ELSEVIER

The SPINE JOURNAL

The Spine Journal 000 (2025) 1–18

Clinical Study

Development of an internationally agreed national minimum dataset for low back pain: a modified Delphi study

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Received 9 March 2025; revised 9 September 2025; accepted 7 October 2025

ABSTRACT

BACKGROUND: Low back pain is the leading cause of disability worldwide and the burden is expected to rise due to increases in ageing and population growth. The 2018 *Lancet* Low Back Pain Series proposed urgent actions to reverse the rising trend of disability due to low back pain including the need for a set of data indicators to routinely monitor progress in achieving these actions worldwide.

PURPOSE: To reach international consensus on a national minimum dataset of low back pain indicators that could be used across all countries to monitor progress in improving care and reducing disability from low back pain.

STUDY DESIGN: Modified Delphi study.

SAMPLE: Nineteen participants attended a preliminary workshop at the 2023 International Back and Neck Pain Forum, The Netherlands. Subsequently, 305 and 339 participants (researchers, clinicians, policy makers, educators, and consumers) completed Delphi surveys Rounds 1 and 2, respectively.

OUTCOME MEASURES: A 9-point Likert scale rated importance and feasibility of low back pain indicators (1 = not important or feasible; 9 = extremely important or feasible, 0 unsure). In Round 2, indicators that achieved consensus on importance and feasibility were ranked "most important" (top-ranked) to "least important."

FDA device/drug status: Not applicable.

Author disclosures: ***BJM:*** Grants: Wiser Healthcare - ECR Seeding grant for conference travel (B); Grants: Monash University - Study away travel grant (conference) (B); Grants: Australia and New Zealand LBP Research Network - travel grant (conference) (A); Fellowship Support: PhD Scholarship - Chiropractic Australia Research Foundation (E); Fellowship Support: PhD top-up scholarship - Australia and New Zealand LBP Research Network (D). ***GEF:*** Research Support (Investigator Salary, Staff/Materials): National Health and Medical Research Council and University of Sydney (G, Paid directly to institution/employer); Grants: National Health and Medical Research Council (I, Paid directly to institution/employer). ***RH:*** Speaking and/or Teaching Arrangements: Monash University (B); Grants: Arthritis Australia (D, Paid directly to institution/employer). ***AG:*** Nothing to disclose. ***CGM:*** Grants: Various Australian government agencies e.g. NHMRC, MRFF (I, Paid directly to institution/employer); Fellowship Support: NHMRC (I, Paid directly to institution/employer). ***RB:*** Royalties: UpToDate for writing chapter on Plantar Fasciitis (B); Grants: Numerous grants including from Australian National Health and Medical Research Council (NHMRC), Medical Research Future Fund (MRFF), Australian government, HCF Foundation, Arthritis Australia (I, Paid directly to institution/employer); Fellowship Support: Australian National Health and Medical Research Council (NHMRC) (I, Paid directly to institution/employer).

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https://doi.org/10.1016/j.spinee.2025.10.003

METHODS: Workshop participants were divided into four groups and asked to independently consider the importance and feasibility of 105 indicators identified from previous reviews divided into six themes. Participants could remove indicators considered unimportant or not feasible. This required unanimous agreement from independent workshop groups. Participants could also suggest improvements to the wording of indicators, the best unit of measure and additional missing indicators.

RESULTS: Thirty-eight indicators were recommended by workshop participants for inclusion in the Delphi study. Survey responses over two rounds reached consensus for 21 indicators (11 burden, 10 care) ranked from most to least important after reaching consensus on importance and feasibility in Round 1. Number of work days lost and number of opioid prescriptions for low back pain were the highest ranked indicators for burden and care, respectively. Importance rankings were similar across subgroups comparing high-income and low- and middle-income countries, and consumers and non-consumers.

CONCLUSION: We reached international consensus that 21 indicators could be used to monitor progress in improving care and outcomes for people with low back pain globally. Future work is needed to confirm the acceptability and feasibility of these indicators across countries, and, if implemented, to determine their value over time.

Keywords: Back pain; Benchmarking; Burden of disease; Chronic disease indicators; Dataset; Delphi technique; Health care; Low back pain; Population surveillance; Quality indicators

Introduction

Low back pain is the leading cause of disability worldwide and the burden is expected to rise in coming decades due to increases in ageing and population growth [1]. This will result in even greater healthcare costs, productivity losses and early retirements [2]. The 2018 *Lancet* Low Back Pain Series proposed urgent actions to address this problem, including the need for a set of data indicators to routinely monitor progress in implementing the actions and resulting improvements in back pain burden across the world [3–5].

A national minimum dataset refers to a minimum number of agreed consistent data indicators that could be mandated for routine collection within a country [6]. While collection of health-related data is often vast and complex, national minimum datasets promote streamlined data collection across different health services for benchmarking pertinent data, monitoring trends over time, and guiding health service improvements at a population level [7]. These datasets are routinely used by many national healthcare services [8–10], and have been developed across a range of health fields including nursing [11,12], mental health [13], bio-surveillance [14] and trauma [15].

Clinical care standards for low back pain have been developed in Australia, Canada and the UK, each proposing indicators for quality improvement [16–18]. However, their limited scope highlights the need for an internationally agreed minimum dataset that could serve as a global surveillance tool. Current standards focus on care indicators for low back pain but do not incorporate measures of low back pain burden. The Australian and Canadian clinical care standards monitor acute low back pain care but lack guidance for monitoring care for chronic low back pain [16,17]. Previous standards are also tailored to specific settings. For example, the Australian standard covers primary care and emergency departments, while the Canadian standard is directed toward primary and community-based care [16,17]. Furthermore, their development for specific national health systems limits their applicability globally.

A national minimum dataset of low back pain indicators could be used by all countries to measure progress in reducing low back pain burden and improving its care. It could also be used to benchmark and make comparisons between countries. Indicators included in the minimum dataset would need to be fit for purpose and feasible to routinely collect in as many countries as possible [19].

As a first step in informing a minimum dataset of indicators, we previously identified 280 indicators that have been used to measure appropriateness of health care for low back pain globally [20]. To inform feasibility, we also performed a scoping review of all low back pain burden and care indicators routinely collected in Australia [21]. We identified 90 burden and 18 care indicators, of which about half are publicly available. Informed by these data, the aim of this study was to reach international consensus on a national minimum dataset that could be used across all countries to monitor progress in improving care and reducing disability from low back pain across all countries.

