). A summary of study characteristics across conditions is in Table 1. Characteristics of
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5 253 included studies is in Supplementary Table 4.
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10 255 Seven studies investigated treatment choices for shoulder pain; four (15, 78, 80, 81) focused
11
12 256 on subacromial pain syndrome (the most common form of shoulder pain (105)), two (77, 79)
13
14 257 included patients with various diagnoses (including subacromial pain syndrome) and one (51)
15
16 258 did not specify a diagnosis (Supplementary Table 4). Evidence on the management of
17
18 259 subacromial pain syndrome was used to categorise treatment choices for all studies on
19
20 260 shoulder pain. Similarly, evidence on the management of lateral ankle sprains was used to
21
22 261 categorise treatment choices for all studies on acute ankle injuries (n=2/3 studies on lateral
23
24 262 ankle sprains (75, 76)) and evidence on the management of knee osteoarthritis for all studies
25
26 263 on knee pain (excluding one study on acute knee injuries (57) and another on a mixed sample
27
28 264 of hip and knee osteoarthritis (60) – see Supplementary Table 5).
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3.1. Methodological quality

34 265
35
36 266 Individual study scores ranged from 4-8 (out of a possible 8) with a mean score of 6.0
37
38 267 (median=6) (Supplementary Table 6). The most common methodological limitations
39
40 268 included failing to report that physical therapists who were prepared to participate were
41
42 269 representative of the population from which they were drawn (n=88/94) and not using an
43
44 270 accurate assessment of treatment choices (n=55/94). All studies clearly described their main
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46 271 findings and used appropriate statistical tests, and most scored positive on the remaining
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48 272 checklist items (Supplementary Table 6).
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3.2. Treatment choices that involved treatments that were recommended, not-recommended and had no recommendation (all studies)

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3 275 **3.2.1. Treatment choices assessed by surveys completed by physical therapists (with**
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6 276 **or without vignettes)**

7
8 277 The median percentage of physical therapists that provide (or would provide) treatments that
9
10 278 were recommended, not-recommended and had no recommendation was 54%, 43% and 81%
11
12 279 for all musculoskeletal conditions, respectively; 35%, 44% and 72% for low back pain; 85%,
13
14 280 38% and 97% for neck pain and whiplash; 93%, 90% and 79% for shoulder pain; 58%, 45%
15
16 281 and 98% for knee pain; 39%, 14% and 7% for lateral ankle sprains; 29%, 43% and 98% for
17
18 282 plantar fasciitis; and 93%, 52% and 62% following knee or hip arthroplasty (Table 2) (Figure
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20
21 283 2).

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24 284 **3.2.2. Treatment choices assessed by audits of clinical notes, audits of billing codes,**
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26
27 285 **treatment recording forms, clinical observation, or surveys completed by**
28
29 286 **patients**

30
31 287 The median percentage of patients that received physical therapy-delivered treatments that
32
33 288 were recommended, not-recommended and had no recommendation was 63%, 27% and 45%
34
35 289 for all musculoskeletal conditions, respectively; 50%, 18% and 43% for low back pain; 79%
36
37 290 (not-recommended) and 57% (no recommendation) for neck pain and whiplash; 76%, 8% and
38
39 291 62% for shoulder pain; 65%, 21% and 53% for knee pain; 45% (no recommendation) for
40
41 292 lateral ankle sprains; 87% (recommended) and 90% (no recommendation) for plantar
42
43 293 fasciitis; and 65%, 43% and 2% following knee or hip arthroplasty (Table 2) (Figure 2).

