The clinical course of acute, subacute and persistent low back pain: a systematic review and meta-analysis

Sarah B. Wallwork PhD, Felicity A. Braithwaite PhD, Mary O'Keeffe PhD, Mervyn J. Travers PhD, Simon J. Summers PhD, Belinda Lange PhD, Dana A. Hince PhD, Leonardo O.P. Costa PhD, Luciola da C. Menezes Costa PhD, Belinda Chiera PhD, G. Lorimer Moseley PhD

Cite as: *CMAJ* 2024 January 22;196:E29-46. doi: 10.1503/cmaj.230542

Abstract

Background: Understanding the clinical course of low back pain is essential to informing treatment recommendations and patient stratification. Our aim was to update our previous systematic review and meta-analysis to gain a better understanding of the clinical course of acute, subacute and persistent low back pain.

Methods: To update our 2012 systematic review and meta-analysis, we searched the Embase, MEDLINE and CINAHL databases from 2011 until January 2023, using our previous search strategy. We included prospective inception cohort studies if they reported on participants with acute (< 6 wk), subacute (6 to less than 12 wk) or persistent (12 to less than 52 wk) nonspecific low back pain at study entry. Primary outcome measures included pain and disability (0–100 scale). We assessed risk of bias of included studies using a modified tool and assessed the level of confidence in pooled estimates using the Grading of Recommendations, Assessment, Development and Evaluation (GRADE) tool. We used a mixed model design to calculate pooled estimates (mean, 95% confidence interval [CI]) of pain and disability at 0, 6, 12, 26 and 52 weeks. We treated time in 2 ways: time since study entry (inception time uncorrected) and time since pain onset (inception time corrected). We transformed the latter by adding the mean inception time to the time of study entry.

Results: We included 95 studies, with 60 separate cohorts in the systematic review (n = 17 974) and 47 cohorts (n = 9224) in the meta-analysis. Risk of bias of included studies was variable, with poor study attrition and follow-up, and most studies did not select participants as consecutive cases. For the acute pain cohort, the estimated mean pain score with inception time uncorrected was 56 (95% CI 49–62) at baseline, 26 (95% CI 21–31) at 6 weeks, 22 (95% CI 18–26) at 26 weeks and 21 (95% CI 17–25) at 52 weeks (moderate-certainty evidence). For the subacute pain cohort, the mean pain score was 63 (95% CI 55–71) at baseline, 29 (95% CI 22–37) at 6 weeks, 29 (95% CI 22–36) at 26 weeks and 31 (95% 23–39) at 52 weeks (moderate-certainty evidence). For the persistent pain cohort, the mean pain score was 56 (95% CI 37–74) at baseline, 48 (95% CI 32–64) at 6 weeks, 43 (95% CI 29–57) at 26 weeks and 40 (95% CI 27–54) at 52 weeks (very low–certainty evidence). The clinical course of disability was slightly more favourable than the clinical course of pain.

Interpretation: Participants with acute and subacute low back pain had substantial improvements in levels of pain and disability within the first 6 weeks (moderate-certainty evidence); however, participants with persistent low back pain had high levels of pain and disability with minimal improvements over time (very low–certainty evidence). Identifying and escalating care in individuals with subacute low back pain who are recovering slowly could be a focus of intervention to reduce the likelihood of transition into persistent low back pain. **Protocol registration:** PROSPERO — CRD42020207442

Low back pain is a leading cause of disability worldwide,[1,2] affecting about 570 million people globally. About 39% of the adult population will have low back pain in any given year.[3] Low back pain is costly; in the United States, health care spending on low back pain was $134.5 billion annually between 1996 and 2016[4] and is increasing.[5] Clinical guidelines recommend triage to identify symptoms that require diagnostic investigation (prevalence of serious pathology < 1% in primary care).[6] Nonspecific low back pain, where no specific pathoanatomical cause can be identified, is the most common type of low back pain.[7] Management focuses on reducing pain and its consequences through education and reassurance, nonpharmacological treatments (e.g., heat, relative rest, staying active), analgesic medicines (e.g., nonsteroidal anti-inflammatory drugs) and timely review.[6]

Existing literature suggests that the clinical course of an episode of low back pain is favourable.[8,9] However, recurrence is common (about 69% of patients will experience recurrence within 12 months)[10] and pain persists for many patients.[11] Several studies have shown that acute low back pain is not always associated with a favourable outcome,[7] including 2 systematic reviews that showed that, although many patients recover within the first month, low levels of pain and disability often persist.[12,13]

In 2012, we conducted a meta-analysis (n = 11 166 participants) and concluded that patients with acute or persistent low back pain usually had positive trajectories, with most showing substantial improvement in pain and disability within the first 6 weeks.[8] We acknowledged a critical limitation, however, that those with subacute low back pain (i.e., duration 6–12 wk at study entry) were included in the group with persistent low back pain, who typically had been experiencing back pain for more than 12 weeks at study entry. This may have resulted in improved outcomes in the persistent group. In addition, our review did not consider different populations (e.g., by age of cohorts) or confounding factors (e.g., presence of radiculopathy or radicular pain), assess the certainty of the evidence or assess study attrition when assessing risk of bias.

A better understanding of the clinical course of low back pain across various pain durations and populations is important in the early detection of slow recovery and escalation of care at the patient level, and in verifying that recommendations in clinical guidelines to reassure patients about a favourable prognosis are appropriate.[14–24] We updated our previous meta-analysis seeking to understand the clinical course of acute (< 6 wk), subacute (6 to less than 12 wk) and persistent (12 to less than 52 wk) low back pain, taking into account age and neuropathic spine-related leg pain.[8]

Methods

We conducted a systematic review and meta-analysis. The search strategy, data extraction and methodological quality assessment was identical to that of our previous publication,[8] except for an additional methodological quality assessment item and a variation to the data analysis (outlined below).

The protocol was prospectively registered with PROSPERO (CRD42020207442). All deviations from that protocol are noted and reporting is in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement.[25]

Data sources and searches

The search strategy from the previous review underwent a Peer Review of Electronic Search Strategies (PRESS) review by an experienced university librarian to confirm that the databases and search terms on each platform were still appropriate.[26] With no revisions required, we searched the MEDLINE, Embase and CINAHL databases from 2011 — overlapping with our previous review's search window by approximately 1 year — until Jan. 16, 2023. We sought cohort studies published in the peer-reviewed literature with no language or age restrictions applied, and searched the reference lists of included studies for additional studies. The search strategy can be found in Appendix 1, available at www.cmaj.ca/lookup/doi/10.1503/cmaj.230542/tab-related-content.

Study selection

Study selection criteria were identical to those of the previous review. We considered prospective inception cohort studies for inclusion if they had a well-defined inception cohort and included participants with acute, subacute or persistent nonspecific low back pain. We defined low back pain as pain or discomfort localized below the costal margins and above the inferior gluteal folds, with or without leg pain. Nonspecific low back pain is a distinct classification of low back pain, where there is no specific identified cause for the low back pain (e.g., cancer, infection, fracture).[7]

To be included, studies needed to report outcome measures for pain intensity (e.g., a visual analogue scale) or disability (or a self-assessment of physical functioning, such as the Roland Morris Disability Questionnaire), or a global measure of recovery (as per each study's definition of recovery). These criteria are aligned with core outcome measures for clinical trials of nonspecific low back pain.[27,28] Our primary outcomes were pain and disability, while global measure of recovery was a secondary outcome.

We excluded studies reporting participants with low back pain for greater than 12 months as we were interested in capturing the trajectory of low back pain within the first year of pain onset, during which care escalation might be most useful.[13] We also excluded retrospective cohorts, experimental or interventional studies, any cohort that was unlikely to follow the normal trajectory (e.g., pregnancy), mixed populations (e.g., studies of patients with either neck pain or low back pain, unless participants with low back pain could be easily differentiated), participants with low back pain specifically recruited with other comorbidities (e.g., osteoarthritis), studies that reported only baseline outcomes or prognostic factors without longitudinal follow-up and studies specifically recruiting only participants with both low back pain and leg pain.

We included studies with participants who had poorly differentiated leg pain along with low back pain, so long as these participants were not specifically sought after, because most studies in our previous review did not exclude those participants. Furthermore, the terminology used to describe spine-related leg pain is inconsistently reported in the literature.[29]

A team of authors (S.B.W., F.A.B., M.O., M.J.T., B.L. and S.J.S.) reviewed titles and abstracts to exclude irrelevant studies. This screening was conducted independently and in duplicate using Covidence. Reviewer pairs resolved conflicts through discussion. For all studies that passed this first screening, we obtained the full-text article and assessed it for inclusion. The team reviewed full-text studies independently and in duplicate but reviewer pairs were modified. Disagreements were resolved by consensus, or a third reviewer from within the team was consulted to make the final decision. We pooled studies that met the inclusion criteria with the studies from our previous review.

Data extraction

Two reviewers (S.B.W. and one of F.A.B., M.O., M.J.T., B.L. and S.J.S.) extracted data independently and in duplicate using a custom spreadsheet identical to that used in our previous review (Appendix 2, available at www.cmaj.ca/lookup/doi/10.1503/cmaj.230542/tab-related-content). Reviewers resolved discrepancies by consensus. We sought missing data by contacting the corresponding author of each study, with up to 3 follow-up emails if no response was received.

Risk of bias and certainty of evidence

We are unaware of any risk of bias tools designed specifically for systematic reviews of the clinical course of a health condition. Therefore, we adapted the risk of bias assessment tool that we used in our original review,[8] itself an adaptation of the methodological criteria outlined by Altman.[30] This allowed us to assess bias domains that are specific to clinical course studies, including sampling (2 items), completeness of follow-up (2 items) and outcome reporting (1 item).

For this study, we added an extra measure (study attrition) in our risk of bias assessment, taken from the Quality In Prognosis Studies (QUIPS) tool.[31] This addition was a deviation from our registered protocol and was done because we considered it important to capture whether the prognosis outcomes at follow-up were representative of the baseline sample. We applied this additional measure retrospectively to all studies in our previous review so that we captured all 6 measures of bias across all included studies (Appendix 3, available at www.cmaj.ca/lookup/doi/10.1503/cmaj.230542/tab-related-content). Two reviewers (S.B.W., and one of F.A.B., M.O., M.J.T., B.L. and S.J.S.) conducted the risk of bias assessment independently and in duplicate. Discrepancies were resolved by consensus.

To assess the level of confidence in pooled estimates of means and 95% confidence intervals (CIs) of pain and disability scores, we used the Grading of Recommendations, Assessment, Development and Evaluation (GRADE) approach in accordance with adaptations for prognostic research.[32] Our previous review did not include a GRADE assessment and its addition was a deviation from our registered protocol.

Two reviewers (S.B.W. and F.A.B.) conducted the GRADE assessment independently and in duplicate for each outcome measure (pain and disability) for each group (acute, subacute and persistent). Discrepancies were resolved by consensus with a third reviewer (G.L.M.). Appendix 4, available at www.cmaj.ca/lookup/doi/10.1503/cmaj.230542/tab-related-content, provides the GRADE assessment criteria.

Statistical analysis

We conducted meta-analyses on aggregate data, where possible, using pain and disability outcome data. In the absence of mean and standard deviation (SD) in the included studies, we used the median, interquartile range, range and sample size to estimate them where possible, following Wan and colleagues' methodology.[33] We converted pain and disability outcomes to a common 0–100 scale by subtracting the minimum scale value from the score, and dividing this amount by the difference between the maximum and minimum scale value, multiplying the overall result by 100; SDs were increased proportionally.

