

BMJ Open International perspective on healthcare provider gender bias in musculoskeletal pain management: a scoping review protocol

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To cite: Wilford KF, Mena-Iturriaga MJ, Vugrin M, *et al.* International perspective on healthcare provider gender bias in musculoskeletal pain management: a scoping review protocol. *BMJ Open* 2022;**12**:e059233. doi:10.1136/bmjopen-2021-059233

► Prepublication history and additional supplemental material for this paper are available online. To view these files, please visit the journal online (<http://dx.doi.org/10.1136/bmjopen-2021-059233>).

Received 30 November 2021
Accepted 30 May 2022



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ABSTRACT

Introduction Chronic pain affects millions of individuals worldwide. Healthcare provider gender bias in the management of these individuals has societal and individual ramifications. Yet, a thorough and comprehensive literature summary on this topic is lacking. Therefore, this study aims to systematically: (1) identify and map the available scientific and grey literature as it relates to healthcare provider gender bias in the assessment, diagnosis and management of (chronic) musculoskeletal pain and (2) identify current gaps that necessitate further research.

Methods and analysis This scoping review will be conducted in accordance with recent guidelines, and the results will be reported via the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews. The following databases will be searched: PubMed (National Library of Medicine), Embase (Elsevier), Scopus (Elsevier), CINAHL Complete (Ovid), Academic Search Complete (Ebscohost), Pre-Prints Database (National Library of Medicine) and Rehabilitation Reference Center from inception to August 2022. Additionally, relevant grey literature will be identified. All screening will be done by two independent reviewers during two stages: first title/abstract screening followed by full-text screening. Data will be extracted from the bibliometric, study characteristics, and pain science families of variables. Results will be descriptively mapped, and the frequency of concepts, population, characteristics and other details will be narratively reported. Additionally, results will be presented in tabular and graphical form.

Ethics and dissemination As this study will neither involve human subject participation nor utilisation of protected data, ethical approval is not required. This study's methodological approach follows current recommendations. Study findings will be disseminated through conference presentations and international peer-review journal publication. In addition, infographics available in English, Spanish and German will be disseminated.

Registration details This project will be registered in Open Science Framework prior to data collection.

STRENGTHS AND LIMITATIONS OF THIS STUDY

- ⇒ This will be the first study to systematically explore and summarise healthcare provider gender bias (HCP-GB) and its influence on patient care with respect to musculoskeletal pain management.
- ⇒ The research team includes a scientific librarian with expertise in search strategies, and Covidence will be used during this review process to ensure blinding reviewer consistency.
- ⇒ Including only resources available in English, Spanish and German may result in missing essential resources only available in other languages.
- ⇒ While focusing on gender bias, the researchers acknowledge it is difficult to separate the intersectionality of gender with other biological or societal determinants. The results of this project will add to a larger discussion on the intersectionality of gender with the previously mentioned constructs.
- ⇒ Discrepancies in assessments, treatment and outcomes between genders do not necessarily imply HCP-GB was present. For example, certain conditions are more prevalent in one gender over the other; therefore, a gender-specific management strategy would not support an HCP-GB.

INTRODUCTION

Pain has become a global health problem.¹ Recent data report that annual costs ranged from \$560 to \$635 billion in the USA for individuals with chronic pain, resulting in lower worker productivity.² Low back and neck pain are among the leading causes of years lived with prolonged disability worldwide.³ The incidence of musculoskeletal (MSK) pain is projected to grow exponentially over the next two decades, further straining healthcare systems already stretched to their breaking points.²

In addition to the economic impact, (chronic) pain management has many widespread societal ramifications. Prescription opioid use is a common management option, used in 40%–60% of primary healthcare



settings.^{4–10} However, its misuse can have severe ramifications that include heroin use, opioid overdose and death.^{4–10} Additionally, individuals with chronic pain are more likely to have mental health conditions such as anxiety and depression.¹¹ Approximately 20% of individuals with chronic pain demonstrate suicidal ideation, increasing the risk of death by suicide twofold versus the general population.¹² Due to the pervasive sequelae of mismanaged (chronic) pain for both the affected individual and society as a whole, care providers who treat individuals with (chronic) MSK pain are required to engage in thoughtful ongoing assessment and modification during the management sequence.