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48 294 **3.3. Physical therapy treatment choices for various musculoskeletal**
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50 295 **conditions**

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53 296 The results summarising the percentage of physical therapy treatments provided for various
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55 297 musculoskeletal conditions that were recommended, not-recommended and had no
56
57 298 recommendation can be found in Table 3. For example, as assessed by surveys of physical
58
59 299 therapists, the most frequently provided recommended treatment for acute low back pain that

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3 300 physical therapists 'must provide' was advice to stay active (median=32%, IQR: 13% to
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5 301 55%, n=7 studies). The most frequently provided not-recommended treatment for acute low
6
7 302 back pain was McKenzie therapy (median=36%, IQR: 24% to 37%, n=6) (Table 3).
8
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10 303 Treatment choices for conditions that were only reported in one study or where one of either
11
12 304 recommended or not-recommended treatments could not be inferred from guidelines or
13
14 305 systematic reviews can be found in Supplementary Table 5.
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19 307 **4. Discussion**

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22 308 Many physical therapists seem not to follow evidence-based guidelines when managing
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24 309 musculoskeletal conditions. Our review highlights that there is considerable scope to increase
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26 310 the frequency with which physical therapists provide recommended treatments for
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28 311 musculoskeletal conditions and reduce the use of treatments that are not-recommended or
29
30 312 have no recommendation to guide their use. Across all musculoskeletal conditions, 54% of
31
32 313 physical therapists chose recommended treatments, 43% chose treatments that were not
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34 314 recommended and 81% chose treatments that have no recommendation (based on surveys
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36 315 completed by physical therapists). Based on audits of clinical notes, 63% of patients received
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38 316 recommended physical therapy-delivered treatments, 27% received treatments that were not
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40 317 recommended and 45% received treatments that have no recommendation.
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45 318 **4.1. Strengths and weaknesses of the study**

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48 319 The primary strength of this review is that we used a systematic approach to identify studies
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50 320 on physical therapy treatment choices and classified recommendations for physical therapy
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52 321 treatments according to evidence-based guidelines and systematic reviews (Supplementary
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54 322 Table 3). Experts provided feedback to help refine our classification, and a second reviewer
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56 323 double-checked all the extracted data to ensure accuracy.
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3 324 The main weakness of this review is that primary studies only reported treatment choices for
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5 325 individual treatments and not combinations of treatments. As a result, we could not determine
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7 326 the percentage of physical therapists that provided only recommended treatments, only not-
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9 327 recommended treatments, only treatments with no recommendation, or other combinations of
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11 328 treatments. Second, it is possible that recommended treatments such as advice and
12
13 329 reassurance were not documented in clinical notes or listed in a survey because they are
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15 330 viewed as a routine part of physical therapy. For example, only 12 out of the 48 studies on
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17 331 low back pain reported that physical therapists provide advice to stay active, while even less
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19 332 reported reassurance (n=2) or advice and education to support self-management (n=2). This
20
21 333 could have underestimated the percentage of recommended treatment choices. Third, physical
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23 334 therapists' treatment choices may have changed over time so including older studies could
24
25 335 limit the relevance of our findings. Nevertheless, we do not believe this is an important
26
27 336 limitation because many guideline recommendations have remained largely consistent
28
29 337 overtime. For example, although some studies on treatment choices for low back pain are
30
31 338 from 1994, a comparison of low back pain guidelines between 1994 and 2000 found a high
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33 339 degree of consistency of recommendations, such as advice to stay active and avoid bed rest
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35 340 (106). This is consistent with current low back pain guidelines. Finally, most studies did not
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37 341 use an accurate assessment of treatment choices (n=55/94). However, we stratified our
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39 342 analysis by how treatment choices were assessed so the influence of having an accurate
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41 343 method of assessment is clear to readers.

4.2. Strengths and weaknesses in relation to other studies

42 344 Our finding that approximately half of treatment choices involved recommended treatments
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44 345 is similar to previous studies of healthcare. For example, the CareTrack study in Australia
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46 346 found that 57% of healthcare provided by general practitioners, specialists, physiotherapists,
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48 347 chiropractors, psychologists and counsellors was appropriate (107), while the earlier
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3 349 CareTrack study in the United States found a figure of 55% (108). The percentage of
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5 350 recommended treatment choices for low back pain however was lower in our review (35-
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7 351 50%) when compared to estimates from the Australian (72%) (107) and United States (69%)
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9 352 CareTrack studies (108). A difference to our study is that the CareTrack studies used
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11 353 consensus of experts to judge the value of care; whereas we based this decision upon
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13 354 evidence-based practice guidelines and systematic reviews. Another difference is that the
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15 355 CareTrack studies only assessed healthcare decisions through audits of clinical notes; we
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17 356 used audit of clinical notes, surveys, vignettes, and clinical observation. Further, the Care
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19 357 Track studies reported primary data collected and were not systematic reviews.
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24 358 **4.3. Meaning of the study**