We classified cohorts into groups by acute (< 6 wk), subacute (6 to less than 12 wk) and persistent low back pain (12 to less than 52 wk), based on the duration of pain (mean or median) at study entry. We classified persistent low back pain as pain for at least 12 weeks (but less than 12 mo), which is well established among clinical guidelines.[14] We classified acute and subacute low back pain to be consistent with the definition of acute in the previous review (< 6 wk), and to align with most clinical guidelines.[14] The inclusion of a subacute group was a deviation from our registered protocol.

Consistent with our previous review, when means and medians of pain duration were not available, we used the midpoint of the inception time range. Where a cohort spanned multiple groups (e.g., 2–12 mo, both subacute and persistent), we contacted the authors to request that their data be split according to our classifications. Where this was not possible, we used the mean, median or midpoint of the inception time to categorize that cohort.

We modelled pain and disability outcomes as a function of time using Stata 18 software (StataCorp), captured in 2 ways. The first approach was with inception time uncorrected, which captured time since entry into the study. The second approach was with inception time corrected, which captured time since pain onset, calculated by adding the mean or median inception time, with time modelled as a continuous variable.

We fitted a separate meta-regression model to the data for each outcome by patient cohort combination. To account for the nonlinear relationship between pain, disability and time, we used fractional polynomial transformations, which allowed the shape of the fitted line to vary by including functions of time (commonly 2) as predictors of the outcome (Appendix 5, available at www.cmaj.ca/lookup/doi/10.1503/cmaj.230542/tab-related-content). We scaled time (uncorrected) for the acute cohort by adding 1 week to time. We did not use scaling for the subacute and persistent cohorts with inception corrected because time was sufficiently greater than zero to not hinder estimation.

We included random effects for study and for the transformed time coefficients in all models to account for dependence in repeated observations and differences in time course between studies. The random effects were allowed to correlate (using an unstructured variance–covariance matrix) if this further improved model fit and achieved convergence. We chose the best fitting models using the smallest Bayesian Information Criteria closest to 0. We inspected residuals to assess goodness of fit. We weighted means using the inverse of the sum of the study sampling variances extracted for each time point and estimates of residual variance, as is standard in the meta meregress program in Stata 18 (Appendix 6, available at www.cmaj.ca/lookup/doi/10.1503/cmaj.230542/tab-related-content).

We used the regression model to obtain pooled estimates for means and 95% CIs of pain and disability scores at 0, 6, 12, 26 and 52 weeks, although these were not computed if it required extrapolation from the observed data.

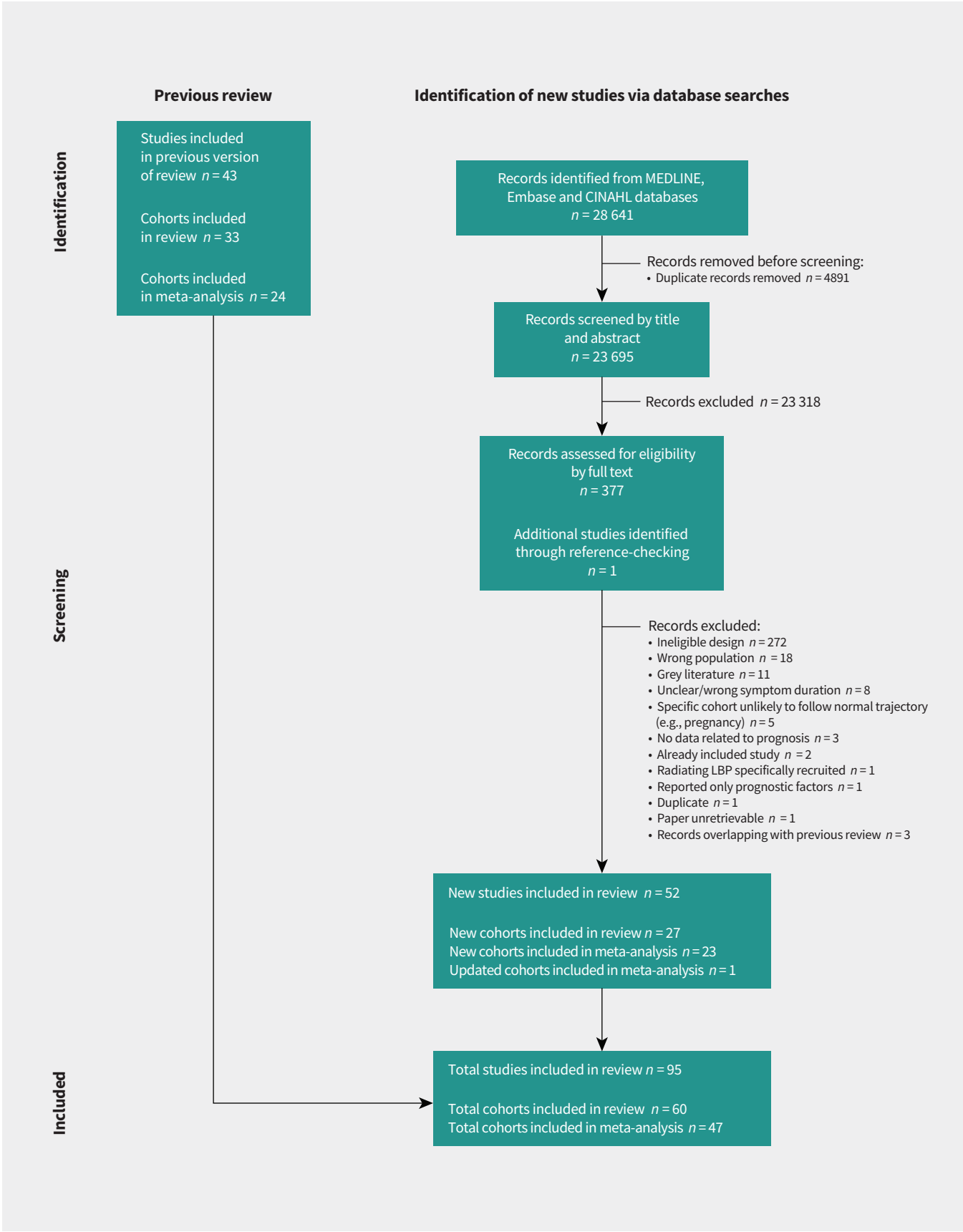

Figure 1: Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow diagram outlining selection of studies for inclusion. Note: LBP = low back pain.

To compare the trajectories of pain and disability, we modelled both outcomes simultaneously for all 3 cohorts using the same modelling process except that we included the fixed effect of outcome (pain or disability) in the model and allowed it to interact with time. We considered an interaction of p less than 0.05 as evidence of differing trajectories between the 2 outcome measures.

Because of the heterogeneity we observed on the definition of recovery between studies, we presented the global recovery outcomes (our secondary outcome) for each study descriptively.

Sensitivity analysis

In a deviation from our previous review and registered protocol, we undertook several sensitivity analyses. Because of the high risk of selection bias, we planned sensitivity analyses (for each group of participants with acute, subacute or persistent low back pain) to include only studies that had a high follow-up rate (> 80% of participants).[34,35] As it is unclear whether the clinical course of low back pain differs among people with or without radicular pain or radiculopathy, we conducted sensitivity analyses to include only studies that specifically excluded people with radicular pain or radiculopathy. Finally, because of lack of representation of younger (< 18 yr) and older (> 60 yr) participants, we conducted sensitivity analyses to include only studies reporting on participants aged 18–60 years. The modelling process for these subgroups was identical to that of the primary analyses. We considered only the acute and subacute cohorts, given insufficient studies involving cohorts with persistent pain.

Ethics approval

As this study was a systematic review and meta-analysis of published studies, ethics approval was not required.

Results

Our search yielded 28 641 articles and we removed 4891 duplicates. After we screened 23 695 titles and abstracts and 377 full papers, 54 studies met the inclusion criteria (Figure 1). Reference checking yielded 1 additional study but the cohort itself was already included.[36] Three studies[37–39] were identified in both the original review and the current review (because of overlap in search period); these data were not re-extracted. We extracted data from 52 new articles.[36,40–90]

We included 27 new cohorts in the updated review and 23 new (and 1 updated) cohorts in the pooled analyses (Appendix 7, available at www.cmaj.ca/lookup/doi/10.1503/cmaj.230542/tab-related-content). Once pooled with articles from the previous review, we included 95 articles[36–130] in this review, reporting on 60 cohorts (17 974 participants). The pooled analyses include data from 47 cohorts (9224 participants with pain assessment and 8957 participants with disability assessment) (Table 1). Global recovery outcomes were reported in 37 cohorts (13 145 participants).

Risk of bias and certainty of evidence

The overall risk of bias of included cohorts was variable (Appendix 8, available at www.cmaj.ca/lookup/doi/10.1503/cmaj.230542/tab-related-content). The criterion regarding study attrition was poor; most studies (n = 47, 82.4%) did not report on participants lost to follow-up or, if reported, the participants who were available at follow-up were not representative of the initial study sample. Most studies (n = 31, 54.4%) did not select participants as consecutive cases and participant follow-up rate was poor.

The overall level of confidence in pooled estimates for mean pain and disability scores (and 95% CIs) in both the acute and subacute groups was rated as moderate certainty (GRADE level 3) and for the persistent group as very low certainty (GRADE level 1) (Table 2 and Appendix 9, available at www.cmaj.ca/lookup/doi/10.1503/cmaj.230542/tab-related-content).

Clinical course of pain and disability

Pain

Pain outcomes were reported for 43 cohorts, included in the meta-analysis. We classified 31 cohorts as having acute low back pain, 10 cohorts as having subacute low back pain and 3 cohorts as having persistent low back pain. The trajectories of pain for all 3 cohorts are shown in Figure 2 and pooled estimates of mean pain scores and 95% CIs are shown in Table 3.

Trajectories for the acute low back pain group showed a large reduction in pain initially (baseline to 6 wk: mean reduction 30 out of 100), after which time low-intensity pain persisted (6–26 wk: mean reduction 4 out of 100; 26–52 wk: mean reduction 1 out of 100, with a mean pain score of 21 out of 100 at 52 wk).

The subacute group showed a similar, but less favourable trend to the acute group, with a smaller reduction in pain scores (baseline to 6 wk: mean reduction 34 out of 100; 6–26 wk: no change in mean scores; 26–52 wk: mean reduction 2 out of 100, with a mean pain score of 31 out of 100 at 52 wk).

The persistent group showed greater variability in trajectory and consistently high pain intensity over time (baseline to 6 wk: mean reduction 8 out of 100; 6–26 wk: mean reduction 5 out of 100; 26–52 wk: mean reduction 3 out of 100, with a mean pain score of 40 out of 100 at 52 wk).

Disability

Disability outcomes were reported for 43 cohorts, included in the meta-analysis. We classified 31 cohorts as having acute low back pain, 9 as having subacute low back pain and 4 as having persistent low back pain. The trajectories of disability for all 3 cohorts are shown in Figure 3 and pooled estimates of mean disability scores and 95% CIs are shown in Table 3.

Trajectories for the acute low back pain group showed a large reduction in disability initially (baseline to 6 wk: mean reduction 21 out of 100), after which time low disability persisted (6–26 wk: mean reduction 4 out of 100; 26–52 wk: mean reduction 1 out of 100, with a mean disability score of 17 out of 100 at 52 wk).

The subacute group showed a similar, but less favourable, trend to the acute group, with a smaller reduction in disability scores (baseline to 6 wk: mean reduction 15 out of 100; 6–26 wk: mean reduction 4 out of 100; 26–52 wk: no change in mean scores, with a mean disability score of 25 out of 100 at 52 wk).