To better manage individuals with (chronic) pain, careful attention must be paid to the *management model* itself. The healthcare–patient management model contains many elements: examination, evaluation, diagnosis, prognosis, intervention and outcomes.^{13–15} The *examination* includes a history wherein the healthcare provider collects patient data on the current condition.¹³ Following, tests and measures are performed to rule in or rule out impairments. The healthcare provider must interpret available data from the entire examination process. This interpretation leads to crafting a diagnosis and prognosis, followed by the development of an overall management plan for the patient.¹³ A failure to correctly collect or interpret data may result in suboptimal or even unfavourable clinical decisions that reduce patient outcomes.

Specific to the examination of individuals with (chronic) *MSK pain*, the affected individual's subjective self-report (ie, verbally during medical history taking and/or by means of various written patient self-reported outcome measures) is the diagnostic gold standard.^{16–17} As is common with verbal communication, however, many possible sources of error can exist between the clinician and patient during this verbal history-taking process.¹⁸ One possible source of error in communication can be related to the influence of bias.¹⁸

Bias, in general, describes a tendency, leaning or prejudice towards an object or a person and can be either positive or negative.¹⁹ Most biases are based on stereotypes rather than on actual knowledge.¹⁹ Such prejudgement can result in injudicious decisions or discriminatory practices.¹⁹ Biases delivered against other people are often based on the group that the biased individuals belong to and/or on an immutable physical characteristic they possess, such as their ethnicity, sexual orientation, age or gender.^{16–19–20} Individuals who act in a biased manner may or may not be aware of their biases. An unconscious bias, also known as 'implicit bias', can have harmful consequences as stereotyping and prejudice ultimately influence both perceptions and decisions.

While highly trained in their respective fields, healthcare providers are not precluded from possessing implicit biases. The patient–healthcare provider interaction is a complicated process wherein current scientific evidence, clinician experience and patient expectations

may collide. Serving as vectors who translate clinical knowledge and research into the patient management process, healthcare providers must be aware of their implicit biases and possible consequences for their patients. Current literature suggests the existence of gender-related discrepancies in assessment, diagnosis and management of (chronic) pain.^{16–20–22} Gender, defined as behavioural, cultural or psychological traits typically associated with one sex, will be used throughout this manuscript rather than sex, defined as either of two forms of individuals that are distinguished based on reproductive organs and structures,²³ as the authors aim to capture healthcare consequences of gender and will, therefore, be describing cultural ramifications rather than simply biological differences. In comparison with men, women experience a delay in access to diagnostic and treatment options for chronic pain and are less likely to receive recommendations for analgesics, radiological examination and physiotherapy.^{24–26}

A systematic and thorough literature summary on the topic of gender bias in healthcare is currently lacking. While a theory-guided review on gender bias in the treatment of pain is available,²² to the best of our knowledge, the topic of gender bias in healthcare is lacking a systematic approach and mapping. Moreover, previous literature does not include the entire patient management model or a strict focus on MSK pain. The purpose of this scoping review is to systematically identify and comprehensively map available scientific literature and grey literature as they relate to healthcare provider-gender bias (HCP-GB) in the assessment, diagnosis and management of (chronic) MSK pain. This study aims to examine: (1) the scope of literature on HCP-GB in MSK pain assessment, diagnosis and management; (2) the effects of HCP-GB on patient outcomes; and (3) how HCP-GB varies across different countries and cultures.