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26 359 Our results suggest that physical therapy treatment choices for musculoskeletal conditions are
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28 360 often not based upon research evidence. There was extensive use of not-recommended
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30 361 treatments and treatments without recommendations; for some conditions treatments that
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32 362 were not-recommended or had no recommendation were more common choices than
33
34 363 recommended treatments (Figure 2). As there are now over 42,000 clinical practice
35
36 364 guidelines, systematic reviews and clinical trials to guide physical therapy practice, the
37
38 365 challenge in physical therapy is applying this evidence to practice. Professional associations
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40 366 have a potential role to play in this area. Unfortunately, recent marketing from professional
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42 367 associations, popular social media handles and leading journals have emphasised the
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44 368 importance of early referral to physical therapy (109) rather than the nature of physical
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46 369 therapy care provided. The high percentage of non-evidence-based treatment choices in our
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48 370 review suggests that referring patients with musculoskeletal conditions for early physical
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50 371 therapy – without emphasising the importance of the type of non-pharmacological care they
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52 372 receive – may be unwise.
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3 373 Treatment waste is another important issue highlighted in our review. Even when patients
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5 374 receive recommended treatments they also usually receive not-recommended treatments and
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8 375 treatments that have no recommendation to guide their use. With nearly \$100 billion spent on
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10 376 physical therapy, optometry, podiatry, or chiropractic medicine each year in the United States
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12 377 (110), the waste due to non-evidence-based physical therapy is likely enormous. Further,
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14 378 billing patients for physical therapy treatments that are not evidence-based could also be
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17 379 considered unethical; the Vision Statement of the American Physical Therapy Association
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19 380 makes clear that there is an expectation that “*physical therapists and physical therapist*
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21 381 *assistants will render evidence-based services*” (111).

24 382 **4.4. Unanswered questions and future research**

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27 383 Understanding what drives poor patterns of physical therapy care is important as it will guide
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29 384 the design of strategies to ensure the use of treatments that are not-recommended for
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31 385 musculoskeletal conditions does not simply shift from medicine to allied health. One possible
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33 386 explanation is the large variation in physical therapists who receive training in evidence-
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35 387 based practice (21-82%) and can critically appraise research papers (48-70%) (systematic
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37 388 review of 12 studies (112)). Physical therapists with a poor understanding of evidence-based
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39 389 practice might be misled into providing treatments with weak supporting evidence. Another
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41 390 explanation is a lack of awareness of, and agreement with, evidence-based clinical practice
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43 391 guidelines. For example, only 12% of physical therapists are aware of clinical practice
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45 392 guidelines for low back pain (survey of 108 physical therapists) (113) and 46% agree that
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47 393 guidelines should inform the management of low back pain (survey of 274 physical
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49 394 therapists) (114).

50 395 A recent initiative that could help physical therapists replace treatments that are not-
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52 396 recommended with recommended treatments is *Choosing Wisely* (115). Over 225
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54 397 professional societies worldwide endorse *Choosing Wisely* and have published lists of tests

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3 398 and treatments that clinicians and their patients should question. This includes physical
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5 399 therapy associations in Australia, the United States and Italy. Testing strategies to increase
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7 400 adoption of *Choosing Wisely* recommendations among physical therapists is important.
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10 401 However, existing *Choosing Wisely* recommendations are likely not maximising the potential
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12 402 of the campaign to reduce the use of physical therapy treatments that are not-recommended in
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14 403 guidelines and systematic reviews. For example, half of the Australian Physiotherapy
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16 404 Association *Choosing Wisely* recommendations target diagnostic testing that is not-
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18 405 recommended, while other recommendations target treatments not part of routine physical
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20 406 therapy care, such as whirlpools for wound management and bed rest following diagnosis of
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22 407 acute deep vein thrombosis (American Physical Therapy Association). Our review
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24 408 highlighted the most frequently provided not-recommended non-pharmacological physical
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26 409 therapy treatments across a range of musculoskeletal conditions (Table 3) and could be used
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28 410 to enhance the relevance of future *Choosing Wisely* recommendations. Further, in countries
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30 411 where physical therapists bill for specific treatments (e.g. the United States), another
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32 412 approach could be to restrict funding for anything but recommended physical therapy
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34 413 treatments.
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43 415 **5. Conclusion**