Methods

Informed by the two previous reviews [20,21], and a preliminary 90-minute workshop at the 18th International Forum for Back and Neck Pain Research in Primary Care in 2023 in Groningen, The Netherlands, we performed a modified international Delphi study. The Delphi method uses a structured approach to achieve consensus among a

group of invited participants (Delphi panel) who are asked to complete a survey over multiple rounds [22]. We used a modified Delphi process to gain consensus as it does not require participants to physically meet, and it provides an equal voice to all participants [23].

Preliminary workshop

There were 19 workshop participants comprised of back and neck pain researchers and clinician-researchers. The aim of the workshop was to obtain participants' views about the importance and feasibility in their country of residence of the low back pain burden and care indicators identified from our prior reviews. After reducing the number of indicators to remove duplication and overlapping indicators, we grouped the final 101 into six themes: intervention (n=31), burden (n=23), healthcare utilization (n=23), work (n=18), self-reported outcomes (n=6) and added an environmental impact indicator [24] (see Appendix A). Three broad indicators for pharmaceutical (n=2) and non-pharmacological (n=1) interventions were also included as there were insufficient indicators relating to these types of low back pain treatments.

To aid discussion participants were divided into four groups. Each group independently considered the themes in different order to ensure that at least two groups considered each theme. Participants were provided with pens and printed lists of indicators arranged by theme. They were invited to suggest improvements to the wording of listed indicators, the best unit of measure for each indicator, and any additional indicators missing from the list. All suggestions by participants were written directly onto the pages of listed indicators. Participants were asked to draw a line through indicators that were considered unimportant or not feasible. Indicators were excluded from the first Delphi survey round when there was unanimous agreement between independent workshop groups that an indicator was unimportant and not feasible to collect. All lists of indicators were collected by investigators at the end of the workshop for analysis.

Modified Delphi

We used a non-probabilistic purposive and snowball sampling approach to invite participation. We aimed to include at least 160 participants with clinical and research experience in the low back pain field and lived experience with low back pain from both high- and low- and middle-income countries. This target sample size exceeds the recommended sample size for gaining consensus among Delphi panel members with consideration for attrition [25], and ensuring the reliability (replicability) of results [26].

We invited all authors of the 2018 *Lancet* Low Back Pain Series [3–5], the working group of the Australian Low Back Pain Clinical Care Standard [16], and authors of high-quality low back pain clinical practice guidelines identified from a previous study [27]. We also invited registrants of the 2023 International Forum for Back and Neck Pain Research in Primary Care, members of the Australian and New Zealand Musculoskeletal (ANZMUSC) Clinical Trials Network [28], the Consortium for Low Back Pain in the Low- and Middle-Income Countries [29], the UK National Spine Network [30] and the USA Back Pain Consortium Research Program [31]. The invitees represented a range of professionals from backgrounds including general practice, rheumatology, physiotherapy, occupational therapy, orthopedic and neurosurgery, chiropractic, osteopathy, rehabilitation and pain.

Consumers with a lived experience of low back pain were also invited to participate using internal advertising via special interest groups of the Australian and New Zealand Low Back Pain Research Network (ANZBACK) [32], ANZMUSC [28], Arthritis Australia [33], Arthritis New Zealand [34] and Musculoskeletal Health Australia [35]. Advertisements seeking participants were also posted on social media platform "X" via Cochrane Musculoskeletal [36]. Australian healthcare policy makers identified from government websites in our previous scoping review [21] and networks of co-authors were invited to participate via email.

Invitations to the first Delphi round were sent via email from October 19, 2023 to November 10, 2023. The invitation included an online survey link and Explanatory Statement. A follow-up email was sent to all invitees who did not respond to the initial invite after two and four weeks. Invitations to the second round were sent on 14 December 2023 using the same process. Participants of the first Delphi round were invited to participate in the second round and asked to distribute an online survey link to their networks. Consumer participants were invited to participate in both survey rounds using internal advertising from consumer advocacy groups and social media advertisements. Each online survey link was closed five weeks after the first email was circulated.

Data collection

The survey was conducted using Qualtrics (Qualtrics, Provo, UT) web-based software. For each survey round we asked participants to provide their name, email address and demographic information (age, gender [woman, man, non-binary/gender diverse, gender not listed, prefer not to say], country of residence) and background (researcher, clinician, policy maker, educator [option added for Round 2], consumer and other [specified using a free text box]). For background, participants could indicate all that apply.

Survey Round 1

In Round 1, participants were presented with the low back pain indicators shortlisted from the workshop, presented in random order. For each indicator they were asked to rate 1) its importance for inclusion in a national minimum dataset to monitor the burden and care of people with

low back pain on a 9-point Likert scale where 1 = not at all important to 9 = extremely important; and 2) how feasible it would be to collect this indicator in their country of residence on a 9-point Likert scale where 1 = not feasible to 9 = feasible. If they were unsure of feasibility, they were asked to indicate this with a 0.

A free text box was provided at the end of the survey asking participants to propose additional indicators that were missing in a free text box. Participants were required to respond to all survey items (excluding the free text box).

A priori we considered an indicator important or feasible if it was given a score of 7 to 9, a score of 4 to 6 was deemed unclear, and a score of 1 to 3 was deemed unimportant or not feasible. We determined, *a priori*, that consensus for importance would be reached if at least 60% of respondents rated an indicator as important (≥7 on 1−9 Likert). Similar thresholds have been widely used in Delphi studies to determine consensus on survey items, although definitions of consensus vary [37−41]. For feasibility, we set a lower *a priori* threshold and deemed consensus would be reached if at least 30% of respondents rated an indicator as feasible. This cut-off which is lower than standard practice was purposefully chosen to identify indicators that may be feasible in high-income countries and potentially aspirational for middle- and low-income countries [42].