The persistent group showed greater variability in trajectory and persisting moderate disability over time (baseline to 6 wk:

Table 1 (part 1 of 5): Characteristics of included studies

Study	Setting	Geographic area	No. of participants	Age inclusion criteria, yr	Onset of pain before study entry	Pain duration category for meta-analysis*	Outcomes extracted	Follow-up
Bakker et al., 2007[91]	General practice	Netherlands	97	No info	< 6 wk	Acute	Pain (NRS 0–10), recovery rates	6 mo
Basinski et al., 2022[83]	Emergency department of the University Clinical Centre	Poland	110	18–65	< 3 mo	–	Recovery rates	3 mo
Ben Ami et al., 2020[40]	Three outpatient physical therapy clinics	Israel	150	≥ 18	< 12 wk	Subacute	Pain (NPRS 0–10), disability (RMDQ 0–24)	3 mo
Besen et al., 2015;[56] Carstens et al., 2014;[43] Shaw et al., 2013;[36] Shaw et al., 2011[65]	Private medical occupational clinics	United States	496	≥ 18	< 14 d	Acute	Pain (NPRS 0–10), disability (QBPDS 0–100)	1 wk and 3 mo
Bousema et al., 2007[92]	General practice and advertisement	Netherlands	124	18–60	4–7 wk	Acute	Pain (VAS 0–100), disability (QBPDQ 0%–100%), recovery rates	12 mo
Breen et al., 2011[37]	Two primary care trust localities	England	97	18–65	< 12 wk	Acute	Pain (NRS 0–10), disability (RMDQ 0–24)	8 wk
Carey et al., 1995;[93] Sundararajan et al., 1998[94]	Urban and rural primary care and chiropractic, orthopedic and neurosurgery practice and health maintenance organization	United States	1633	No info	< 10 wk	–	Recovery rates	2, 4, 8, 12 and 24 wk
Carey et al., 2000[95]	Urban and rural primary care and chiropractic, orthopedic and neurosurgery practice, and health maintenance organization	United States	96	≥ 18	12–22 wk	Persistent	Disability (RMDQ 0–23), recovery rates	18 mo
Costa et al., 2009[96]	Primary care (general practitioners, physiotherapists and chiropractors)	Australia	379	≥ 14	12 wk	Persistent	Pain (1–6), disability (1–5), recovery rates	9 and 12 mo
Coste et al., 1994[97]	Primary care	France	103	≥ 18	< 72 h	Acute	Pain (VAS 0–100), disability (RMDQ 0–24), recovery rates	8 and 15 d; 1, 2 and 3 mo
Coste et al., 2004[98]	Primary care or rheumatology	France	113	≥ 18	< 72 h	Acute	Pain (VAS 0–100), disability (RMDQ 0–24), recovery rates	8 and 15 d; 1, 2 and 3 mo

Table 1 (part 2 of 5): Characteristics of included studies

Study	Setting	Geographic area	No. of participants	Age inclusion criteria, yr	Onset of pain before study entry	Pain duration category for meta-analysis*	Outcomes extracted	Follow-up
Elfering et al., 2014;[44] Melloh et al., 2011;[39] Melloh et al., 2012;[72] Melloh et al., 2013;[57] Melloh et al., 2013;[71] Melloh et al., 2013;[68] Melloh et al., 2013;[69] Melloh et al., 2015;[73] Melloh et al., 2015[70]	Primary care	New Zealand	315	18–65	< 12 wk	Acute	Pain (VAS 0–100), disability (ODI 0–100), recovery rates	3, 6 and 12 wk; 6 mo
Epping-Jordan et al., 1998;[99] Shaw et al., 2007;[100] Wahlgren et al., 1997;[101] Williams et al., 1998[102]	Naval medical centre	United States	140	18–50	6–10 wk	Subacute	Pain (DDS 0–20), disability (SIP 0%–100%), recovery rates	6 and 12 mo (after pain onset)
Faber et al., 2006[103]	General practice and occupational health	Netherlands	103	No info	3–12 wk	–	None	3 and 6 mo
Ferguson et al., 2000;[105] Ferguson et al., 2001[104]	Primary and urgent care facilities	United States	32	No info	< 4 wk	Acute	Pain (0–5), disability (VAS 0–150), recovery rates	2, 4, 6, 8 and 10 wk
Gatchel et al., 1995;[106] Gatchel et al., 1995[107]	Industrial medicine clinic and orthopedic practices	United States	421	No info	< 6 wk	–	None	6 and 12 mo
Grotle et al., 2005;[109] Grotle et al., 2007[108]	Primary care	Norway	123	18–60	< 3 wk	Acute	Pain (NRS 0–10), disability (RMDQ 0–24), recovery rates	1, 2, 3 and 4 wk; 3, 6, 9 and 12 mo
Gurcay et al., 2009[110]	Tertiary care referral hospital	Turkey	99	No info	< 3 wk	–	Recovery rates	1, 2, 4, 8 and 12 wk
Hallegraeff et al., 2020;[41] Hallegraeff et al., 2021[79]	Primary care physiotherapy practices	Netherlands	204	18–60	< 6 wk	Acute	Pain (NPRS 0–10), disability (PDI 0–70)	12 wk
Hasenbring et al., 2012[111]	General or orthopedic practice	Germany	177	≥ 18	< 12 wk	Acute	Pain (NRS 0–10), disability (PDI 0–10)	6 mo
Hazard et al., 1996;[112] Reid et al., 1997[113]	Vermont Department of Labor and Industry	United States	166	18–60	Within 11 d of low-back pain	–	None	3 mo

Table 1 (part 3 of 5): Characteristics of included studies

Study	Setting	Geographic area	No. of participants	Age inclusion criteria, yr	Onset of pain before study entry	Pain duration category for meta-analysis*	Outcomes extracted	Follow-up
Hendrick et al., 2013[42]	Public advertising within primary care (physiotherapy clinics, general practice), and newspaper advertisements	New Zealand	91	18–65	≤ 6 wk	Acute	Pain (VAS 0–100), disability (RMDQ 0–24)	3 mo
Heneweer et al., 2007[114]	Primary care physical therapy centres	Netherlands	80	21–60	< 12 wk	Subacute	Pain (VAS 0–100), disability (QBPDQ 0%–100%), recovery rates	2, 4, 8 and 12 wk
Henschke et al., 2008[115]	Primary care (general practitioners, physiotherapists and chiropractors)	Australia	969	≥ 14	> 24 h but < 2 wk	Acute	Pain (1–6), disability (1–5), recovery rates	6 wk; 3 and 12 mo
Jenkins et al., 2022;[90] Jenkins et al., 2023[89]	Local hospitals, primary care, newspapers/online advertisements, flyers and social media	Australia	120	No info	> 24 h but < 6 wk	Acute	Pain (NRS 0–10), disability (RMDQ), recovery rates	6 mo
Karran et al., 2017[49]	Spinal outpatient clinic at public hospital	Australia	189	18–75	< 12 mo	Subacute and persistent	Pain (NRS 0–10), disability (NRS 0–10), recovery rates	4 mo
Klenerman et al., 1995[116]	General practice	England	300	No info	< 1 wk	–	Recovery rates	2 and 12 mo
Klyne et al., 2018;[62] Klyne et al., 2020;[75] Klyne et al., 2020;[77] Klyne et al., 2022;[82] Klyne et al., 2022[85]	Local community, social media and recruitment agency	Australia	133	18–50	Within 2 wk	Acute	Pain (NRS 0–10), disability (RMDQ 0–24), recovery rates	3, 6, 9 and 12 mo
Knoop et al., 2022[88]	Primary care (physiotherapists)	Netherlands	247	18–85	≤ 1 mo	Acute	Pain (NRS 0–10), recovery rates	2 wk and 3 mo
Koleck et al., 2006[117]	General practice	France	99	No info	10–90 d	Subacute	Pain (VAS 0–10), recovery rates	12 mo
Kovacs et al., 2005[118]	Primary care centres	Spain	366	No info	< 12 wk	Acute	Pain (VAS 0–10), disability (RMDQ 0–24)	2 and 8 wk
Lehmann et al., 1993[119]	Occupational medicine	United States	60	18–65	2–6 wk	–	None	6 mo
Machado et al., 2016;[59] Pozzobon et al., 2019[60]	Primary care (physiotherapists, general practitioners and chiropractors)	Australia	999	No info	< 1 wk	–	Recovery rates	6 wk; 3 and 12 mo

Table 1 (part 4 of 5): Characteristics of included studies

Study	Setting	Geographic area	No. of participants	Age inclusion criteria, yr	Onset of pain before study entry	Pain duration category for meta-analysis*	Outcomes extracted	Follow-up
Medeiros et al., 2018[50]	Emergency department	Brazil	200	18–80	< 6 wk	Acute	Pain (NPRS 0–10), disability (RMDQ 0–24), recovery rates	6 and 26 wk
Mehling et al., 2011;[51] Mehling et al., 2012;[58] Mehling et al., 2015;[52] Mehling et al., 2015[63]	Primary care — members of the largest health maintenance organization	United States	605	18–70	Up to 30 d	Acute	Pain (NRS 0–10), disability (RMDQ 0–24), recovery rates	6 mo and 2 yr
Morf et al., 2021[76]	Hospitals, private physiotherapy practices and university campus	Switzerland	103	18–65	< 4 wk	Acute	Pain (NRS 0–10), disability (ODI 0–100)	3 and 6 mo
Muller et al., 2019[45]	Primary care	Switzerland	130	No info	< 6 wk	–	Recovery rates	6 mo
Poiraudeau et al., 2006[120]	Rheumatologist practices	France	443	18+	4–12 wk	Subacute	Pain (0–4), disability (QBPDQ 0–20), recovery rates	3 mo
Ranger et al., 2020[84]	SpineData registry (Denmark)	Denmark	511	No info	2–12 mo	Subacute and persistent	Pain (NRS 0–10), disability (RMDQ 0–23 — Danish version)	12 mo
Reeser et al., 2001[121]	Primary and tertiary care facilities	United States	368	18–65	< 6 wk	Acute	Disability (MODEMS 0–100)	6 wk; 3 and 12 mo
Schiottz-Christensen et al., 1999[122]	General practices	Denmark	524	18–60	< 14 d	–	Recovery rates	1, 6 and 12 mo
Schulz et al., 2016[54]	Emergency department	Australia	29	18–65	< 3 mo	Subacute	Pain (NPRS 0–10), disability (RMDQ 0–24)	2 and 6 wk
Seyedmehdi et al., 2016[64]	Occupational setting (rubber factory)	Iran	511	No info	< 2 wk	–	Recovery rates	3, 6, 9 and 12 mo
Sharpe et al., 2014[67]	Physiotherapy clinics, general practice and newspaper advertisements	Australia	100	18–75	< 3 mo	Acute	Pain (VAS 0–10), disability (RMDQ 0–24), recovery rates	3 and 6 mo
Shaw et al., 2005;[124] Shaw et al., 2007;[123] Shaw et al., 2009;[125] Shaw et al., 2012;[53] Shaw et al., 2018[55]	Community-based occupational health clinics	United States	568	≥ 18	< 14 d	Acute	Pain (VAS 0–10), disability (RMDQ 0–100)	1 and 3 mo
Shaw et al., 2011[46]	Community-based medical clinics	United States	97	≥ 18	< 14 d	Acute	Pain (NPRS 0–10), disability (RMDQ 0–100), recovery rates	1 and 3 mo