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46 416 Our results suggest that that there is considerable scope to increase the contribution physical
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48 417 therapists could make to managing musculoskeletal conditions by increasing the frequency
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50 418 with which they provide treatments that are recommended in guidelines and systematic
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52 419 reviews and reduce their use of treatments that are not-recommended or have no
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54 420 recommendations to guide their use.
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3 422 **Authors' contributions**
4

5 423 All authors critically revised the manuscript for important intellectual content and approved
6
7 424 the final manuscript. Please find below a detailed description of the role of each author:

- 8
9
10 425 - Joshua R Zadro: conception and design, analysis and interpretation of data, drafting
11
12 426 and revision of the manuscript, and final approval of the version to be published
13
14 427 - Mary O’Keeffe: conception and design, interpretation of data, drafting and revision of
15
16 428 the manuscript and final approval of the version to be published
17
18 429 - Christopher G Maher: conception and design, interpretation of data, drafting and
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20 430 revision of the manuscript and final approval of the version to be published
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22

23
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Table 1. Summary of study characteristics by condition

Condition	N	Countries	Age range*; mean (SD) unless stated otherwise	Experience*; mean (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) <ul style="list-style-type: none"> 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 <ul style="list-style-type: none"> 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 fasciitis	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.

MUSCULOSKELETAL CONDITIONS^a	Assessed by surveys of physical therapists*				Assessed by clinical notes			
	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									
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									
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									
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									
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*

Recommended	Assessed by surveys of physical therapists**				Assessed by clinical notes				
	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	84	93	2	55	54	56	2
	(range of motion or flexibility only)							
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

Recommended	Assessed by surveys of physical therapists				Assessed by clinical notes			
	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

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3 *: two studies combined physical therapy treatment choices for a variety of shoulder conditions
4 **:there is no high-quality evidence supporting a recommended physical therapy intervention for
5 shoulder pain
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7 a: includes massage, mobilisation or manipulation

8 b: including advice on posture and advice to rest or reduce activity

9 **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								
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								
Other exercise ^d	98	88	100	5	75			1
Balneotherapy	16			1	-			
Iontophoresis	-				8			1

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38 *: 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)

39 **: 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)

40 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

41 b: includes massage, mobilisation or manipulation

42 c: advice promoting bed rest or time off work

43 d: exercise that is neither aerobic nor strengthening

44 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)*

Recommended	Inpatients				Outpatients**			
	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.

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3 **Figure legend**
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5 Figure 1. PRISMA flow diagram
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8 Figure 2. Median percentage of physical therapy treatment choices that involved treatments
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10 that are recommended, not-recommended and had no recommendation
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Supplementary Tables

Supplementary Table 1. Search strategy

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

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

CBT: cognitive behavioural therapy; ES: electrical stimulation; NSAIDs: non-steroidal anti-inflammatory drugs; SWD: short wave diathermy; TENS: transcutaneous electrical nerve stimulation; US: Ultrasound.

Supplementary Table 4. Summary of study characteristics by condition

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.

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

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.

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

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.