Survey Round 2

Participants in Round 2 were presented with indicators that had reached consensus for importance in Round 1, including the percentage of participants that rated each indicator important and feasible (≥7 on 1−9 Likert). They were presented as two lists (burden or care indicators) and in random order to prevent order effects bias. We used a broad definition of burden and care indicators as defined in our recent review [21]. Burden indicators could include self-reported burden, (eg, self-reported measures from population surveys), health services burden (eg, number of people receiving hospital care for low back pain), disease burden (eg, disability-adjusted life-years), financial burden (eg, direct costs for treating low back pain), work disability burden (eg, time off work), medication burden (eg, medications currently being taken by people with low back pain) and time burden (eg, wait times on a waiting list to receive care). Care indicators related to the delivery of health care within relevant settings or facilities (eg, the number and proportion of people who received a specific type of care or health service for low back pain, including any care for work-related injuries). Consistent with our Australian indicators review [21], for indicators that could be classified as both burden and care indicators we classified them as "burden" when the indicator could be used to measure or assess the impact of low back pain on health care services, workplaces or across populations (eg, number of people admitted to hospital with a primary discharge diagnosis of low back pain), and "care" when the indicator could be used to measure specific care people with low back pain received (eg, number of people who receive lumbar spine decompression surgery).

For each group, participants were asked to rank the indicators from "most important" (top-ranked) to "least important." We also planned to present any new indicators identified in Survey 1 for rating importance and feasibility as per Survey 1 provided they had not already been excluded at the workshop. If they reached consensus for importance and feasibility, we planned to perform a third round to add the new indicators into the rankings.

We did not revisit rating the feasibility of survey items in Round 2 unless there were new indicators proposed by participants of Round 1. Given the diversity of countries and health system contexts represented, we were concerned that showing aggregated Round 1 feasibility scores could bias responses in Round 2. Specifically, participants might align their ratings with the group mean rather than maintaining their own perspective based on their country's context.

Data analysis

We present participant demographic data (age group, gender, country of residence and World Bank classification of countries according to income) and background descriptively.

For Survey 1, we present the number (percent) of respondents who rated the low back pain indicators "important," "unclear" or "unimportant," and "feasible," "unclear," "not feasible" or "I do not know." Free text responses were reviewed and inductively coded.

We analyzed survey responses for Round 2 using a weighted rank order scale, where indicators ranked by participants as being "most important" were assigned a higher value than the next ranked indicators in the list (eg, an indicator ranked 1 (most important) was assigned a weight of 10, an indicator ranked 2 (second most important) was weighted 9 etc.). We calculated the total weighted scores of each indicator and present the weighted mean scores (sum of total weighted scores from all participants divided by the number of participant responses) ranked in order of importance within the burden and care lists of indicators. Due to different numbers of indicators within the two theme lists, weighted mean scores were standardized to allow direct comparisons between the groups.

We performed two subgroup analyses: ranked importance of indicators of participants from high-income versus low- and middle-income countries and ranked importance of indicators of participants who identified as being consumers alone versus those who did not. Round 1 feasibility ratings for the two subgroups were also compared. All analyses were performed using Microsoft Excel and Stata 17 (StataCorp LLP, College Station, TX, USA).

Ethics

Ethics approval was obtained from Monash University Human Research Ethics Committee (MUHREC) (Project

ID: 39106). An Explanatory Statement outlining the details of the research project was provided to all potential participants, clearly stating that participating in the workshop or responding to survey rounds was considered consent to participate in the study and having de-identified responses included in the analyses (see Appendix B). Consent was implied by participation in the online Delphi survey(s) and participants could withdraw from the study at any time.

Authorship was offered to all participants who completed both rounds of the Delphi survey and workshop attendees who completed at least one round. All authors were also required to review and approve the final manuscript. All collected data were anonymized and stored on a password protected secure server only accessible by the investigator team. Data will be retained for five years from the date of publication.

Results

Workshop participants considered 67 indicators were unimportant or not feasible for a national minimum dataset (Fig. 1). After making wording modifications for uniformity, the remaining 35 indicators as well as three additional indicators suggested by workshop participants were included in the first Delphi round (see Appendix C). It was agreed that "number per 100,000 population" was the best unit of measurement to express a scaled proportion of people or events for relevant indicators but for the purpose of the surveys, we used number of people or events.