Table 1 (part 5 of 5): Characteristics of included studies

Study	Setting	Geographic area	No. of participants	Age inclusion criteria, yr	Onset of pain before study entry	Pain duration category for meta-analysis*	Outcomes extracted	Follow-up
Shojaei et al., 2020[61]	Primary physician referral	United States	29	No info	< 3 mo	Subacute	Pain (Wisconsin brief pain inventory 0–10), disability (RMDQ 0–24)	3 and 6 mo
Sieben et al., 2002[126]	General practices	Netherlands and Belgium	34	18–65	< 2 wk	Acute	Disability (RMDQ 0–24)	2 wk; 3 and 12 mo
Sieben et al., 2005[127]	General practices	Netherlands	220	18–60	< 3 wk	Acute	Pain (VAS 0–100), disability (QBPDQ 0–100)	3, 6 and 12 mo
Soares Oliveira et al., 2021[81]	Emergency department in 4 public hospitals	Brazil	600	18–80	< 6 wk	Acute	Pain (0–10 NPRS), disability (RMDQ 0–24), recovery rates	6 wk; 3, 6 and 12 mo
Starkweather et al., 2016;[66] Bernier Carney et al., 2021[80]	University health system	Mid-Atlantic region (United States)	48	18–50	< 4 wk	Acute –	Pain (MPQ 0–100), disability (RMDQ 0–24), recovery rates	6 wk and 6 mo
Suri et al., 2011[38]	Outpatient clinics	United States	47	≥ 18	≤ 3 mo	Acute	Pain (NPRS 0–10), disability (ODI 0–100)	6 wk
Swinkels-Meewisse et al., 2006[130]	General practice and physiotherapy practice	Netherlands	546	18–65	< 4 wk	Acute	Pain (VAS 0–100), disability (RMDQ 0–24)	6 wk and 6 mo
Tan et al., 2018[47]	Emergency department	Singapore	177	≥ 21	< 1 mo	Acute	Pain (NPRS 0–10), recovery rates	6 wk and 6 mo
Thomas and France, 2008[128]	Public advertising	United States	43	No info	< 4 wk	Acute	Pain (MPQ 0–5), disability (RMDQ 0–24)	6 and 12 wk
Valat et al., 2000[129]	General practice and rheumatologist practice	France	2493	20–55	< 1 wk	–	Recovery rates	7 ± 1 wk of follow-up
Zille Queiroz et al., 2017;[48] Felicio et al., 2021;[78] Teixeira et al., 2021;[74] Silva et al., 2022;[87] Rocha et al., 2023[86]	Advertisements in local newspapers, community centres, radio, internet and referral by health care professionals from primary care settings	Brazil	500	≥ 60	< 6 wk	Acute	Pain (NRS 0–10), disability (RMDQ 0–24 — Brazillian version), recovery rates	6 wk; 3, 6, 9 and 12 mo

Note: DDS = Descriptor Differential Scale, MODEMS = Musculoskeletal Outcomes Data Evaluation and Management System, MPQ = McGill Pain Questionnaire, NPRS = Numerical Pain Rating Scale, NPS = Numerical Pain Scale, NRS = Numerical Rating Scale, ODI = Oswestry Disability Index, PDI = Pain Disability Inventory, QBPDQ = Quebec Back Pain Disability Questionnaire, RMDQ = Roland-Morris Disability Questionnaire, SIP = Sickness Impact Profile, VAS = visual analogue scale.
*Pain duration categories for meta-analysis: acute low back pain = < 6 weeks; subacute low back pain = 6 to less than 12 weeks; and persistent low back pain = 12 to less than 52 weeks.

Table 2: Summary of Grading of Recommendations, Assessment, Development and Evaluation (GRADE) assessment[32]

		GRADE assessment*							
Outcome	Cohort†	Study design‡	Risk of bias	Inconsistency	Indirectness	Imprecision	Publication bias	Rating up§	Overall certainty¶
Pain	Acute	+4	–1	–1	0	0	0	+1	3
	Subacute	+4	–1	–1	0	0	0	+1	3
	Persistent	+4	–1	–1	0	–2	0	+1	1
Disability	Acute	+4	–1	–1	0	0	0	+1	3
	Subacute	+4	–1	–1	0	0	0	+1	3
	Persistent	+4	–1	–1	0	–2	0	+1	1

*Scores defined as follows: 0 = no serious concern, –1 = serious concern, –2 = very serious concern, +1 = well-defined pattern, +2 = very well-defined pattern.
†Acute low back pain = < 6 weeks; subacute low back pain = 6 to less than 12 weeks and persistent low back pain =12 to less than 52 weeks.
‡Note that all longitudinal cohort studies initially provided high confidence and therefore started with a +4 rating.
§Rating up was considered if events over time followed a well-defined pattern (+1) or a very well-defined pattern (+2) that would increase confidence in the estimates.
¶Certainty scores defined as follows: 1 = very low certainty, 2 = low certainty, 3 = moderate certainty, 4 = high certainty.

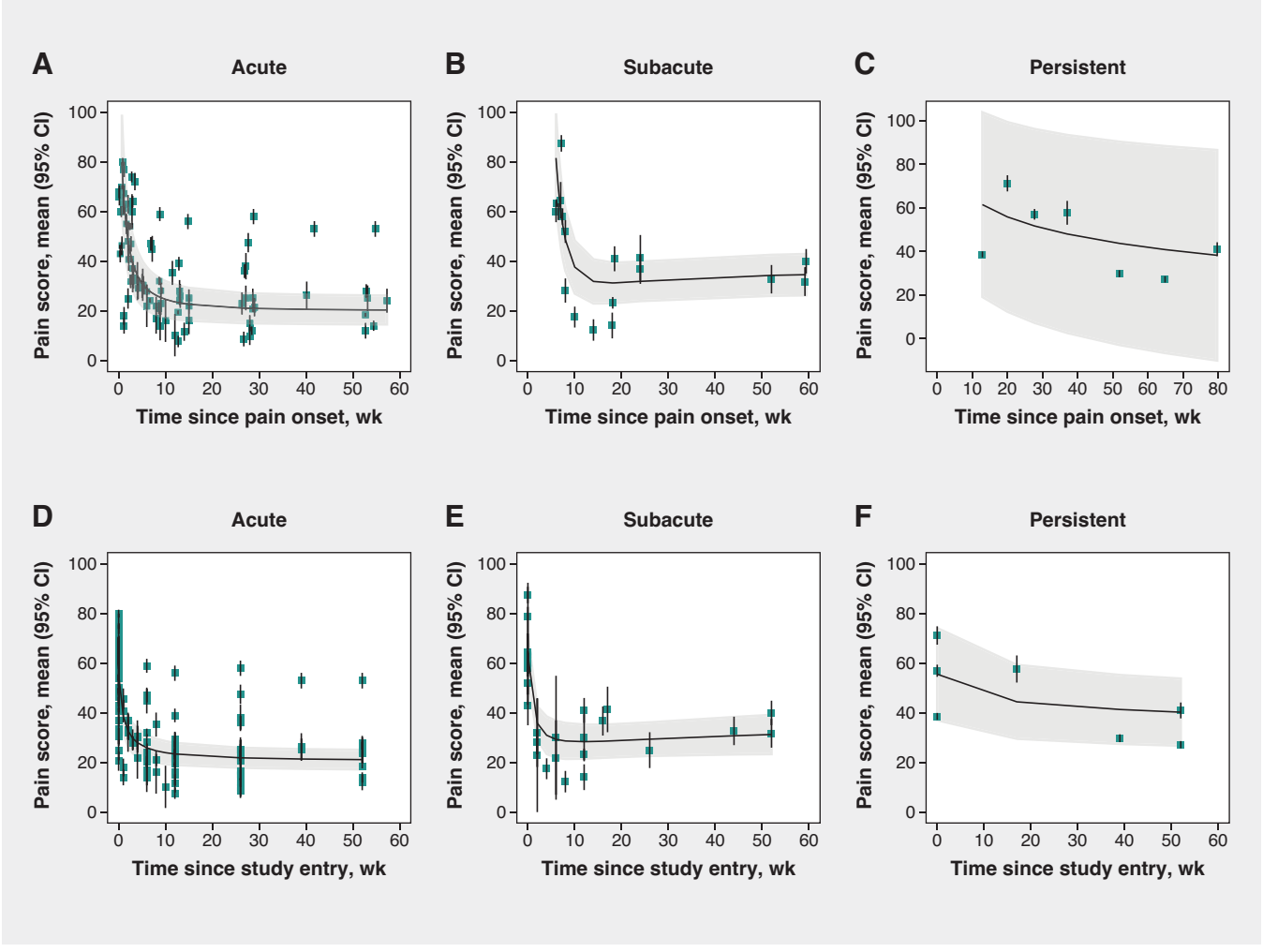

Figure 2: Trajectory of pain among patients with acute (< 6 wk) (A, D), subacute (6 to less than 12 wk) (B, E) or persistent (12 to less than 52 wk) (C, F) low back pain. The top row of graphs shows pain trajectory for inception time corrected, where time is captured as the time since the onset of low back pain. The bottom row of graphs shows pain trajectory for inception time uncorrected, where time reflects the time since study entry. Green boxes represent the observed mean pain score for each study at each time point. Shaded area represents 95% confidence intervals (CIs).

Table 3: Pooled estimates of mean pain and disability scores*

Group and time point	Pooled estimate of mean pain scores (95% CI)		Pooled estimate of mean disability scores (95% CI)	
	Inception time uncorrected†	Inception time corrected†	Inception time uncorrected†	Inception time corrected†
Acute low back pain (< 6 wk)				
Baseline	56 (49 to 62)	NA‡	43 (37 to 49)	NA‡
6 wk	26 (21 to 31)	29 (20 to 38)	22 (19 to 26)	24 (15 to 33)
26 wk	22 (18 to 26)	21 (15 to 27)	18 (14 to 21)	15 (8 to 22)
52 wk	21 (17 to 25)	20 (15 to 26)	17 (14 to 21)	15 (8 to 21)
Subacute low back pain (6 to less than 12 wk)				
Baseline	63 (55 to 71)	NA‡	44 (34 to 54)	NA‡
6 wk	29 (22 to 37)	82 (64 to 100)	29 (21 to 38)	50 (35 to 66)
26 wk	29 (22 to 36)	32 (24 to 40)	25 (16 to 33)	28 (16 to 39)
52 wk	31 (23 to 39)	34 (26 to 43)	25 (16 to 33)	24 (13 to 35)
Persistent low back pain (12 to less than 52 wk)				
Baseline	56 (37 to 74)	NA‡	57 (34 to 81)	NA‡
6 wk	48 (32 to 64)	NA‡	58 (35 to 82)	NA‡
26 wk	43 (29 to 57)	52 (8 to 97)	59 (35 to 83)	49 (20 to 78)
52 wk	40 (27 to 54)	44 (–3 to 90)	59 (35 to 83)	38 (15 to 60)

Note: CI = confidence interval, NA = not applicable.
*All values are expressed in a scale ranging from 0 (i.e., no pain or disability) to 100 (i.e., maximum pain or disability).
†Inception time uncorrected is time captured as time since entry into the study. Inception time corrected is time captured as time since pain onset.
‡The estimates of some values were not obtained for analyses of inception time–corrected time for pain outcomes because this involved extrapolating the fitted curves beyond the range of the data.

mean increase 1 out of 100; 6–26 wk: mean increase 1 out of 100; 26–52 wk: no change in mean disability scores, with a mean disability score of 59 out of 100 at 52 wk).

Appendix 10, available at www.cmaj.ca/lookup/doi/10.1503/cmaj.230542/tab-related-content, provides the full table of fitted model results and Appendix 11, available at www.cmaj.ca/lookup/doi/10.1503/cmaj.230542/tab-related-content, provides the spaghetti plots showing pain and disability outcomes for each patient group.

Sensitivity analyses

Because of the small number of included studies reporting high follow-up (> 80% of participants), we had insufficient data points for sensitivity analyses of studies with a high follow-up rate. We were able to complete the remaining 2 sensitivity analyses (exclusion of participants with radiculopathy or radicular pain, and inclusion of participants aged 18–60 yr) in the acute and subacute cohorts. These analyses were not possible for the persistent group.