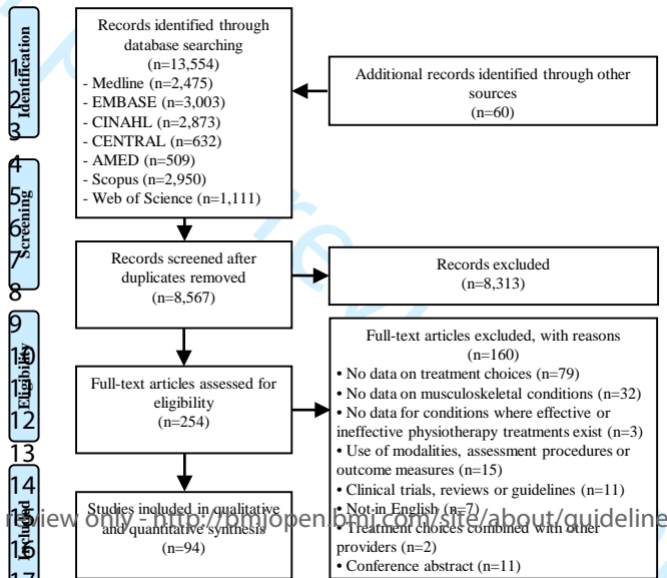
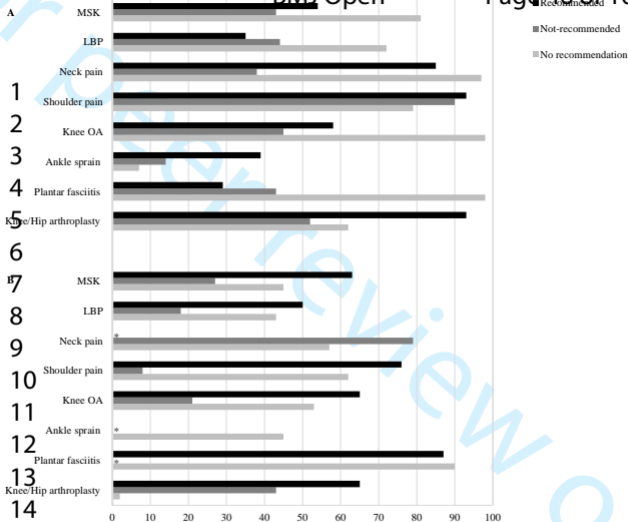


Figure 2. Median percentage of physical therapy treatment choices that are recommended, not-recommended and had no recommendation



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

16 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.

17 *No treatment choices in this category(s) could be identified

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

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3 **Supplementary Table 1: Search Strategy**
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5 **MEDLINE** via Ovid
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	Searches
<p>9 Low-value 10 care 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60</p>	<p>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</p>

	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	<ol style="list-style-type: none"> 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	<ol style="list-style-type: none"> 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	<ol style="list-style-type: none"> 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

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AMED via Ovid

	Searches
Low-value care	<ol style="list-style-type: none"> 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	<ol style="list-style-type: none"> 36. "physiotherap*".mp 37. exp Physical Therapy Modalities/ 38. "physical therap*".mp 39. 36 or 37 or 38

	40. 35 and 39
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Scopus

	Searches
Low-value care	<ol style="list-style-type: none"> 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

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Web of Science

	Searches
Low-value care	<ol style="list-style-type: none"> 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

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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? <ul style="list-style-type: none"> 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? <ul style="list-style-type: none"> 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? <ul style="list-style-type: none"> 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? <ul style="list-style-type: none"> 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? <ul style="list-style-type: none"> 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? <ul style="list-style-type: none"> 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) <ul style="list-style-type: none"> 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 <ul style="list-style-type: none"> • Advice and education to support self-management • Reassurance • Advice to keep active 	Primary guideline (1): <ul style="list-style-type: none"> • US, ES, TENS, IF • Poor advice^b • Acupuncture • Traction • External support^c 	Secondary guideline (2): <ul style="list-style-type: none"> • Superficial heat (4) (chronic low back pain) • Cold therapy (4) • SWD
	CONSIDER PROVIDING <ul style="list-style-type: none"> • Group exercise 	Systematic reviews: <ul style="list-style-type: none"> • McKenzie (acute or subacute low back pain) (3) 	Systematic reviews: <ul style="list-style-type: none"> • 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)
	CONSIDER combinations of two or more of: <ul style="list-style-type: none"> • Manual therapy^a • Exercise • Psychological therapy (with a CBT approach) 		
	Secondary guideline (2): SHOULD PROVIDE <ul style="list-style-type: none"> • Superficial heat (acute and sub-acute low back pain) 		No reviews: <ul style="list-style-type: none"> • 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
	Systematic reviews: <ul style="list-style-type: none"> • McKenzie (chronic low back pain) (3) 		