METHODS AND ANALYSIS

Study design

This scoping review will be conducted in accordance to recent guidelines^{27–28} and reported via the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR), as per current recommendations.^{29–30} Furthermore, while not currently required for scoping reviews, this project will be registered in Open Science Framework prior to data collection.^{27–28}

Data sources

This scoping review will include both scientific research and grey literature (eg, conference proceedings and dissertations). Relevant scientific studies will be identified in the electronic databases PubMed (National Library of Medicine), Embase (Elsevier), Scopus (Elsevier), CINAHL Complete (Ovid), Academic Search Complete (Ebscohost), Pre-Prints Database (National Library of Medicine) and Rehabilitation Reference Center from

Table 1 PCC framework

Population (P)	Man, woman, adult, healthcare provider, professional
Concept (C)	Bias, gender, stereotype, gendered norm, inequity, sex, gender research
Context (C)	Musculoskeletal pain, pain assessment, pain perception, treatment, pain management, rehabilitation, diagnosis, outcome, culture, equity in health

inception to August 2022. All databases will be accessed through the local university libraries. Grey literature will be identified by searching Trip database, Papers First, Conference Papers Index and Clinical Trial Register Databases (Prospero, ClinicalTrials.gov, WHO International Clinical Trials Registry Platform, ISRCTN registry, ClinicalResearch.com and CenterWatch) and Google Scholar.^{27 31 32} Google Scholar search will end when 20 consecutive links irrelevant to the search topic are found.

Search strategy

Search terms will be developed in accordance with previous recommendations for scoping reviews using the PCC framework summarised in [table 1](#).²⁷

As search strategies will be specified for each data source, an experienced scientific librarian will be involved in final search strategy development.²⁸ A combination of Medical Subject Headings/concepts subject headings will be meaningfully linked, based on the targeted database and keywords. The snowball method will be used to identify additional papers from included studies' reference lists.^{31–33} The full PubMed search strategy used during the pilot process is included in online supplemental appendix A.

Study screening

The review management software Covidence (Veritas Health Innovation Ltd, Melbourne, Australia) will be used for study screening and data extraction. A three-reviewer model will be employed, wherein two blinded primary reviewers (KFW and MJM-I) independently screen references for possible inclusion. A third blinded reviewer (GHS) will solve emerging conflicts.^{27 28} A two-part pilot process will be used to revise search criteria, refine the study selection process and ensure a threshold of at least 75% agreement between reviewers prior to final study selection. The previously mentioned reviewers will screen title and abstract first followed by the full text of selected references prior to data extraction. The entire search will be limited to resources available in English, Spanish and German. In vitro, cadaveric, animal or experimentally induced pain studies will be excluded from title/abstract screening. Studies will be excluded from full-text screening for the following reasons: pain not evaluated, non-MSK pain, no healthcare provider bias, unable to find full text and language other than English, German or Spanish.

Study variables, data extraction and data reporting

The following families of variables will be extracted from the full texts of included studies, using the same three-reviewer model outlined in the previous section^{27 28}:

- ▶ Bibliometric variables (author; title; publishing journal; etc).
- ▶ Study characteristic variables (design; purposes; aims; population; setting; etc).
- ▶ Pain science variables (pain descriptors; diagnosis; outcomes; patient characteristics; bias explanation; etc).

All extracted data will be summarised in a customised pre-piloted data extraction table using the Covidence software. To avoid possible duplication of extracted data, reviews and meta-analyses will be excluded from the extraction phase. Rather, the reference list of reviews and meta-analyses will be mined for relevant studies for inclusion. Only original studies will be used for data extraction. As expected with scoping reviews, results will be descriptively mapped.^{27 28} The data extraction format will be based on the specific variables, and the reporting method is outlined further in [table 2](#).

Patient and public involvement

Neither patients nor members of the public were involved during the design of this research. Moreover, neither of the two groups will be involved during the conduct of this scoping review due to the nature of the study's design. Prior to dissemination of the infographic, patient and clinician feedback will be sought and incorporated into the final product.