When we included only studies that specifically excluded radicular pain or radiculopathy, those in both the acute and subacute groups followed a similar pain and disability trajectory to the main analyses (Table 4 and Appendix 12, available at www.cmaj.ca/lookup/doi/10.1503/cmaj.230542/tab-related-content). When we included only studies with participants aged 18–60 years, trajectories for pain and disability also followed a similar trajectory to the main analyses.

Comparison between pain and disability

Among participants with acute low back pain, the course of disability was more favourable than that of pain (uncorrected and corrected $p < 0.001$). Among those with subacute low back pain, the courses of pain and disability also differed (uncorrected and corrected $p < 0.001$) with pain tending to increase over time, although the number of observations beyond 26 weeks was small. Among those with persistent low back pain, the course of disability was more favourable than that of pain for the uncorrected time only (uncorrected $p < 0.005$, corrected $p = 0.811$) (Appendix 13, available at www.cmaj.ca/lookup/doi/10.1503/cmaj.230542/tab-related-content).

Recovery

Outcomes for recovery from low back pain were reported for 37 cohorts. Studies showed large heterogeneity with regard to definition of recovery and follow-up times. Trajectories of recovery in these cohorts appeared to generally align with the findings of the meta-analyses for pain and disability. Data on recovery rates are reported in Appendix 14, available at www.cmaj.ca/lookup/doi/10.1503/cmaj.230542/tab-related-content.

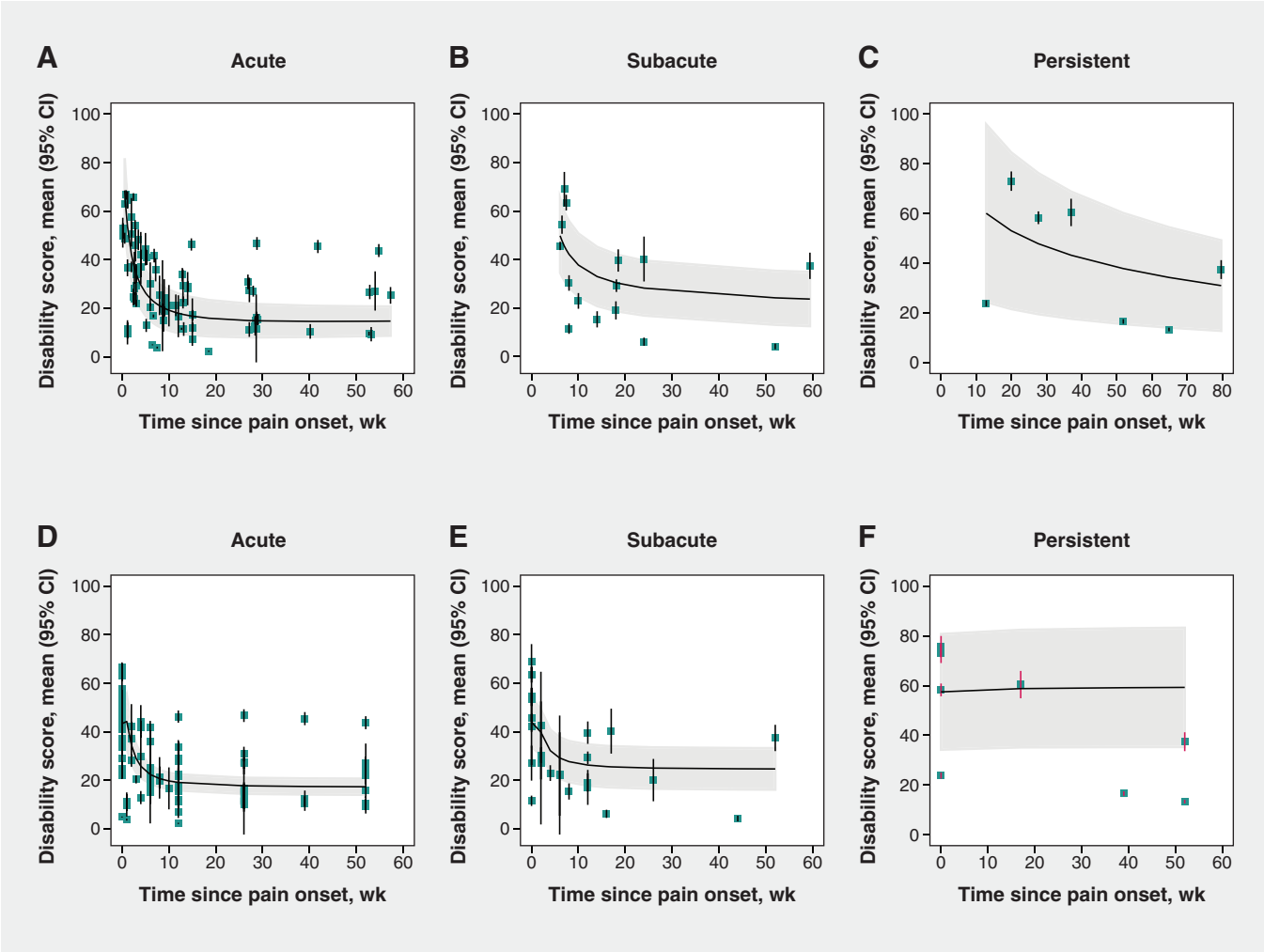

Figure 3: Trajectory of disability in patients with acute (< 6 wk) (A, D), subacute (6 to less than 12 wk) (B, E) and persistent (12 to less than 52 wk) (C, F) low back pain. The top row of graphs shows disability trajectory for inception time corrected, where time is captured as the time since the onset of low back pain. The bottom row of graphs shows disability trajectory for inception time uncorrected, where time reflects the time since study entry. Green boxes represent the observed mean pain score for each study at each time point. Shaded area represents 95% confidence intervals (CIs).

Interpretation

We found moderate-certainty evidence that the clinical course of low back pain was most favourable in the group with acute low back pain, with a large reduction in pain and disability within the first 6 weeks. After this time, recovery slowed. Moderate-certainty evidence indicated that recovery for those with subacute low back pain also showed significant (but smaller) reductions in pain and disability over the first 6 weeks, with subsequently slowed improvement. The clinical course in the persistent pain group was much less favourable than the other groups, with very low–certainty evidence for minor improvements in pain and disability over time.

To obtain a more precise picture of the clinical course of low back pain, we included a subacute group, which filled a gap in our previous meta-analysis and has important implications.[8] In 2012, we had reported that participants with acute and persistent low back pain showed marked improvements in pain and disability within the first 6 weeks, a finding that has guided clinical guidelines internationally.[8,14] In separating a subacute group from those with persistent pain, our current analyses suggest that the outcomes for those with persistent low back pain are substantially less favourable than previously thought.

Our findings are consistent with similar work. In a community cohort, De Campos and colleagues[131] found that a subsequent new episode of acute low back pain resolved rapidly (about 5 d) among participants who had recently recovered from low back pain (including participants enrolled in a randomized controlled trial to prevent recurrence of low back pain). A systematic review of randomized controlled trials reported a similar pattern of improvement within the first 6 weeks and less pronounced improvement at longer-term follow-up (1 yr).[132] This was also shown in a systematic review of emergency department visits among patients with acute low back pain, which reported that most people had an initial reduction in pain intensity, after which symptoms stabilized and persisted up to 6 months later.[133] In addition, a 2012 systematic review (search strategy 1990–2010) of cohort studies involving peole visiting primary care for low

Table 4: Pooled estimates of mean pain and disability scores when excluding cohorts with radiculopathy or radicular pain, and when excluding cohorts with participants younger than 18 years and older than 60 years

	Pooled estimate of mean pain scores (95% CI)*		Pooled estimate of mean disability scores (95% CI)*	
Group and time point	Inception time uncorrected†	Inception time corrected†	Inception time uncorrected†	Inception time corrected†
Excluding cohorts with radiculopathy or radicular pain				
Acute low back pain (< 6 wk)‡				
Baseline	57 (47 to 66)	NA††	44 (34 to 51)	NA††
6 wk	22 (15 to 30)	18 (2 to 35)	15 (11 to 19)	18 (13 to 23)
26 wk	21 (14 to 27)	7 (–10 to 25)	13 (10 to 16)	12 (8 to 15)
52 wk	20 (14 to 27)	7 (–16 to 30)	13 (10 to 15)	11 (7 to 15)
Subacute low back pain (6 to less than 12 wk)§				
Baseline	61 (57 to 64)	NA††	47 (30 to 65)	NA††
6 wk	15 (9 to 21)	68 (55 to 81)	35 (18 to 53)	NA††
26 wk	29 (11 to 48)	26 (13 to 39)	26 (8 to 43)	30 (11 to 50)
52 wk	63 (30 to 96)	29 (16 to 42)	23 (5 to 40)	22 (2 to 42)
Excluding cohorts with participants aged < 18 yr and > 60 yr				
Acute low back pain (< 6 wk)¶				
Baseline	50 (38 to 61)	NA††	36 (31 to 41)	NA††
6 wk	24 (14 to 33)	27 (9 to 45)	14 (12 to 17)	23 (14 to 32)
26 wk	21 (16 to 26)	20 (13 to 27)	14 (10 to 18)	15 (7 to 23)
52 wk	21 (16 to 26)	20 (13 to 25)	14 (9 to 20)	15 (7 to 23)
Subacute low back pain (6 to less than 12 wk)**				
Baseline	67 (46 to 88)	NA†	–	–
6 wk	15 (–16 to 46)	61 (11 to 112)	–	–
26 wk	20 (4 to 35)	27 (17 to 37)	–	–
52 wk	26 (12 to 39)	29 (19 to 40)	–	–

Note: CI = confidence interval, NA = not applicable.
*All values are expressed in a scale ranging from 0 (i.e., no pain or disability) to 100 (i.e., maximum pain or disability).
†Inception time uncorrected is time captured as time since entry into the study. Inception time corrected is time captured as time since pain onset.
‡Analyses included 12 (uncorrected)[38,41,42,66,89,91,97,98,105,115,118,127] or 11 (corrected)[38,41,66,89,91,97,98,105,115,118,127] cohorts for pain, and 11 (uncorrected)[38,41,42,66,89,97,98,105,115,118,127] or 10 (corrected)[38,41,42,66,89,97,98,105,115,118] cohorts for disability.
§Analyses included 3 (uncorrected)[84,114,120] or 3 (corrected)[84,114,120] cohorts for pain, and 3 (uncorrected)[84,114,120] or 3 (corrected)[84,114,120] cohorts for disability.
¶Analyses included 6 (uncorrected)[41,66,85,92,109,127] or 5 (corrected)[41,66,92,109,127] cohorts for pain, and 6 (uncorrected)[41,66,85,92,109,127] or 4 (corrected)[41,66,92,109] cohorts for disability.
**Analyses included 3 (uncorrected)[99,114,117] or 3 (corrected)[99,114,117] cohorts for pain. Disability analyses only had 2 cohorts available for analysis[99,114] and we could therefore not fit the model.
††The estimates of some values were not obtained from inception time–corrected models for pain or disability outcomes because this involved extrapolating the fitted curves beyond the range of the data.

back pain (< 3 mo) cautioned that, while an initial reduction in pain was common, many still reported pain at longer-term follow-up (65% reported pain at 1 yr), suggesting that intensive follow-up should be directed toward those who have not recovered within 3 months.[13] Several studies included in that systematic review were also included in the current meta-analysis.