a: includes massage, mobilisation or manipulation;

b: advice promoting bed rest or time off work

c: corsets, belts, braces, sticks or taping

Neck pain and whiplash	RECOMMENDED	NOT-RECOMMENDED	NO RECOMMENDATION*
	<u>Acute neck pain/whiplash</u>	<u>Acute neck pain/whiplash</u>	<u>Acute neck pain/whiplash</u>
	Primary guideline (14):	Primary guideline (14):	Primary guideline (14):
	<i>SHOULD PROVIDE</i>		
	<ul style="list-style-type: none"> • Information on nature, management and course • Importance of maintaining activity and movement 	<ul style="list-style-type: none"> • Education alone • Strain-counter strain therapy • Relaxation massage • Electroacupuncture • ES 	<ul style="list-style-type: none"> • Supervised combined exercise • Supervised graded strengthening • Yoga • Strengthening alone
	<i>CONSIDER</i> structured education in combination with:		<ul style="list-style-type: none"> • Clinical massage • Laser
	<ul style="list-style-type: none"> • Multimodal care^a • Unsupervised range of motion/flexibility exercises 	<ul style="list-style-type: none"> • Clinic based heat • Poor advice^b • Heat therapy 	<ul style="list-style-type: none"> • Acupuncture • TENS, SWD • Traction • Relaxation therapy • CBT
	<u>Chronic neck pain/whiplash</u> (not mentioned above)	<u>Chronic neck pain/whiplash</u>	<u>Chronic neck pain/whiplash</u>
	Primary guideline (14):	Primary guideline (14):	Primary guideline (14):
	<i>CONSIDER</i> structured education in combination with:		
	<ul style="list-style-type: none"> • Range of motion/flexibility and strengthening exercises • Strengthening combined exercise • Yoga • Clinical massage • Laser 	<ul style="list-style-type: none"> • Strengthening alone • Strain-counter strain therapy • Relaxation massage • Electroacupuncture • ES, TENS, SWD • Relaxation therapy • Clinic based heat • Poor advice^b • Heat therapy 	<ul style="list-style-type: none"> • Education alone • Supervised graded strengthening • Acupuncture • Traction • Collar • CBT

Systematic reviews:

- US (15)
- Cold therapy (15)

- Other exercise^c (16)
- Manual therapy alone^d (17)
- Neural mobilisation (12)
- Ergonomic interventions (8)

All whiplash

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

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

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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): <i>MUST PROVIDE</i> <ul style="list-style-type: none"> • 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): <ul style="list-style-type: none"> • Acupuncture • Poor advice^c Secondary guideline (28): <ul style="list-style-type: none"> • SWD • IF • US • Laser Systematic reviews:	Primary guideline (27): <ul style="list-style-type: none"> • Other exercise^d Systematic reviews: <ul style="list-style-type: none"> • 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):	Primary guideline (31):	No reviews:
	<i>SHOULD PROVIDE</i>		
	<ul style="list-style-type: none"> • Exercise 	<ul style="list-style-type: none"> • US, ES, Laser • Joint mobilisation • Heat or cold therapy alone 	<ul style="list-style-type: none"> • Advice or education • IF, SWD, Diadynamic current
	<i>CONSIDER PROVIDING</i>		
	<ul style="list-style-type: none"> • Short period of immobilisation • Rest, ice, compression and elevation • External support^a 		