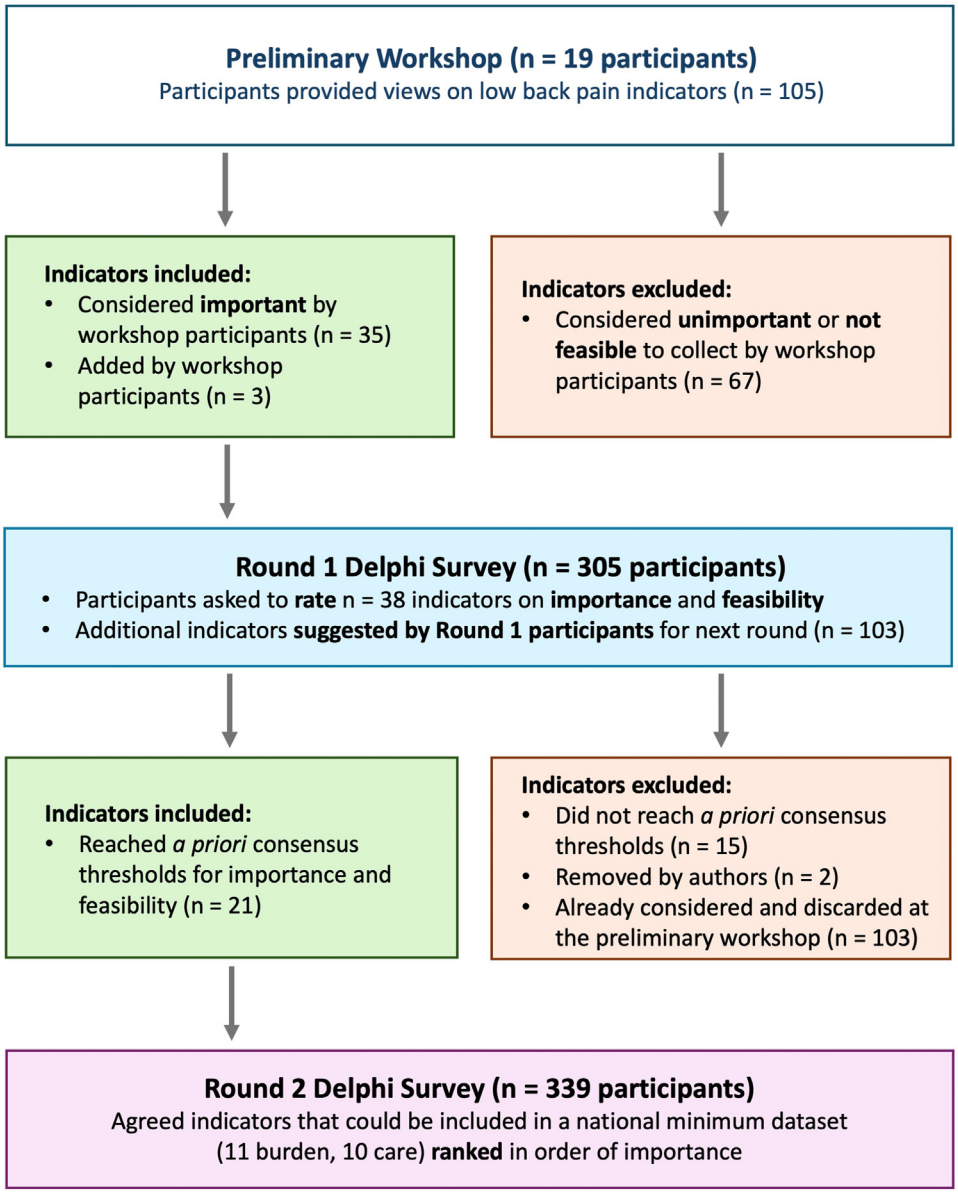

Fig. 1. Flowchart of the modified Delphi study.

Survey Round 1

Of 680 people invited to participate in the modified Delphi study, 305 participants from 31 countries completed the first survey round and 339 (including an additional 35 consumer participants) participated in the second round (Table 1). Australia (n=157, 51%) was the most represented country, followed by The Netherlands (n=19, 6%), New Zealand (n=18, 6%), United Kingdom (n=15, 5%) and the United States (n=15, 5%). Most participants were from high-income countries (n=269, 88%). Two hundred and thirty-eight (78%) participants were researchers, 190 (62%) were clinicians, 15 (5%) were educators, 11 (4%) were policy makers and 60 (20%) had lived experience of low back pain. 176 (58%) reported dual roles (eg, researcher and clinician), while 21 (7%) indicated they were consumers only.

The results of Survey Round 1 are graphically reported as Figs. 2 and 3 and tabulated in detail as Appendices D and E, respectively. Twenty-three (61%) of the 38 indicators included in Survey Round 1, reached consensus for both importance and feasibility. We elected to remove two indicators: one was deemed unimportant and excluded by participants during the preliminary workshop but was erroneously included in the survey (number of people with low back pain who report restriction in activities of daily living [ADLs]), and the other indicator (number of emergency department attendances for a recorded primary discharge diagnosis of low back pain) was considered to be a similar measure to another indicator included in Round 1 (number of hospital admissions for a primary discharge diagnosis of low back pain). There was no consensus on importance of 14 indicators and one indicator reached consensus for importance but not feasibility. There were an additional 103 indicators suggested by survey participants as free text, but all were excluded as they had been considered and discarded at the preliminary workshop.

The 13 burden and 10 care indicators that reached consensus for both importance and feasibility are shown in Table 2. Eight burden indicators related to work days lost or workers' compensation claims for low back pain, two related to hospital admissions or emergency department attendances, and the remaining indicators related to restriction in ADLs (n=1), people who report feeling confident self-managing their low back pain (n=1), and hospital outpatient clinic attendances (n=1). Care indicators related to imaging of the lumbar spine (n=3), pharmaceutical prescriptions (n=3), specialist referrals (n=2) and surgical treatment (n=2), hospital admission (n=1), hospital outpatient care (n=1) and healthcare costs of approved workers' compensation claims (n=1). Feasibility ratings of burden indicators that reached consensus varied from 30% to 73%, which relate to the number of people who report taking time off work due to low back pain and the number of hospital admissions with a primary discharge diagnosis of low back pain, respectively. The care indicators rated most feasible to collect related to the number of lumbar fusion surgeries (78%) and lumbar decompression and fusion surgeries (77%). The number of referrals to medical specialists for low back pain was rated by participants as the least feasible care indicator to collect (47%).

Table 1
Characteristics of Delphi participants

Characteristics	Round 1 (n=305) N (%)	Round 2 (n=339) N (%)
Gender		
Woman	137 (44.9)	171 (50.4)
Man	167 (54.8)	165 (48.7)
Non-binary or gender not listed	1 (0.3)	3 (0.8)
Background (multiple responses were permitted)		
Researcher	238 (78.0)	236 (69.6)
Clinician	190 (62.3)	190 (56.1)
Policy maker	11 (3.6)	14 (4.1)
Educator	15 (4.9)	119 (35.1)
Consumer (person with lived experience of low back pain)	60 (19.7)	90 (26.6)
Consumer only	21 (6.9)	56 (15.9)
Other	6 (2.0)*	5 (1.5)*
Country of residence with 5 or more participants		
Australia	157 (51.5)	187 (55.2)
The Netherlands	19 (6.2)	24 (7.1)
New Zealand	18 (5.9)	21 (6.2)
United Kingdom	15 (4.9)	17 (5.0)
United States of America	15 (4.9)	16 (4.7)
Brazil	13 (4.3)	12 (3.5)
Denmark	8 (2.6)	8 (2.4)
Norway	8 (2.6)	7 (2.1)
Nepal	8 (2.6)	6 (1.8)
Canada	6 (2.0)	5 (1.5)
Switzerland	5 (1.6)	5 (1.5)
Belgium	5 (1.6)	4 (1.2)
Other†	28 (9)	27 (8)
World Bank classification of economies of participants' country of residence		
High-income countries	269 (88.2)	304 (89.7)
Low- and middle-income countries	36 (11.8)	35 (10.3)
Age group (y)		
18–29	14 (4.6)	14 (4.1)
30–39	76 (24.9)	79 (23.3)
40–49	88 (28.9)	88 (26.0)
50–59	69 (22.6)	80 (23.6)
60+	57 (18.7)	77 (22.7)
Not reported	1 (0.3)	1 (0.3)

* Other in Round 1: consumer director (n=1), hospital advisory committee member (n=1), manager (n=2), patient experience or usability professional (n=1) and practice consultant (n=1). Other in Round 2: consumer director (n=1), clinical advisor (n=1), clinical manager (n=1), dental assistant (n=1) and regulatory body member (n=1).