In our main meta-analysis of cohorts with acute low back pain, 1 study that specifically sought older patients (≥ 60 yr) was an outlier, showing much poorer pain and disability outcomes than the main trajectory trend.[74] Most studies excluded participants in this age group, reporting mean ages between 30 and 50 years. However, our sensitivity analyses showed that excluding studies with participants who had radicular pain or radiculopathy, or studies with older (> 60 yr) and younger participants (< 18 yr) did not appear to affect the clinical course. Previous work has shown that people aged 60 years and older are more likely to have disabling and persistent episodes of low back pain than younger people.[115,134,135] We had insufficient data in the older age group to support or refute these claims. Furthermore, we found only 2 studies that included people younger than 18 years.[96,115] Both recruited people 14 years and older, and reported mean ages of 43.3 and 44.1 years. Therefore, we cannot generalize our findings to populations older than 60 years or younger than 18 years, which identifies a critical evidence gap in the field.

For people with acute, subacute or persistent low back pain, the course of disability was slightly more favourable than that of pain. This finding aligns with key objectives of psychological interventions for persistent low back pain, which aim primarily to improve functioning and quality of life, rather than pain.[136]

The current understanding that most individuals with a new episode of low back pain get better within 2 weeks may need reconsideration.[14] Although most people with acute and subacute low back pain do see improvements early on, our updated meta-analysis shows that many continue to experience ongoing pain and disability. Some benefit may be garnered by providing positive expectations about recovery, but people may also benefit from more realistic expectations.[137] Advice might be best focused on the likelihood of symptom recurrence and acknowledging that ongoing symptoms do not necessarily reflect serious pathology.

Our findings also support the need for timely reassessment within the first 12 weeks after an episode of low back pain to identify and escalate care among those recovering slowly. For people who have pain that persists for 12 weeks or more, pain and disability remain high, which highlights the importance of developing better treatments for this group.

Further work is required to increase the certainty of evidence regarding the clinical course of persistent low back pain. The precision and value of clinical course studies for low back pain may be enhanced by pooling trajectories of individual patients with low back pain (i.e., meta-analyses of individual patient data), and by evaluating the stability of trajectories.[138] A better understanding of the clinical trajectories of low back pain among older (> 60 yr) and younger (< 18 yr) populations is needed, and more effective treatments for those with persistent low back pain should be developed. A risk-of-bias tool specific to clinical course studies in low back pain is another important gap.

Limitations

Potential limitations of this work include using our own risk-of-bias tool (similar to other clinical course reviews that have used their own tool or modified other tools[13,133]), which means that all measures of bias may not have been adequately captured. We found variable risk of bias across studies, with overall high attrition and participants in most studies were not recruited as consecutive cases. Unfortunately, we were unable to assess the impact of poor study quality through sensitivity analyses because of low study numbers and, as such, the impact of low-quality studies on the validity of our results is unclear.

In our analyses, to capture time since pain onset, we added mean (or median) inception time to time of study entry. Median time since pain onset is likely smaller than the mean, which may have implications whereby the corrected inception time course may appear more favourable than it really is.

We excluded interventional studies, which could have contributed to our understanding of the clinical course of low back pain. Having said this, the trajectory of low back pain appears to be similar in randomized controlled trials and cohort studies. Finally, definitions of acute low back pain vary between 4 and 12 weeks across guidelines.[14] A different definition of acute low back pain may have yielded different results, although the similar trajectories in the acute and subacute groups here suggest otherwise.

Conclusion

Most people with acute and subacute low back pain begin to improve within the first 6 weeks, but many have ongoing pain and disability. Importantly, and in contrast to our previous review, people with persistent low back pain (≥ 12 wk) have ongoing moderate-to-high levels of pain and disability. Identifying and escalating care among people with subacute low back pain who are recovering slowly seems a critical focus of intervention.

References

1. Wu A, March L, Zheng X, et al. Global low back pain prevalence and years lived with disability from 1990 to 2017: estimates from the Global Burden of Disease Study 2017. *Ann Transl Med* 2020;8:299.
2. GBD 2019 Diseases and Injuries Collaborators. Global burden of 369 diseases and injuries in 204 countries and territories, 1990–2019: a systematic analysis for the Global Burden of Disease Study 2019. *Lancet* 2020;396:1204-22.
3. Hoy D, Bain C, Williams G, et al. A systematic review of the global prevalence of low back pain. *Arthritis Rheum* 2012;64:2028-37.
4. Dieleman JL, Cao J, Chapin A, et al. US health care spending by payer and health condition, 1996–2016. *JAMA* 2020;323:863-84.
5. Bevan S. Economic impact of musculoskeletal disorders (MSDs) on work in Europe. *Best Pract Res Clin Rheumatol* 2015;29:356-73.
6. Foster NE, Anema JR, Cherkin D, et al.; Lancet Low Back Pain Series Working Group. Prevention and treatment of low back pain: evidence, challenges, and promising directions. *Lancet* 2018;391:2368-83.
7. Maher C, Underwood M, Buchbinder R. Non-specific low back pain. *Lancet* 2017;389:736-47.
8. Da C Menezes Costa L, Maher CG, Hancock MJ, et al. The prognosis of acute and persistent low-back pain: a meta-analysis. *CMAJ* 2012;184:E613-24.
9. Artus M, van der Windt D, Jordan KP, et al. The clinical course of low back pain: a meta-analysis comparing outcomes in randomised clinical trials (RCTs) and observational studies. *BMC Musculoskelet Disord* 2014;15:68.
10. da Silva T, Mills K, Brown BT, et al. Recurrence of low back pain is common: a prospective inception cohort study. *J Physiother* 2019;65:159-65.
11. Kongsted A, Kent P, Axen I, et al. What have we learned from ten years of trajectory research in low back pain? *BMC Musculoskelet Disord* 2016;17:220.
12. Pengel LHM, Herbert RD, Maher CG, et al. Acute low back pain: systematic review of its prognosis. *BMJ* 2003;327:323.
13. Itz CJ, Geurts JW, van Kleef M, et al. Clinical course of non-specific low back pain: a systematic review of prospective cohort studies set in primary care. *Eur J Pain* 2013;17:5-15.
14. Oliveira CB, Maher CG, Pinto RZ, et al. Clinical practice guidelines for the management of non-specific low back pain in primary care: an updated overview. *Eur Spine J* 2018;27:2791-803.
15. Toward Optimized Practice (TOP) Low Back Pain Working Group. Evidence-informed primary care management of low back pain: Clinical practice guidelines Edmonton, AB: Toward Optimized Practice; 2015. Available: https://actt.albertadoctors.org/cpgs/ (accessed 2023 Aug. 28).
16. Hussein AMM, Choy CY, Singh D, et al. *The Malaysian low back pain: management guidelines, 1st ed*. Kuala Lumpur (Malaysia): Malaysian Association for the Study of Pain; 2016:1-26. Available: https://www.masp.org.my/index.cfm?&menuid=23 (accessed 2017 June 9).
17. Latorre Marques E. The treatment of low back pain and scientific evidence. In: *Low Back Pain*. Norasteh AA, editor. London (UK): IntechOpen Limited; 2012.
18. Low back pain and sciatica in over 16s: assessment and management. NICE guideline (NG59). London (UK): National Institute for Health and Care Excellence; 2016. Available: https://www.nice.org.uk/guidance/ng59 (accessed 2023 Aug. 28).
19. *Management of people with acute low back pain: model of care*. Chatswood (Australia): NSW Agency for Clinical Innovation; 2016:1-39. Available: https://www.aci.health.nsw.gov.au/__data/assets/pdf_file/0007/336688/acute-low-back-pain-moc.pdf (accessed 2023 Aug. 28).
20. Pohjolainen T, Leinonen V, Frantén J, et al. Update on current care guideline: low back pain [article in Finnish]. *Duodecim* 2015;131:92-4.
21. Qaseem A, Wilt TJ, McLean RM, et al. Noninvasive treatments for acute, subacute, and chronic low back pain: a clinical practice guideline from the American College of Physicians. *Ann Intern Med* 2017;166:514-30.
22. Stochkendahl MJ, Kjaer P, Hartvigsen J, et al. National Clinical Guidelines for non-surgical treatment of patients with recent onset low back pain or lumbar radiculopathy. *Eur Spine J* 2018;27:60-75.