ETHICS AND DISSEMINATION

A persistent HCP-GB in the assessment, diagnosis and management of (chronic) MSK pain is highly unethical. Furthermore, HCP-GB can lead to reduced treatment outcomes and prolonged disability in certain populations and contributes to a significant economic strain on society. Thus, this study will provide a systematic exploration and summary of HCP-GB and its influence on patient care. Literature suggests that gender biases occur at many healthcare delivery levels, damaging the health of millions of individuals worldwide.³⁴ The lack of HCP-GB awareness is a barrier to change.^{35 36} Furthermore, a call to action is needed to protect the health and lives of millions of individuals with chronic pain. Minimising HCP-GB in health systems will require a bold approach to raising awareness and transforming values among service providers.^{34 35} This will be the first study to systematically explore and summarise HCP-GB and its influence on patient care. This study's results will identify gaps in current literature and aide future research needs in the field of (chronic) pain management. In addition, this study will challenge entrenched beliefs surrounding interactions with, and management of, individuals with (chronic) pain. By bringing to light HCP-GB and encouraging a self-reflective practice, individuals with (chronic)

**Table 2** Data extraction for bibliometric, study characteristics and pain science variables

	Bibliometric	Study characteristics	Pain science
Variables to be extracted and mapped	<ul style="list-style-type: none"> ▶ Author(s) ▶ Type of study ▶ Publication year ▶ Journal ▶ DOI ▶ Language ▶ Country 	<ul style="list-style-type: none"> ▶ Study design ▶ Setting ▶ Sample/population ▶ Purpose(s) ▶ Aim(s) ▶ Level of evidence ▶ Approach (qualitative vs quantitative vs mixed methods) 	<ul style="list-style-type: none"> ▶ Healthcare provider specifications: profession, age, sex, gender, degree, years of experience, country, religion and ethnic background ▶ Patient specifications: age, sex, gender, education level, socioeconomic status, country, religion, ethnic background, mental health status, comorbidities, severity of health issue, familial history and accessibility to healthcare ▶ Healthcare setting ▶ Pain descriptors: location(s), intensity, onset and type ▶ Diagnosis: outcome measures/assessment tools used, time from pain onset, timeline, sex-related prevalence and diagnostic criteria available ▶ Type of treatment prescribed: medication versus rehab versus psychological versus other ▶ Patient outcome after treatment bias explanation(s)
Reporting measures	<ul style="list-style-type: none"> ▶ Author(s), type of study, publication year, country, methodology, etc → absolute and relative frequencies ▶ Purposes and aims → descriptively ▶ Variables related to population age and sample size → mean (SD)/median (IQR) ▶ Population gender and other characteristics → absolute or relative frequencies ▶ Pain variables → descriptively and/or as absolute or relative frequencies 		

DOI, digital object identifier.

MSK pain should expect to receive ethical and unbiased care by empathetic healthcare providers.

Acknowledging the pervasive evidence–practice gap in healthcare research and the difficulty converting research findings into clinical practice, the concept of knowledge translation has come to the foreground within the past several years. We will address knowledge translation via two strategies.³⁷ First, our study findings will be disseminated among the scientific community through conference presentations and an international peer-review journal publication. In addition, we strive to promote the integration of our findings into the clinical practice of healthcare providers outside the scientific environment. Informational graphics (also known as infographics) have been suggested as an attractive and effective form of knowledge dissemination among non-scientific audiences via simple visualisation and plain language use.^{38 39} As the current project involves researchers from three different countries (namely Chile, the USA and Germany) that use different languages, this investigation's emerging infographic will be available in English, Spanish and German. Once completed, we will devise a plan to disseminate the infographic throughout the physical therapy associations of countries that use these languages. By this means we hope to raise awareness about HCP-GB and to promote behaviour change in a wide-reaching manner.

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Acknowledgements The authors would like to acknowledge the intramural student support award from the Texas Tech University Health Sciences Center School of Health Professions Pain Science Scholar Development Award.