^a: includes braces, boots or taping

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Plantar fasciitis

	RECOMMENDED	NOT-RECOMMENDED	NO RECOMMENDATION*
	Primary guideline(32): SHOULD PROVIDE <ul style="list-style-type: none"> • Stretching • Night splints • Manual therapy^a • Taping MAY PROVIDE <ul style="list-style-type: none"> • Laser • Strengthening exercises and movement training • Education and counselling for weight loss • Rocker-bottom shoe and shoe rotation during the week 	Primary guideline (32): <ul style="list-style-type: none"> • Acupuncture • US, ES 	Primary guideline (32): <ul style="list-style-type: none"> • Shockwave No reviews: <ul style="list-style-type: none"> • 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: <ul style="list-style-type: none"> • Exercise (33-35) 	Systematic reviews: <ul style="list-style-type: none"> • Passive range of motion (36) • Cold therapy (37) 	Systematic reviews: <ul style="list-style-type: none"> • TENS (38) • Electrotherapy (39) • Acupuncture (39) No reviews: <ul style="list-style-type: none"> • Manual therapy^a • Advice or education • Biofeedback

^a: includes massage or mobilisation

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3 *: treatments that have not been mentioned in a clinical practice guideline or investigated in a systematic review do not have a citation.

4 CBT: cognitive behavioural therapy; ES: electrical stimulation; IF: interferential current; NSAIDs: non-steroidal anti-inflammatory drugs; SWD:
5 short wave diathermy; TENS: transcutaneous electrical nerve stimulation; US: Ultrasound.
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For peer review only

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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 (\leq 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

1 2 3 4 5 6 7 8	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
9 10 11	Mielenz 1997 (United States)	Acute LBP (<10 weeks)	Pts: 41 (13)	Not reported	Pts: 53%	1580 Pts	Audit of clinical notes
12 13 14 15 16 17	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
18 19 20 21	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
22 23 24 25	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
26 27 28 29	Pincus 2011 (United Kingdom)	Work-related LBP (duration not specified)	PTs: 47 (9.3)	24 (9.4)	Not reported	113 PTs	Survey without vignette
30 31 32 33 34 35 36 37	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
38 39 40 41 42 43 44 45 46	Reid 2002 (New Zealand)	Acute LBP (4 days)	Not reported	Not reported	Not reported	324 PTs	Survey with vignette

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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: < 35 y (60%). Pts: 43.5 (16.1)	Not reported	Pts: 58.9%	1,085 Pts	Treatment recording forms

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3	van der Valk	LBP (<1 week; ≥1 week and	Pts with LBP <1	Not reported	Pts with LBP	3,507 Pts
4	1995	<3 months; and ≥3 months)	week: 0-14y		<1 week:	
5	(Netherlands)		(0.6%); 15-24y		41.4%.	Treatment
6			(8.3%); 25-34y		Pts with LBP	recording
7			(21.5%); 35-44y		≥1 week and	forms
8			(25.4%); 45-54y		<3 months:	
9			(20.8%); 55-64y		47.1%.	
10			(13.9%); 65-74y		Pts with LBP	
11			(6.3%); >74y		≥3 months:	
12			(3.2%).		58.3%.	
13			Pts with LBP ≥1			
14			week and <3			
15			months: 0-14y			
16			(0.4%); 15-24y			
17			(11.0%); 25-34y			
18			(21.8%); 35-44y			
19			(23.8%); 45-54y			
20			(18.5%); 55-64y			
21			(12.0%); 65-74y			
22			(8.6%); >74y			
23			(3.9%).			
24			Pts with LBP ≥3			
25			months: 0-14y			
26			(0.7%); 15-24y			
27			(12.1%); 25-34y			
28			(21.7%); 35-44y			
29			(20.4%); 45-54y			
30			(18.9%); 55-64y			
31			(13.2%); 65-74y			
32			(8.2%); >74y			
33			(4.9%).			
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39	Neck pain or whiplash					
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1 2 3 4 5 6	Ayanniyi 2007 (Nigeria)	Neck pain (no duration specified)	Pts: 53.4 (11.2)	Not reported	Pts: 56.8%	532 Pts	Audit of clinical notes
7 8 9 10 11 12 13	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
14 15 16 17 18	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
19 20 21 22 23	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
24 25 26 27 28	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
29 30 31 32	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
33 34 35 36	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
37 38 39 40 41 42 43 44 45 46	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