23. Van Tulder MW, Custers JWH, de Bie RA et al. *Multidisciplinary guideline for non-specific low back pain*. Belgrade (Serbia): KKCZ; 2010.
24. van Wambeke P, Desomer A, Jonckheer P, et al. The Belgian national guideline on low back pain and radicular pain: key roles for rehabilitation, assessment of rehabilitation potential and the PRM specialist. *Eur J Phys Rehabil Med* 2020;56:220-7.
25. Page MJ, McKenzie JE, Bossuyt PM, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *BMJ* 2021;372.
26. McGowan J, Sampson M, Salzwedel DM, et al. PRESS peer review of electronic search strategies: 2015 guideline statement. *J Clin Epidemiol* 2016;75:40-6.
27. Chiarotto A, Boers M, Deyo RA, et al. Core outcome measurement instruments for clinical trials in nonspecific low back pain. *Pain* 2018;159:481-95.
28. Chiarotto A, Deyo RA, Terwee CB, et al. Core outcome domains for clinical trials in non-specific low back pain [published erratum in *Eur Spine J* 2015;24:2097]. *Eur Spine J* 2015;24:1127-42.
29. Lin C-WC, Verwoerd AJH, Maher CG, et al. How is radiating leg pain defined in randomized controlled trials of conservative treatments in primary care? A systematic review. *Eur J Pain* 2014;18:455-64.
30. Altman DG. Systematic reviews of evaluations of prognostic variables. *BMJ* 2001;323:224-8.
31. Hayden JA, van der Windt DA, Cartwright JL, et al. Assessing bias in studies of prognostic factors. *Ann Intern Med* 2013;158:280-6.
32. Iorio A, Spencer FA, Falavigna M, et al. Use of GRADE for assessment of evidence about prognosis: rating confidence in estimates of event rates in broad categories of patients. *BMJ* 2015;350:h870.
33. Wan X, Wang W, Liu J, et al. Estimating the sample mean and standard deviation from the sample size, median, range and/or interquartile range. *BMC Med Res Methodol* 2014;14:135.
34. Dettori JR. Loss to follow-up. *Evid Based Spine Care J* 2011;2:7-10.
35. Altman DG. Statistics in medical journals: some recent trends. *Stat Med* 2000;19:3275-89.
36. Shaw WS, Reme SE, Pransky G, et al. The pain recovery inventory of concerns and expectations: a psychosocial screening instrument to identify intervention needs among patients at elevated risk of back disability. *J Occup Environ Med* 2013;55:885-94.
37. Breen AC, Carr E, Langworthy JE, et al. Back pain outcomes in primary care following a practice improvement intervention: a prospective cohort study. *BMC Musculoskelet Disord* 2011;12:28.
38. Suri P, Rainville J, Fitzmaurice GM, et al. Acute low back pain is marked by variability: an internet-based pilot study. *BMC Musculoskelet Disord* 2011;12:220.
39. Melloh M, Elfering A, Egli Presland C, et al. Predicting the transition from acute to persistent low back pain. *Occup Med (Lond)* 2011;61:127-31.
40. Ami NB, Weisman A, Yona T, et al. STarT back tool retained its predicting abilities in patients with acute and sub-acute low back pain after a transcultural adaptation and validation to Hebrew. *Musculoskelet Sci Pract* 2020;46:102134. doi: 10.1016/j.msksp.2020.102134.
41. Hallegraeff JM, Kan R, van Trijffel E, et al. State anxiety improves prediction of pain and pain-related disability after 12 weeks in patients with acute low back pain: a cohort study. *J Physiother* 2020;66:39-44.
42. Hendrick P, Milosavljevic S, Hale L, et al. Does a patient's physical activity predict recovery from an episode of acute low back pain? A prospective cohort study. *BMC Musculoskelet Disord* 2013;14:126.
43. Carstens JKP, Shaw WS, Boersma K, et al. When the wind goes out of the sail - declining recovery expectations in the first weeks of back pain. *Eur J Pain* 2014; 18:269-78.
44. Elfering A, Käser A, Melloh M. Relationship between depressive symptoms and acute low back pain at first medical consultation, three and six weeks of primary care. *Psychol Health Med* 2014;19:235-46.
45. Müller M, Curatolo M, Limacher A, et al. Predicting transition from acute to chronic low back pain with quantitative sensory tests: a prospective cohort study in the primary care setting. *Eur J Pain* 2019;23:894-907.
46. Shaw WS, Pransky G, Roter DL, et al. The effects of patient-provider communication on 3-month recovery from acute low back pain. *J Am Board Fam Med* 2011;24:16-25.
47. Tan CIC, Liaw JSC, Jiang B, et al. Predicting outcomes of acute low back pain patients in emergency department: a prospective observational cohort study. *Medicine (Baltimore)* 2018;97:e11247.
48. Queiroz BZ, Pereira DS, de Britto Rosa NM, et al. Inflammatory mediators and pain in the first year after acute episode of low-back pain in elderly women: longitudinal data from back complaints in the elders — Brazil. *Am J Phys Med Rehabil* 2017;96:535-40.
49. Karran EL, Traeger AC, McAuley JH, et al. The value of prognostic screening for patients with low back pain in secondary care. *J Pain* 2017;18:673-86.
50. Medeiros FC, Costa LOP, Oliveira IS, et al. The use of STarT BACK Screening Tool in emergency departments for patients with acute low back pain: a prospective inception cohort study. *Eur Spine J* 2018;27:2823-30.
51. Mehling WE, Gopisetty V, Acree M, et al. Acute low back pain and primary care: How to define recovery and chronification? *Spine* 2011;36:2316-23.
52. Mehling WE, Ebell MH, Avins AL, et al. Clinical decision rule for primary care patient with acute low back pain at risk of developing chronic pain. *Spine J* 2015;15:1577-86.
53. Shaw WS, Tveito TH, Woiszwillo MJ, et al. The effect of body mass index on recovery and return to work after onset of work-related low back pain. *J Occup Environ Med* 2012;54:192-7.
54. Schulz P, Prescott J, Shifman J, et al. Comparing patient outcomes for care delivered by advanced musculoskeletal physiotherapists with other health professionals in the emergency department: a pilot study. *Australas Emerg Nurs J* 2016;19:198-202.
55. Shaw WS, Nelson CC, Woiszwillo MJ, et al. Early return to work has benefits for relief of back pain and functional recovery after controlling for multiple confounds. *J Occup Environ Med* 2018;60:901-10.
56. Besen E, Young AE, Shaw WS. Returning to work following low back pain: towards a model of individual psychosocial factors. *J Occup Rehabil* 2015;25:25-37.
57. Melloh M, Salathé CR, Elfering A, et al. Occupational, personal and psychosocial resources for preventing persistent low back pain. *Int J Occup Saf Ergon* 2013;19:29-40.
58. Mehling WE, Gopisetty V, Bartmess E, et al. The prognosis of acute low back pain in primary care in the United States: a 2-year prospective cohort study. *Spine* 2012;37:678-84.
59. Machado GC, Ferreira PH, Maher CG, et al. Transient physical and psychosocial activities increase the risk of nonpersistent and persistent low back pain: a case-crossover study with 12 months follow-up. *Spine J* 2016;16:1445-52.
60. Pozzobon D, Nogueira LAC, Ferreira PH, et al. Return to self-reported physical activity level after an event of acute low back pain. *PLoS One* 2019;14:e0219556. doi: 10.1371/journal.pone.0219556.
61. Shojaei I, Salt EG, Bazrgari B. A prospective study of lumbo-pelvic coordination in patients with non-chronic low back pain. *J Biomech* 2020;102:109306.
62. Klyne DM, Barbe MF, van den Hoorn W, et al. ISSLS Prize in Clinical Science 2018: longitudinal analysis of inflammatory, psychological, and sleep-related factors following an acute low back pain episode-the good, the bad, and the ugly. *Eur Spine J* 2018;27:763-77.
63. Mehling WE, Avins AL, Acree MC, et al. Can a back pain screening tool help classify patients with acute pain into risk levels for chronic pain? *Eur J Pain* 2015;19:439-46.
64. Seyedmehdi SM, Dehghan F, Ghaffari M, et al. Effect of general health status on chronicity of low back pain in industrial workers. *Acta Med Iran* 2016;54:211-7.
65. Shaw WS, Reme SE, Linton SJ, et al. 3rd place, PREMUS best paper competition: development of the return-to-work self-efficacy (RTWSE-19) questionnaire — psychometric properties and predictive validity. *Scand J Work Environ Health* 2011;37:109-19.
66. Starkweather AR, Lyon DE, Kinser P, et al. Comparison of low back pain recovery and persistence. *Biol Res Nurs* 2016;18:401-10.
67. Sharpe L, Haggman S, Nicholas M, et al. Avoidance of affective pain stimuli predicts chronicity in patients with acute low back pain. *Pain* 2014;155:45-52.
68. Melloh M, Elfering A, Stanton TR, et al. Who is likely to develop persistent low back pain? A longitudinal analysis of prognostic occupational factors. *Work* 2013;46:297-311.
69. Melloh M, Elfering A, Chapple CM, et al. Prognostic occupational factors for persistent low back pain in primary care. *Int Arch Occup Environ Health* 2013;86:261-9.
70. Melloh M, Elfering A, Käser A, et al. What is the best time point to identify patients at risk of developing persistent low back pain? *J Back Musculoskeletal Rehabil* 2015;28:267-76.
71. Melloh M, Elfering A, Käser A, et al. Depression impacts the course of recovery in patients with acute low-back pain. *Behav Med* 2013;39:80-9.
72. Melloh M, Elfering A, Salathé CR, et al. Predictors of sickness absence in patients with a new episode of low back pain in primary care. *Ind Health* 2012; 50:288-98.
73. Melloh M, Cornwall J, Crawford RJ, et al. Does injury claim status and benefit status predict low back pain outcomes? *Australas Med J* 2015;8:268-76.
74. Teixeira LF, Diz JBM, da Souza Moreira B, et al. Attitudes and beliefs of older adults with acute low back pain: 12-month results from the Brazilian cohort back complaints in the elders. *Musculoskelet Care* 2022;20:279-89.
75. Klyne DM, van den Hoorn W, Barbe MF, et al. Cohort profile: Why do people keep hurting their back? *BMC Res Notes* 2020;13:538.
76. Morf R, Pfeiffer F, Hotz-Boendermaker S, et al. Prediction and trend of tactile acuity, pain and disability in acute LBP: a six-month prospective cohort study. *BMC Musculoskelet Disord* 2021;22:666.
77. Klyne DM, Hodges PW. Circulating adipokines in predicting the transition from acute to persistent low back pain. *Pain Med* 2020;21:2975-85.