† Other countries: France (Round 1 n=3; Round 2 n=2), South Africa (R1 n=2; R2 n=4), India (R1 n=2; R2 n=3), Italy (n=2 both rounds), Finland (R1 n=2; R2 n=1), Sweden (R1 n=2; R2 n=1), Bangladesh (n=1 both rounds), Colombia (n=1 both rounds), Indonesia (n=1 both rounds), Ireland (n=1 both rounds), Israel (n=1 both rounds), Lebanon (n=1 both rounds), Mexico (n=1 both rounds), Nigeria (n=1 both rounds), Pakistan (n=1 both rounds), Portugal (n=1 both rounds), Tanzania (n=1 both rounds), Ethiopia (R1 n=1), Saudi Arabia (R1 n=1), Bahrain (R2 n=1), Burundi (R2 n=1), country not specified (R1 n=2; R2 n=1).

Fig. 2. Percentage of respondents that indicated items were important, unclear and or not important in Survey Round 1, n=305. Vertical line represents the *a priori* consensus threshold for importance. LBP, low back pain; ADLs, activities of daily living; MRIs, magnetic resonance imaging scans; CT, computed tomography.

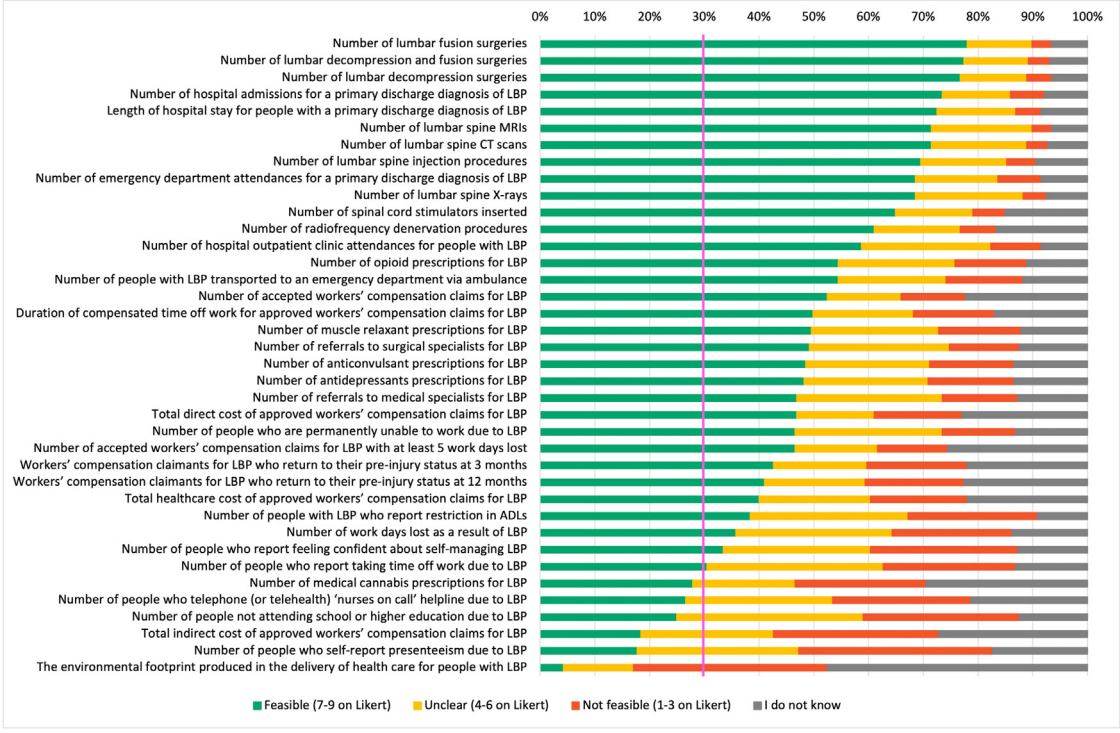

Fig. 3. Percentage of respondents that indicated items were feasible, unclear or not feasible or don't know in their countries Survey Round 1, n=305. Vertical line represents the *a priori* consensus threshold for feasibility. LBP, low back pain; MRIs, magnetic resonance imaging scans; CT, computed tomography; ADLs, activities of daily living.

Table 2
Indicators that met consensus criteria for importance* and feasibility† in Round 1

Indicator	Number (%) that rated indicators important	Number (%) that rated indicators feasible
Burden indicators (N=13)		
Number of work days lost because of low back pain (LBP)	273 (90)	109 (36)
Number of people who are permanently unable to work due to LBP	272 (89)	142 (47)
Number of people with low back pain who report restriction in activities of daily living	269 (88)	117 (38)
Number of people who report taking time off work due to LBP	251 (82)	93 (30)
Number of hospital admissions for a primary discharge diagnosis of LBP‡	219 (72)	224 (73)
Number of people who report feeling confident about self-managing LBP	212 (70)	102 (33)
Total healthcare cost of approved workers' compensation claims for LBP‡	205 (67)	122 (40)
Number of emergency department attendances for a primary discharge diagnosis of LBP	203 (67)	209 (69)
Number of hospital outpatient clinic attendances for people with LBP‡	199 (65)	179 (59)
Duration of compensated time off work for approved workers' compensation claims for LBP	199 (65)	152 (50)
Workers' compensation claimants for LBP who return to their pre-injury status at 12 mo	193 (63)	125 (41)
Total direct cost of approved workers' compensation claims for LBP	189 (62)	143 (47)
Workers' compensation claimants for LBP who return to their pre-injury status at 3 mo	185 (61)	130 (43)
Care indicators (N=10)		
Number of opioid prescriptions for LBP	251 (82)	166 (54)
Number of referrals to surgical specialists for LBP	221 (72)	150 (49)
Number of referrals to medical specialists for LBP	215 (70)	143 (47)
Number of lumbar spine MRIs	210 (69)	218 (71)
Number of lumbar spine X-rays	200 (66)	209 (69)
Number of antidepressants prescriptions for LBP	193 (63)	147 (48)
Number of lumbar decompression and fusion surgeries	191 (63)	236 (77)
Number of lumbar spine CT scans	191 (63)	218 (71)
Number of muscle relaxant prescriptions for LBP	185 (61)	151 (50)
Number of lumbar fusion surgeries	183 (60)	238 (78)

* At least 60% of respondents rated indicator as important (≥7 on 1−9 Likert).
† At least 30% of respondents rated an indicator as feasible (≥7 on 1−9 Likert).
‡ Indicators could also be considered care indicators.