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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
Roebroek 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 fasciitis						
Fraser 2017 (United States)	Plantar fasciitis (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 fasciitis (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

1 2 3 4 5 6 7 8 9	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
10 11 12 13	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
14 15 16 17 18 19 20 21 22	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
23 24 25 26	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
27 28 29	Hurkmans 2012 (Netherlands)	Rheumatoid arthritis	PTs: 43 (10.8)	19 (10.3)	PTs: 53%	233 PTs	Survey without vignette
30 31 32 33 34	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
35 36 37 38 39 40 41 42 43 44 45 46	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 \geq 40 years old)	Not reported	13.7 (10.8)	PTs: 77.1%	83 PTs	Survey without vignette
Peterson 2005 (Sweden)	Chronic epicondylitis (\geq 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

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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*

Recommended	Assessed by surveys of physical therapists				Assessed by clinical notes				
	Median (% [€])	Q1	Q3	N	Median (% [¥])	Q1	Q3	N	
<i>SHOULD PROVIDE</i>									
Aerobic or strengthening exercise	-				86				1
No-recommendation									
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*

No-recommendation	Assessed by surveys of physical therapists				Assessed by clinical notes			
	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*

No-recommendation	Assessed by surveys of physical therapists				Assessed by surveys of patients			
	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*

Recommended	Assessed by surveys of physical therapists				Assessed by clinical notes				
	Median (%[€])	Q1	Q3	N	Median (%[¥])	Q1	Q3	N	
<i>MUST PROVIDE</i>									
Advice to keep active	87			1	-				
Advice and education to support self-management	85			1	-				
<i>CONSIDER PROVIDING</i>									
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									
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									
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

Recommended	Assessed by surveys of physical therapists				Assessed by clinical notes			
	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

No-recommendation	Assessed by surveys of physical therapists				Assessed by clinical notes			
	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

Recommended	Assessed by surveys of physical therapists				Assessed by clinical notes			
	Median (% [€])	Q1	Q3	N	Median (% [¥])	Q1	Q3	N
<i>SHOULD PROVIDE</i>								
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			
	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	-			
<i>Due to a fall</i>								

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*

No-recommendation	Assessed by surveys of physical therapists				Assessed by clinical notes			
	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

Recommended	Assessed by surveys of physical therapists				Assessed by clinical notes			
	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

Dingemans 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

No-recommendation	Assessed by surveys of physical therapists				Assessed by clinical notes			
	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

Recommended	Assessed by surveys of physical therapists				Assessed by clinical notes			
	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

Recommended	Assessed by surveys of physical therapists				Assessed by clinical notes			
	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)

ORTHOPEDECS

LUMBAR DISCECTOMY AND FUSION (surveys of physical therapists)

Recommended	Inpatients				Outpatients			
	Median (% [€])	Q1	Q3	N	Median (% [¥])	Q1	Q3	N
<i>Discectomy</i>								
High-intensity exercise ^a	81	81	81	1	-			

Rehabilitation starting 4-6 weeks post-surgery	-	15	1
<i>Fusion</i>			
Exercise and CBT	-	61	1
No-recommendation	Median (%[€])	Q1	Q3
Other exercises ^{b, c}	96	94	97
Advice, education or reassurance	86	79	92
Neural mobilisation	57		1
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

No-recommendation	Assessed by surveys of physical therapists				Assessed by clinical notes			
	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

No-recommendation	Assessed by surveys of physical therapists				Assessed by clinical notes			
	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

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3 nerve stimulation; US: Ultrasound.

4 €: the percentage of physical therapists that report they provide (or would provide) high-value
5 care, low-value care and care of unknown value for a given condition.

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7 ¥: the percentage of patients that received high-value care, low-value care or care of unknown
8 value from a physical therapist for a particular condition as determined by audits of clinical
9 notes, treatment recording forms, or surveys of patients.
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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 fasciitis	1	1	1	1	1	0	1	1	7	Audit of billing codes

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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 fasciitis	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

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46
Roebroek 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																																		

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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.

For peer review only



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. 1 st 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

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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

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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.



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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

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