78. Felício DC, Filho JE, Pereira DS, et al. The effect of kinesiophobia in older people with acute low back pain: longitudinal data from Back Complaints in the Elders (BACE). *Cad Saude Publica* 2021;37:e00232920. doi: 10.1590/0102-311X00232920.
79. Hallegraeff JM, van Trijffel E, Kan RW, et al. Illness perceptions as an independent predictor of chronic low back pain and pain-related disability: a prospective cohort study. *Physiotherapy* 2021;112:72-7.
80. Bernier Carney KM, Guite JW, Young EE, et al. Investigating key predictors of persistent low back pain: a focus on psychological stress. *Appl Nurs Res* 2021;58:151406. doi: 10.1016/j.apnr.2021.151406.
81. Oliveira IS, da Silva T, Costa LOP, et al. The long-term prognosis in people with recent onset low back pain from emergency departments: an inception cohort study. *J Pain* 2021;22:1497-505.
82. Klyne DM, Barbe MF, Hodges PW. Relationship between systemic inflammation and recovery over 12 months after an acute episode of low back pain. *Spine J* 2022;22:214-25.
83. Basiński K, Zdun-Ryżewska A, Majkowicz M. Psychosocial predictors of persistent low back pain in patients presenting to the emergency department. *Am J Emerg Med* 2022;51:85-91.
84. Ranger TA, Cicuttini FM, Jensen TS, et al. Catastrophization, fear of movement, anxiety, and depression are associated with persistent, severe low back pain and disability. *Spine J* 2020;20:857-65.
85. Klyne DM, Hall LM, Nicholas MK, et al. Risk factors for low back pain outcome: Does it matter when they are measured? *Eur J Pain* 2022;26:835-54.
86. Rocha VTM, Leopoldino AAO, de Queiroz BZ, et al. The impact of low back pain and disability on frailty levels in older women: longitudinal data from the BACE-Brazil cohort. *Eur Geriatr Med* 2023;14:181-9.
87. da Silva JP, de Jesus-Moraleida FR, Felício DC, et al. Trajectories of pain and disability in older adults with acute low back pain: longitudinal data of the BACE-Brazil cohort. *Braz J Phys Ther* 2022;26:100386. doi: 10.1016/j.bjpt.2021.100386.
88. Knoop J, van Lankveld W, Beijer L, et al. Development and internal validation of a machine learning prediction model for low back pain non-recovery in patients with an acute episode consulting a physiotherapist in primary care. *BMC Musculoskelet Disord* 2022;23:834.
89. Jenkins LC, Chang W-J, Buscemi V, et al. Cortical function and sensorimotor plasticity are prognostic factors associated with future low back pain after an acute episode: the Understanding persistent Pain Where it ResiDes prospective cohort study. *Pain* 2023;164:14-26.
90. Jenkins LC, Chang W-J, Buscemi V, et al. Low somatosensory cortex excitability in the acute stage of low back pain causes chronic pain. *J Pain* 2022;23:289-304.
91. Bakker EWP, Verhagen AP, Lucas C, et al. Spinal mechanical load: a predictor of persistent low back pain? A prospective cohort study. *Eur Spine J* 2007;16:933-41.
92. Bousema EJ, Verbunt JA, Seelen HAM, et al. Disuse and physical deconditioning in the first year after the onset of back pain. *Pain* 2007;130:279-86.
93. Carey TS, Garrett J, Jackman A, et al. The outcomes and costs of care for acute low back pain among patients seen by primary care practitioners, chiropractors, and orthopedic surgeons. The North Carolina Back Pain Project. *N Engl J Med* 1995;333:913-7.
94. Sundararajan V, Konrad TR, Garrett J, et al. Patterns and determinants of multiple provider use in patients with acute low back pain. *J Gen Intern Med* 1998;13:528-33.
95. Carey TS, Garrett JM, Jackman AM. Beyond the good prognosis. Examination of an inception cohort of patients with chronic low back pain. *Spine* 2000;25:115-20.
96. Menezes Costa LdC, Maher CG, McAuley JH, et al. Prognosis for patients with chronic low back pain: inception cohort study. *BMJ* 2009;339:b3829. doi: 10.1136/bmj.b3829.
97. Coste J, Delecoeuillerie G, Cohen de Lara A, et al. Clinical course and prognostic factors in acute low back pain: an inception cohort study in primary care practice. *BMJ* 1994;308:577-80.
98. Coste J, Lefrançois G, Guillemin F, et al. Prognosis and quality of life in patients with acute low back pain: insights from a comprehensive inception cohort study. *Arthritis Rheum* 2004;51:168-76.
99. Epping-Jordan JE, Wahlgren DR, Williams RA, et al. Transition to chronic pain in men with low back pain: predictive relationships among pain intensity, disability, and depressive symptoms. *Health Psychol* 1998;17:421-7.
100. Shaw WS, Means-Christensen A, Slater MA, et al. Shared and independent associations of psychosocial factors on work status among men with subacute low back pain. *Clin J Pain* 2007;23:409-16.
101. Wahlgren DR, Atkinson JH, Epping-Jordan JE, et al. One-year follow-up of first onset low back pain. *Pain* 1997;73:213-21.
102. Williams RA, Pruitt SD, Doctor JN, et al. The contribution of job satisfaction to the transition from acute to chronic low back pain. *Arch Phys Med Rehabil* 1998;79:366-74.
103. Faber E, Burdorf A, Bierma-Zeinstra SM, et al. Determinants for improvement in different back pain measures and their influence on the duration of sickness absence. *Spine* 2006;31:1477-83.
104. Ferguson SA, Gupta P, Marras WS, et al. Predicting recovery using continuous low back pain outcome measures. *Spine J* 2001;1:57-65.
105. Ferguson SA, Marras WS, Gupta P. Longitudinal quantitative measures of the natural course of low back pain recovery. *Spine* 2000;25:1950-6.
106. Gatchel RJ, Polatin PB, Kinney RK. Predicting outcome of chronic back pain using clinical predictors of psychopathology: a prospective analysis. *Health Psychol* 1995;14:415-20.
107. Gatchel RJ, Polatin PB, Mayer TG. The dominant role of psychosocial risk factors in the development of chronic low back pain disability. *Spine* 1995;20:2702-9.
108. Grotle M, Brox JI, Glomsrød B, et al. Prognostic factors in first-time care seekers due to acute low back pain. *Eur J Pain* 2007;11:290-8.
109. Grotle M, Brox JI, Veierød MB, et al. Clinical course and prognostic factors in acute low back pain: patients consulting primary care for the first time. *Spine* 2005;30:976-82.
110. Gurcay E, Bal A, Eksioglu E, et al. Acute low back pain: clinical course and prognostic factors. *Disabil Rehabil* 2009;31:840-5.
111. Hasenbring MI, Hallner D, Klasen B, et al. Pain-related avoidance versus endurance in primary care patients with subacute back pain: psychological characteristics and outcome at a 6-month follow-up. *Pain* 2012;153:211-7.
112. Hazard RG, Haugh LD, Reid S, et al. Early prediction of chronic disability after occupational low back injury. *Spine* 1996;21:945-51.
113. Reid S, Haugh LD, Hazard RG, et al. Occupational low back pain: recovery curves and factors associated with disability. *J Occup Rehabil* 1997;7:1-14.
114. Heneweer H, Aufdemkampe G, van Tulder MW, et al. Psychosocial variables in patients with (sub)acute low back pain: an inception cohort in primary care physical therapy in The Netherlands. *Spine* 2007;32:586-92.
115. Henschke N, Maher CG, Refshauge KM, et al. Prognosis in patients with recent onset low back pain in Australian primary care: inception cohort study. *BMJ* 2008;337:a171.
116. Klenerman L, Slade PD, Stanley IM, et al. The prediction of chronicity in patients with an acute attack of low back pain in a general practice setting. *Spine* 1995;20:478-84.
117. Koleck M, Mazaux J-M, Rascle N, et al. Psycho-social factors and coping strategies as predictors of chronic evolution and quality of life in patients with low back pain: a prospective study. *Eur J Pain* 2006;10:1-11.
118. Kovacs FM, Abraira V, Zamora J, et al. The transition from acute to subacute and chronic low back pain: a study based on determinants of quality of life and prediction of chronic disability. *Spine* 2005;30:1786-92.
119. Lehmann TR, Spratt KF, Lehmann KK. Predicting long-term disability in low back injured workers presenting to a spine consultant. *Spine* 1993;18:1103-12.
120. Poiraudeau S, Rannou F, Baron G, et al. Fear-avoidance beliefs about back pain in patients with subacute low back pain. *Pain* 2006;124:305-11.
121. Reeser JC, Wiegmann SM, Hoover N, et al. Treatment of acute low back pain in Wisconsin: results of the State Medical Society's Medical Outcomes Research Project. *WMJ* 2001;100:35-42.
122. Schiøttz-Christensen B, Nielsen GL, Hansen VK, et al. Long-term prognosis of acute low back pain in patients seen in general practice: a 1-year prospective follow-up study. *Fam Pract* 1999;16:223-32.
123. Shaw WS, Pransky G, Patterson W, et al. Patient clusters in acute, work-related back pain based on patterns of disability risk factors. *J Occup Environ Med* 2007;49:185-93.
124. Shaw WS, Pransky G, Patterson W, et al. Early disability risk factors for low back pain assessed at outpatient occupational health clinics. *Spine* 2005;30:572-80.
125. Shaw WS, Pransky G, Winters T. The Back Disability Risk Questionnaire for work-related, acute back pain: prediction of unresolved problems at 3-month follow-up. *J Occup Environ Med* 2009;51:185-94.
126. Sieben JM, Vlaeyen JWS, Tuerlinckx S, et al. Pain-related fear in acute low back pain: the first two weeks of a new episode. *Eur J Pain* 2002;6:229-37.
127. Sieben JM, Vlaeyen JWS, Portegijs PJM, et al. A longitudinal study on the predictive validity of the fear-avoidance model in low back pain. *Pain* 2005;117:162-70.
128. Thomas JS, France CR. The relationship between pain-related fear and lumbar flexion during natural recovery from low back pain. *Eur Spine J* 2008;17:97-103.
129. Valat JP, Goupille P, Rozenberg S, et al.; Spine Group of the Société Française de Rhumatologie. Acute low back pain: predictive index of chronicity from a cohort of 2487 subjects. *Joint Bone Spine* 2000;67:456-61.
130. Swinkels-Meewisse IEJ, Roelofs J, Schouten EGW, et al. Fear of movement/(re) injury predicting chronic disabling low back pain: a prospective inception cohort study. *Spine* 2006;31:658-64.

131. de Campos TF, da Silva TM, Maher CG, et al. Prognosis of a new episode of low-back pain in a community inception cohort. *Eur J Pain* 2023;27:602-10.
132. Artus M, van der Windt DA, Jordan KP, et al. Low back pain symptoms show a similar pattern of improvement following a wide range of primary care treatments: a systematic review of randomized clinical trials. *Rheumatology (Oxford)* 2010;49:2346-56.
133. Coombs DM, Machado GC, Richards B, et al. Clinical course of patients with low back pain following an emergency department presentation: a systematic review and meta-analysis. *Emerg Med J* 2021;38:834-41.
134. Dionne CE, Dunn KM, Croft P. Does back pain prevalence really decrease with increasing age? A systematic review. *Age Ageing* 2006;35:229-34.
135. Traeger AC, Underwood M, Ivers R, et al. Low back pain in people aged 60 years and over. *BMJ* 2022;376:e066928. doi: 10.1136/bmj-2021-066928.
136. McCracken LM, Morley S. The psychological flexibility model: a basis for integration and progress in psychological approaches to chronic pain management. *J Pain* 2014;15:221-34.
137. Hayden JA, Wilson MN, Riley RD, et al. Individual recovery expectations and prognosis of outcomes in non-specific low back pain: prognostic factor review. *Cochrane Database Syst Rev* 2019;2019:CD011284.
138. Andersen TE, Karstoft K-I, Lauridsen HH, et al. Trajectories of disability in low back pain. *Pain Rep* 2022;7:e985. doi: 10.1097/PR9.0000000000000985.

Competing interests: Sarah Wallwork has received speaker fees from the Neuro Orthopaedic Institute and Exercise and Sport Science Australia. Felicity Braithwaite has received speaker fees from the Neuro Orthopaedic Institute, San Diego Pain Summit, Medicine Education Science and Health (MESH) . Mary O'Keeffe reports consulting fees from the European Pain Federation EFIC, honoraria from the Physio Network and travel support from INTERACT-EUROPE, PANACEA and Happy. Mervyn Travers has received speaker fees from Aalborg University, Australian Physiotherapy Association, Australian Podiatry Association, Life Ready Physiotherapy, PhysioFormation, Smart Education, O_2 Academy, Healthia, Queensland Health, The University of Western Australia, Hemophilia Association Australia, Icelandic Physiotherapy Association and Rural Health West. Belinda Lange is a non-executive director of the Australian Physiotherapy Council and the Australasian Institute of Digital Health. G. Lorimer Moseley has received support from the National Health and Medical Research Council of Australia, the Medical Research Future Fund, Reality Health, Connect Health UK, Institutes of Health California, American International Assurance Australia, Workers' Compensation Boards and professional sporting organisations (International Olympic Committee, English Premier League, La Liga, Australian Football League Clubs, National Basketball League, Athletics Australia, Cricket Australia). Professional and scientific bodies have reimbursed him for travel costs related to presentations of research on pain. He has received speaker fees for lectures on pain and rehabilitation from the Royal Australian College of General Practitioners, Noigroup Australia and MasterSessions. He receives royalties from Noigroup Publications, Orthopedic Physical Therapy Products and Dancing Giraffe Press. He sits on boards with Painaustralia and National Pain Solutions Research Alliance, and is chief executive officer with Pain Revolution. No other competing interests were declared.

This article has been peer reviewed.

Affiliations: IIMPACT in Health (Wallwork, Braithwaite, Moseley), University of South Australia, Kaurna Country, Adelaide, Australia; Persistent Pain Research Group, Hopwood Centre for Neurobiology (Braithwaite), South Australian Health and Medical Research Institute (SAHMRI), Adelaide, Australia; Institute for Musculoskeletal Health (O'Keeffe), School of Public Health, Faculty of Medicine and Health, University of Sydney, Sydney, Australia; School of Health Sciences and Physiotherapy (Travers), University of Notre Dame Australia, Fremantle, Australia; School of Biomedical Science (Summers), Queensland University of Technology, Queensland, Australia; Caring Futures Institute (Lange), College of Nursing and Health Sciences, Flinders University, Adelaide, Australia; Institute for Health Research (Hince), Faculty of Medicine, Nursing, Midwifery and Health Sciences, University of Notre Dame, Fremantle, Australia; Masters and Doctoral Programs in Physical Therapy (Costa, Menezes Costa), Universidade Cidade de São Paulo, São Paulo, Brazil; UniSA STEM (Chiera), University of South Australia, Kaurna Country, Adelaide, Australia

Contributors: Sarah Wallwork, Leonardo Costa, Luciola da C. Menezes Costa and G. Lorimer Moseley conceived and designed the study. Sarah Wallwork, Felicity Braithwaite, Mary O'Keeffe, Mervyn Travers, Simon Summers and Belinda Lange acquired the data. Sarah Wallwork, Belinda Chiera and Dana Hince carried out and interpreted the statistical analysis. Sarah Wallwork, Mary O'Keeffe, Dana Hince and G. Lorimer Moseley drafted the manuscript. All of the authors revised the manuscript for critically important intellectual content, approved the final version of the manuscript and agreed to be accountable for all aspects of the work.

Funding: Sarah Wallwork, G. Lorimer Moseley and project costs were supported by an National Health and Medical Research Council Leadership Investigator Grant to G. Lorimer Moseley (ID1178444). Felicity Braithwaite is supported by the John Stuart Colville Fellowship (Arthritis Foundation of South Australia). Mary O'Keeffe is supported by the Marie Curie Fellowship from the European Commission. Leonardo Costa and Luciola da C. Menezes Costa are supported by CNPq research productivity fellowships.

Data sharing: All data from this meta-analysis are available on request from the corresponding author.

Accepted: Nov. 16, 2023

Correspondence to: Sarah Wallwork, sarah.wallwork@unisa.edu.au