Survey Round 2

Of 745 people invited to complete survey Round 2, 339 from 31 countries completed survey Round 2. They had similar characteristics to participants in Round 1 (see Table 1). Twenty one of the 23 indicators that reached consensus in Round 1 (11 burden, 10 care indicators) were presented for importance ranking in Round 2, and two were discarded for reasons outlined in Survey Round 1.

Table 3 presents the overall importance rank and weighted mean importance scores of the low back pain burden indicators from the Round 2 survey, as well as the importance rank, weighted mean importance scores and number (%) participants that considered indicators were feasible in their country stratified by country income level and participant category (not consumers or consumers). Number of work days lost because of low back pain was the highest ranked burden indicator (weighted mean rank score 7.66) followed by number of people who are permanently unable to work due to low back pain (weighted mean rank score 7.18), number of people who report taking time off work due to low back pain (weighted mean rank score 6.32), number of hospital admissions for a primary discharge diagnosis of low back pain (weighted mean rank score 6.16) and number of hospital outpatient clinic attendances for people with low back pain (weighted mean ranked score 5.7).

Importance rankings were similar across subgroups. Participants from low- and middle-income countries ranked the same five indicators in their top five as participants from high-income countries as did both consumers and non-consumers, although there were slight variations in the order. There were also differences in feasibility rankings between high- and low- and middle-income country participants. For example, only 19% of participants from low- and middle-income countries considered the number of work days lost because of low back pain to be a feasible indicator to collect in their countries compared with 38% of participants from high-income countries.

Table 4 presents the results of Round 2 for the low back pain care indicators. The top indicator was number of opioid prescriptions for low back pain (weighted mean score 7.19) followed by number of medical specialist referrals (weighted mean score 6.38), number of lumbar spine MRIs (weighted mean score 6.11) and X-rays (weighted mean score 5.93) and number of surgical referrals (weighted mean score 5.77). Participants from low- and middle-income countries ranked the same five care indicators in their top five as participants from high-income countries but the order varied. Medical specialist referrals were the most important care indicator nominated by low- and middle-income country participants followed by lumbar spine X-rays and surgical referrals. Consumer and non-consumer participants had different importance rankings. For

Table 3
Overall importance rank and weighted mean importance scores of low back pain burden indicators in Round 2 and importance rank, weighted mean importance scores and number (%) participants that considered indicator was feasible in their country stratified by country income level and participant category (not consumers or consumers)

Burden indicators	All participants (n=339)		Participants from HICs (n=304)			Participants from LMICs (n=35)			Not consumers (n=283)			Consumers (n=56)		
	Importance rank	Weighted mean score†	Importance rank	Weighted mean score†	N (%) that rated indicator feasible* (n=269)	Importance rank	Weighted mean score	N (%) that rated indicator feasible* (n=36)	Importance rank	Weighted mean score†	N (%) that rated indicator feasible* (n=284)	Importance rank	Weighted mean score†	N (%) that rated indicator feasible* (n=21)
Number of **work days lost** because of low back pain	**1**	7.66	**1**	7.7	**102 (38)**	**1**	7.37	**7 (19)**	**1**	**7.69**	**104 (37)**	**1**	7.54	**5 (24)**
Number of people who are **permanently unable to work** due to low back pain	**2**	7.18	**2**	7.25	**129 (48)**	**3**	6.57	**13 (36)**	**2**	**7.25**	**134 (47)**	**4**	6.86	**8 (38)**
Number of people who **report taking time off work** due to low back pain	**3**	6.32	**3**	6.36	**85 (32)**	**5**	5.87	**8 (22)**	**4**	**6.13**	**86 (30)**	**2**	7.25	**7 (33)**
Number of **hospital admissions** for a primary discharge diagnosis of low back pain	**4**	6.16	**4**	6.18	**205 (76)**	**4**	6	**19 (53)**	**3**	**6.14**	**212 (75)**	**5**	6.32	**12 (57)**
Number of **hospital outpatient clinic attendances** for people with low back pain (eg, consultation with a specialist, physiotherapist etc.)	**5**	5.7	**5**	5.58	**157 (58)**	**2**	6.67	**22 (61)**	**5**	**5.46**	**168 (59)**	**3**	6.88	**11 (52)**
Total healthcare cost of approved workers' compensation claims for low back pain (injury)	**6**	5.11	**6**	5.12	**114 (42)**	**7**	5.06	**8 (22)**	**6**	**5.28**	**111 (39)**	**7**	4.24	**11 (52)**
Number of people who **report feeling confident about self-managing their low back pain**	**7**	4.87	**7**	4.88	**92 (34)**	**8**	4.85	**10 (28)**	**8**	**4.75**	**96 (34)**	**6**	5.54	**6 (28)**
Total direct cost of approved workers' compensation claims for low back pain (injury)	**8**	4.69	**8**	4.64	**136 (51)**	**6**	5.19	**7 (19)**	**7**	**4.9**	**131 (46)**	**11**	3.64	**12 (57)**
Duration of compensated time off work for approved workers' compensation claims for low back pain (injury)	**9**	4.33	**9**	4.26	**143 (53)**	**9**	4.83	**9 (25)**	**9**	**4.45**	**142 (50)**	**10**	3.7	**10 (48)**
Number of **workers' compensation claimants for low back pain (injury) who return to their pre-injury status at 3 mo**	**10**	4.09	**10**	4.09	**125 (46)**	**10**	4.05	**5 (14)**	**10**	**4.08**	**120 (42)**	**8**	4.11	**10 (48)**
Number of **workers' compensation claimants for low back pain (injury) who return to their pre-injury status at 12 mo**	**11**	3.88	**11**	3.93	**121 (45)**	**11**	3.51	**4 (11)**	**11**	**3.87**	**116 (41)**	**9**	3.93	**9 (43)**

HICs, high-income countries; LMICs, low- and middle-income countries.

* Feasible if scored ≥7 on 1−9 Likert scale in Round 1 (n=305).

† Weighted mean scores for the 11 burden indicators were standardized to a 10-item equivalent weighting to allow comparison with the weighted mean scores of the 10 care indicators.