Contributors KFW, MJM-I and MW contributed to the conceptualisation, methodology, writing of the original draft and revised drafts of the manuscript. MV contributed to the methodology and assisted securing required resources. PSS supervised the project and assisted with reviewing and editing drafts of the manuscript. GHS contributed to the conceptualisation, methodology, writing of the original draft and revised drafts of the manuscript and supervised reviewing and editing of critical revisions. All authors approved the final version of this manuscript.

Funding The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors.

Competing interests None declared.

Patient and public involvement Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Patient consent for publication Not applicable.

Provenance and peer review Not commissioned; externally peer reviewed.

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REFERENCES

- Goldberg DS, McGee SJ. Pain as a global public health priority. *BMC Public Health* 2011;11:770 <http://www.biomedcentral.com/1471-2458/11/770>
- Gaskin DJ, Richard P. The economic costs of pain in the United States. *J Pain* 2012;13:715–24.
- Vos T, Flaxman AD, Naghavi M, et al. Years lived with disability (YLDs) for 1160 sequelae of 289 diseases and injuries 1990–2010: a systematic analysis for the global burden of disease study 2010. *Lancet* 2012;380:2163–96.
- Fleming MF, Balousek SL, Klessig CL, et al. Substance use disorders in a primary care sample receiving daily opioid therapy. *J Pain* 2007;8:573–82.
- Volkow ND, McLellan AT. Opioid Abuse in Chronic Pain--Misconceptions and Mitigation Strategies. *N Engl J Med* 2016;374:1253–63.
- Saunders KW, Dunn KM, Merrill JO, et al. Relationship of opioid use and dosage levels to fractures in older chronic pain patients. *J Gen Intern Med* 2010;25:310–5.
- Dunn KM, Saunders KW, Rutter CM, et al. Opioid prescriptions for chronic pain and overdose: a cohort study. *Ann Intern Med* 2010;152:85–92 <http://ovidsp.ovid.com/ovidweb.cgi?T=JS&PAGE=fulltext&D=ovft&CSC=Y&NEWS=N&SEARCH=00000605-201001190-00006.an>
- Franklin GM, Mai J, Turner J, et al. Bending the prescription opioid dosing and mortality curves: impact of the Washington state opioid dosing guideline. *Am J Ind Med* 2012;55:325–31.
- Michna E, Jamison RN, Pham L-D, et al. Urine toxicology screening among chronic pain patients on opioid therapy: frequency and predictability of abnormal findings. *Clin J Pain* 2007;23:173–9.
- Turk DC, Swanson KS, Gatchel RJ. Predicting opioid misuse by chronic pain patients: a systematic review and literature synthesis. *Clin J Pain* 2008;24:497–508.
- Hooten WM. Chronic pain and mental health disorders: shared neural mechanisms, epidemiology, and treatment. *Mayo Clin Proc* 2016;91:955–70.
- Tang NKY, Crane C. Suicidality in chronic pain: a review of the prevalence, risk factors and psychological links. *Psychol Med* 2006;36:575–86.
- APTA. *Guide to Physical therapist practice*. American Physical Therapy Association, 2021. <https://guide.apta.org/>
- Kranz F. Therapie MIT system – Ergotherapeutische Prozessmodelle. *Ergopraxis* 2015;8:12–13.
- Toney-Butler T, Thayer J. Nursing Process. In: *StatPearls [Internet]*. StatPearls Publishing, 2022. <https://www.ncbi.nlm.nih.gov/books/NBK499937/>
- Zhang L, Losin EAR, Ashar YK, et al. Gender biases in estimation of others' pain. *J Pain* 2021;00:1–12.
- Casser H, Schaible H. Muskuloskeletaler Schmerz [Musculoskeletal pain]. *Schmerz* 2015;29:486–8.