Table 4
Overall importance rank and weighted mean importance scores of low back pain care indicators in Round 2 and importance rank, weighted mean importance scores and number (%) participants that considered indicator was feasible in their country stratified by country income level and participant category (not consumers or consumers)

Care indicators	All participants (n=339)		Participants from HICs (n=304)			Participants from LMICs (n=35)			Not consumers (n=283)			Consumers (n=56)		
	Importance rank	Weighted mean score	Importance rank	Weighted mean score	N (%) of participants rated as feasible to collect* (n=269)	Importance rank	Weighted mean score	N (%) of participants rated as feasible to collect* (n=36)	Importance rank	Weighted mean score	N (%) of participants rated as feasible to collect* (n=284)	Importance rank	Weighted mean score	N (%) of participants rated as feasible to collect* (n=21)
Number of **opioid prescriptions** for low back pain	**1**	7.19	**1**	7.33	**150 (56)**	**5**	5.94	**16 (44)**	**1**	7.52	**154 (54)**	**6**	5.5	**12 (57)**
Number of **referrals to medical specialists** for low back pain	**2**	6.38	**2**	6.19	**133 (49)**	**1**	8.09	**10 (28)**	**2**	6.23	**132 (46)**	**1**	7.16	**11 (52)**
Number of **lumbar spine MRIs**	**3**	6.11	**3**	6.12	**194 (72)**	**4**	6.06	**24 (67)**	**3**	6.07	**204 (72)**	**3**	6.29	**14 (67)**
Number of **lumbar spine X-rays**	**4**	5.93	**4**	5.88	**185 (69)**	**2**	6.34	**24 (67)**	**4**	5.88	**197 (69)**	**5**	6.18	**12 (57)**
Number of **referrals to surgical specialists** for low back pain	**5**	5.77	**5**	5.71	**139 (52)**	**3**	6.29	**11 (31)**	**5**	5.84	**139 (49)**	**7**	5.41	**11 (52)**
Number of **lumbar spine CT scans**	**6**	5.27	**6**	5.37	**195 (72)**	**8**	4.49	**23 (64)**	**6**	5.08	**204 (72)**	**4**	6.27	**14 (67)**
Number of **lumbar decompression and fusion surgeries**	**7**	4.71	**7**	4.77	**215 (80)**	**9**	4.14	**21 (58)**	**7**	4.91	**221 (78)**	**9**	3.68	**15 (71)**
Number of **muscle relaxant prescriptions** for low back pain	**8**	4.7	**9**	4.57	**139 (52)**	**6**	5.8	**12 (33)**	**10**	4.38	**140 (49)**	**2**	6.3	**11 (52)**
Number of **antidepressants prescriptions** for low back pain	**9**	4.5	**10**	4.49	**135 (50)**	**7**	4.6	**12 (33)**	**9**	4.41	**138 (49)**	**8**	4.96	**9 (43)**
Number of **lumbar fusion surgeries**	**10**	4.4	**8**	4.59	**217 (81)**	**10**	3.26	**21 (58)**	**8**	4.69	**223 (79)**	**10**	3.25	**15 (71)**

HICs, high-income countries; LMICs, low- and middle-income countries.
* Feasible if scored ≥7 on 1−9 Likert scale in Round 1 (n=305).

consumers, medical specialist referral was the most important care indicator followed by number of muscle relaxant prescriptions, lumbar spine MRIs, CTs and X-rays. Number of opioid prescriptions was the top ranked indicator for both high-income country participants and non-consumers, it was ranked of less importance by both low- and middle-income country participants and consumers (fifth and sixth, respectively).

Discussion

We identified 21 indicators that may be suitable for a national minimum dataset to monitor progress in reducing low back pain burden and improving its care. Overall, the top ranked burden indicators were number of work days lost or number of people unable to work due to low back pain, and the number of hospital admissions and hospital outpatient clinic attendances. The top ranked care indicators were number of opioid prescriptions, medical and surgical specialist referrals and lumbar spine imaging. The burden indicator results were similar across subgroups although the rank order and feasibility scores varied. There was greater variability in the importance ranking and scores between high-income and low- and middle-income country participants and between consumers and non-consumers for the care indicators. Feasibility results also varied across subgroups.

While we aimed to develop a national minimum dataset of indicators, not all the 21 ranked indicators that reached consensus may be feasible or necessary in less resourced countries. For example, it may not be necessary to collect all three lumbar spine imaging indicators (X-Ray, CT and MRI) but countries could choose the imaging modality of most relevance to their setting. Additionally, countries without a workers' compensation insurance scheme may not be able to include work-related indicators but could include other proxy indicators sourced from other data.

The different importance rankings for opioid prescriptions for low back pain given by high- and low- and middle-income country participants may reflect lower rates of opioid prescriptions in low- and middle-income countries [43]. Similarly, its lower importance ranking among consumers compared with other participants may have several explanations. Consumers may be less aware of the risk-benefit profile of opioids for low back pain and some consumers have also pushed back against greater opioid regulation [44,45].

Clinical care standards for low back pain published in Australia, Canada and the United Kingdom have proposed indicators to support the improvement of health care through monitoring various aspects of care over time [16−18]. Of the 21 shortlisted indicators ranked on importance in our Delphi study, seven (33%) were recommended for routine collection by at least one country. These include percentage of people who receive spinal imaging for low back pain [16−18], percentage of people who are given

opioids for low back pain [16–18], percentage of people referred to a medical specialist or provider for low back pain [17], percentage of people who report feeling confident about self-managing their low back pain [17] and number of work days lost for people with acute low back pain [17]. Our review of low back pain indicators in Australia identified five of these indicators (number of people referred for X-rays/CT/MRI, number of referrals to medical specialists and number of work days lost because of low back pain) that are routinely collected at national and state or territory levels [21]. While the Australian Commission on Safety and Quality in Health Care (ACSQHC) has proposed 12 quality indicators for determining whether the quality of low back pain care improves over time, there is a need for accessible indicators to be revisited regularly.

The Canadian clinical care standard recommends using national data sources for two indicators shortlisted in this Delphi study: (1) the percentage of people who receive diagnostic imaging for low back pain [46,47] and (2) the percentage of people who are given opioids for low back pain [46–48]. The majority (94%, n=29) of indicators from the Canadian and UK clinical care standards suggest that indicators be collected from "local sources" (eg, service protocols and patient notes), however, it is unclear whether existing low back pain indicators are routinely collected in these jurisdictions [17,18].

The feasibility of collecting several of our shortlisted indicators was demonstrated in a recent study from Belgium [49]. Using a registry of general practice data, the authors established statistical benchmarks of four care indicators, including five indicators ranked in Round 2: three imaging indicators, one opioid prescriptions indicator and one prescription of medical leave indicator [49].

We have developed a short list of low back pain indicators that countries worldwide could choose to include in a national minimum dataset to monitor progress in reducing the burden of low back pain and improving its care over time. Previous consensus efforts have focused primarily on patient outcomes for use in primary care and clinical research rather than for benchmarking at a population level. For example, the US National Institutes of Health (NIH) Task Force on Research Standards developed a minimum dataset of self-reported chronic low back pain indicators to promote standardization across grant applications, clinical studies and epidemiological studies [50]. Similarly, Verbung and colleagues used a modified RAND-UCLA Delphi approach to develop a set of low back pain outcome measures for monitoring aspects of primary care such as shared-decision making and internal quality improvement [51], and Clement and colleagues conducted a six-round Delphi process to recommend a standardized set of outcome measures for supporting quality improvement in degenerative low back conditions [52]. In contrast, our indicators are intended to support consistent monitoring and benchmarking at a population level.

Strengths and limitations

Our study has several strengths. Our international Delphi panel included low back pain researchers, clinicians, policy makers, educators and people with lived experience of low back pain from 33 countries, including 14 low- and middle-income countries. While there is little guidance for what expertise qualifies people to participate in Delphi studies [23], our large sample size included people with knowledge and interest in low back pain across a range of settings. Our combined purposive and snowballing approach led to over 300 participants in each survey round, with consistent response rates of approximately 45% in Rounds 1 and 2 and people with lived experience of low back pain were well represented. The modified-Delphi approach that we used, including a preliminary workshop to refine an extensive list of indicators, was consistent with studies in other health fields and could be used to develop burden and care indicators for other health conditions [53,54].

Our study has some limitations. First, most indicators included in Round 1 were derived from studies in high-income countries and may not be applicable to other settings. Second, participants rated the feasibility of indicator collection in their own country, which may not accurately reflect their true feasibility. Third, we removed two indicators that met consensus thresholds in Round 1 and this may not have been appropriate. One (number of people with low back pain who report restriction in ADLs) was excluded during the preliminary workshop as participants considered it unimportant for use in a national minimum dataset, but it was erroneously included in the first survey round. The other (number of emergency department attendances for a recorded primary discharge diagnosis of low back pain) was initially viewed as being similar to the number of hospital admissions but on reflection, captures a distinct aspect of hospital system burden. We recommend that both indicators be reconsidered in future work. Additionally, other pertinent indicators for monitoring low back pain burden and care may also have been excluded during the preliminary workshop phase of this study.

Another limitation of this study is that only a small proportion of participants in the Delphi survey rounds were from low- and middle-income countries (12% and 10% of participants in Rounds 1 and 2, respectively), which may affect the applicability of the 21 shortlisted indicators in these countries. This imbalance likely reflects the larger pool of researchers, researcher-clinicians, clinicians, policy makers and consumers engaged in back pain research in high-income countries. To address this, we invited all potential participants we could identify from low- and middle-income countries, including members of the Consortium for Low Back Pain in the Low- and Middle-Income Countries [29], and used snowball sampling to increase participation further. Assessing the relevance of the shortlisted indicators in low- and middle-income countries will form

part of the next phase of work where the indicators will be refined and piloted internationally.

Implications and future work

A national minimum dataset of low back pain indicators is urgently needed to monitor care and outcomes, and this surveillance tool could have the potential for international adoption. Routine collection of some or all 21 indicators could serve as an effective benchmarking tool and for monitoring changes over time. Future work is required to understand the acceptability and feasibility of collecting a national minimum dataset of indicators that can be used by all countries. Leveraging the indicators shortlisted from this study, the next step will be to refine the dataset by defining a core set of essential indicators that all countries should collect, while allowing flexibility for additional country-specific indicators. This will require collaborative discussion between researchers, data custodians, health care providers, policy makers and consumers within countries that are actively seeking to reduce the burden of low back pain and improve its care as a national priority. These discussions should focus on determining which indicators are feasible for routine collection, how data can be standardized across different health systems and how best to integrate these indicators into national health monitoring frameworks. Additionally, the expansion of future work to include real-world feasibility studies like the study in Belgium that evaluated low back pain indicators in general practice settings [49], would also be valuable for determining indicators that can be practically implemented on a larger scale.

Conclusion

We developed a minimum dataset of 21 low back pain indicators that could be used to monitor progress in improving care and outcomes for people with low back pain globally. Future work is needed to confirm the acceptability and feasibility of these indicators across countries, and, if implemented, to determine their value over time.

International low back pain minimum dataset Delphi panel

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Funding

Bayden McKenzie is supported by a PhD scholarship from the Chiropractic Australia Research Foundation and a top-up scholarship from the National Health and Medical Research Council (NHMRC) Australia & New Zealand Low Back Pain Research Network Centre of Research Excellence (ANZBACK CRE; APP1171459). Giovanni Ferreira is supported by an NHMRC Early Leadership Fellowship (APP2009808), Chris Maher and Rachelle Buchbinder are supported by NHMRC Leadership Grants (APP1194283 and APP1194483 respectively). The funding bodies were not involved in any aspect of the study design, collection, analysis or interpretation of the data or writing of the manuscript.

Data availability

All data are available upon reasonable request to the corresponding author.

Declaration of competing interest

The authors have declared that no conflicts of interest exist.

CRediT authorship contribution statement

Bayden J. McKenzie: Writing – original draft, Visualization, Project administration, Methodology, Formal analysis, Data curation, Conceptualization. **Giovanni E. Ferreira:** Writing – review & editing, Supervision, Methodology, Investigation, Formal analysis, Conceptualization. **Romi Haas:** Writing – review & editing, Supervision, Methodology, Investigation, Formal analysis, Conceptualization. **Alexandra Gorelik:** Writing – review & editing, Visualization, Validation, Formal analysis, Data curation. **Chris G. Maher:** Writing – review & editing, Supervision, Methodology, Formal analysis, Conceptualization. **Rachelle Buchbinder:** Writing – review & editing, Visualization, Supervision, Methodology, Investigation, Formal analysis, Conceptualization.

Acknowledgments

We acknowledge and thank all Delphi participants for their contribution to this work. A special thanks to the consumer advocacy groups of ANZMUSC and ANZBACK, Arthritis Australia, Arthritis New Zealand, and the Consortium for Low Back Pain in Low- and Middle-Income Countries for promoting our study across your networks.

Supplementary materials

Supplementary material associated with this article can be found in the online version at https://doi.org/10.1016/j.spinee.2025.10.003.

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