- Maitland G, Hengeveld E, Banks K. Chapter 3: Communication and the therapeutic relationship. In: Hengeveld E, Banks K, eds. *Maitland's Vertebral Manipulation*. 1. 8th. Elsevier, 2005. ISBN: 9780702054587.
- Ellemers N. Gender stereotypes. *Annu Rev Psychol* 2018;69:275–98. Epub 2017 Sep 27.
- Bernardes SF, Keogh E, Lima ML. Bridging the gap between pain and gender research: a selective literature review. *Eur J Pain* 2008;12:427–40.
- Seers T, Derry S, Seers K, et al. Professionals underestimate patients' pain: a comprehensive review. *Pain* 2018;159:811–8.
- Samulowitz A, Gremyr I, Eriksson E, et al. "Brave Men" and "Emotional Women": A Theory-Guided literature review on gender bias in Health Care and gendered norms towards patients with chronic pain. *Pain Res Manag* 2018;2018:1–14.
- Dictionary. Merriam-Webster. published 2020. Available: <https://www.merriam-webster.com/> [Accessed December 5, 2020].
- Schäfer G, Prkachin KM, Kaseweter KA. *Health Care Providers' Judgments in Chronic Pain: The Influence of Gender and Trustworthiness*. 157, 2016.
- Stålnacke B-M, Haukenes I, Lehti A, et al. Is there a gender bias in recommendations for further rehabilitation in primary care of patients with chronic pain after an interdisciplinary team assessment? *J Rehabil Med* 2015;47:365–71.
- Margarit C, Roca R, Inda M-D-M, et al. Sex bias and genotype influence on opioid safety profile in chronic low back pain. *Clin J Pain* 2020;36:420–9.
- Peters M, Godfrey C, Mclnerney P. Chapter 11: Scoping Reviews (2020 version). In: Aromataris E, Munn Z, eds. *JBI manual for evidence synthesis*. JBI, 2020.
- Peters MDJ, Marnie C, Tricco AC, et al. Updated methodological guidance for the conduct of scoping reviews. *JBI Evid Synth* 2020;18:2119–26.
- Tricco AC, Lillie E, Zarin W, et al. PRISMA extension for scoping reviews (PRISMA-ScR): checklist and explanation. *Ann Intern Med* 2018;169:467–73.
- Page MJ, McKenzie JE, Bossuyt PM. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *BMJ* 2021;372.
- Hofste A, Soer R, Hermens HJ, et al. Inconsistent descriptions of lumbar multifidus morphology: a scoping review. *BMC Musculoskelet Disord* 2020;21:1–18.
- Daniel M, Rencic J, Durning SJ, et al. Clinical Reasoning assessment methods: a scoping review and practical guidance. *Acad Med* 2019;94:902–12.
- Cuff A, Parton S, Tyer R, et al. Guidelines for the use of diagnostic imaging in musculoskeletal pain conditions affecting the lower back, knee and shoulder: a scoping review. *Musculoskeletal Care* 2020;18:546–54.
- Sen G, Östlin P. Gender inequity in health: why it exists and how we can change it. *Glob Public Health* 2008;3 Suppl 1:1–12.
- Gupta GR, Oomman N, Grown C, et al. Gender equality and gender norms: framing the opportunities for health. *Lancet* 2019;393:2550–62.
- George A. The outrageous as ordinary: primary health care workers' perspectives on accountability in Koppal district, Karnataka State, India. Published online 2007.
- Kristensen N, Nymann C, Konradsen H. Implementing research results in clinical practice- the experiences of healthcare professionals. *BMC Health Serv Res* 2015;16.
- Houts PS, Doak CC, Doak LG, et al. The role of pictures in improving health communication: a review of research on attention, comprehension, recall, and adherence. *Patient Educ Couns* 2006;61:173–90.
- Guide to knowledge translation planning at CIHR: integrated and End-of-Grant approaches. *Canadian Institutes of Health Research* 2012.