




BMJ Open Role of artificial intelligence-powered conversational agents (chatbots) in musculoskeletal disorders: a scoping review protocol

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ABSTRACT

Introduction Musculoskeletal disorders (MSDs) represent a significant global health burden that leads to substantial disability with socioeconomic impact. With the rise of artificial intelligence (AI), particularly large language model-driven conversational agents (chatbots), there is potential to enhance the management of MSDs. However, the application of AI-powered chatbots in this population has not been comprehensively synthesised. Therefore, this scoping review aims to explore the current and potential use of AI-powered chatbots in managing MSDs. The review will map out the targeted diseases, the purposes of chatbot interventions, the clinical tools or frameworks used in training these systems and the evaluated outcomes in clinical settings.

Methods and analysis This scoping review will follow the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews guidelines, with a comprehensive search across multiple databases, including Medline (Ovid Medline), Embase (Ovid), ISI Web of Science (Clarivate) and ClinicalTrials.gov. We will include studies involving adults with MSDs, regardless of publication status, language or year. The scoping review will exclude studies using non-AI chatbots or human health coaches. Data extraction and synthesis will focus on demographic characteristics, chatbot methods, outcomes and thematic analysis.

Ethics and dissemination Formal ethical approval is not required as this study involves neither human participants nor unpublished secondary data. The findings of this scoping review will be disseminated through professional networks, conference presentations and publication in a scientific journal.

INTRODUCTION

Musculoskeletal disorders (MSDs) are a significant global health concern, ranking as the second cause of non-fatal disability in 2020 and affecting over 1.63 billion individuals worldwide.¹ The burden of MSDs extends beyond physical limitations, often leading to substantial disability and topping the list in terms of years lost to disability, according to

STRENGTHS AND LIMITATIONS OF THIS STUDY

- ⇒ We will develop a search strategy with high sensitivity to retrieve studies.
- ⇒ The search will be very sensitive, and the scoping review will not exclude studies by publication status, language or year of publication.
- ⇒ Due to the rapidly growing body of research on chatbots, this scoping review may miss some studies that are planned or are still in progress.

the latest Global Burden of Disease report.² The enduring pain and disability associated with MSDs can also precipitate long-term psychological consequences.³ Additionally, the considerable healthcare costs and the strain on workforce availability further compound the societal burden of these conditions.⁴

Amid these challenges, artificial intelligence (AI) emerges as a transformative tool, reshaping how we process information and augmenting decision-making processes through problem-solving, reasoning and learning. AI encompasses a range of methods, including machine learning, deep learning (DL) and natural language processing (NLP). Large language models (LLMs) represent a specific type of AI that employs DL and extensive data sets to comprehend, summarise, generate and forecast new text-based content.^{5–7} In the healthcare field, AI applications are diverse, ranging from machine learning algorithms that assist in diagnostic tools to LLMs that dialogue with patients.⁸ This ability to engage in real-time dialogue with patients not only improves accessibility to healthcare services but also empowers patients by offering immediate, reliable information. NLP models based on LLMs have gained prominence, enhancing



their capabilities by generating and understanding human language through learnt patterns rather than relying solely on predefined rules.^{9,10} From these models, the use of chatbots arises. Chatbots are systems that engage users in dialogue—typically online—and generate responses based on analysed inputs and accessed knowledge.¹¹ The use of chatbots has been reported in various aspects of healthcare, such as cancer,¹² behavioural change¹³ and psychiatry,¹⁴ among others. Particularly in musculoskeletal care, chatbots have been studied in people with chronic pain,¹⁵ shoulder arthroplasty¹⁶ and back pain.¹⁷ However, to our knowledge, no evidence synthesis has been conducted on the use of chatbots in this population.

This scoping review aims to provide an overview of the current and potential use of AI-powered conversational agents (chatbots) in people with MSD.

Review questions

- ▶ In the context of MSDs, in which diseases and for what purpose have chatbots been used (eg, medication reminders, exercise-based treatment reminders, education and motivation)?
- ▶ What clinical tools or conceptual frameworks are serving as benchmarks in training chatbots with AI algorithms for application in clinical settings related to musculoskeletal conditions?
- ▶ What outcomes are evaluated when implementing AI chatbots for the management of MSDs in clinical settings?

METHODS AND ANALYSIS

This scoping review will be conducted between June and December 2025 and will be reported following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) guidelines.¹⁸

Eligibility criteria

This review will include all primary studies that assess the use of AI chatbots in adults (older than 18 years) with a musculoskeletal disease in any setting. MSDs refer to a diverse set of conditions affecting the muscles, bones, joints and related tissues, with symptoms that can vary in duration.

Articles will be excluded if they (1) used chatbots that did not incorporate AI (eg, chatbots and computerised coaches that were not conversational and without machine learning capabilities), (2) used human health coaches conversing with users through messaging platforms and (3) included participants who experience pain due to particular pathological causes (such as neurological disease, malignancy and inflammatory disease). We will not exclude by status of publication, language or year of publication. Narrative reviews, letters to editors or any non-original study will be excluded from this scoping review.

Search methods

We will search the following databases from inception, with no restrictions on date, language or publication status:

- ▶ Medline (Ovid Medline).
- ▶ Embase (Ovid).
- ▶ ISI Web of Science (Clarivate).
- ▶ ClinicalTrials.gov (www.clinicaltrials.gov).

For detailed search strategies, see online supplemental appendix 1.

Selection of studies

After deduplication, all identified records will be uploaded to the Covidence web application. Prior to the screening process, a pilot test of the proposed eligibility criteria will be performed using 3–10 articles to solve any possible disagreements regarding the selection process. Two independent reviewers will then screen the titles and abstracts and further select the studies by reading the full text of potentially eligible studies. If there is a discrepancy in any step of the selection process, a third reviewer will decide whether the study meets the eligibility criteria. The search results and the reasons for exclusions will be recorded and reported in a PRISMA-ScR flow chart.

Data extraction process

Two independent reviewers will extract data from the selected articles into a predefined template. For each study, we will extract the author, year of publication, country of origin, objectives, study population and sample size, intervention or exposure, measured outcomes, details of these outcomes, MSD and the key findings that relate to the questions of this review. In case of discrepancies, a third reviewer will participate in this process.

Collating, summarising and reporting the results

The findings will be summarised in accordance with the PRISMA-ScR guidelines, focusing on descriptive and thematic analyses. Descriptive elements will cover demographic characteristics, country of research, publication details and bibliometric data. These include musculoskeletal diagnosis, description of the AI chatbot method, the purpose of the AI chatbot, nature of the data set (eg, size, data cleaning or preparation methods), the outcomes assessed, knowledge user engagement and the healthcare setting of the study. Whenever possible, we will conduct an equity-related assessment by extracting and synthesising evidence by age groups and ethnicity from studies with disaggregated data. We will explore the use of AI-powered chatbots in managing MSDs separately for men and women, whenever we find available data. Although primary studies may differ between low-income and high-income settings, we will not specifically assess these differences but will consider them in our discussion. Additionally, we may conduct further bibliometric analysis such as cocitation networks among authors and countries using VOSviewer.¹⁹ Furthermore, a thematic

summary will be provided to emphasise the main themes identified in the literature.

Patient and public involvement

In designing this scoping review protocol, we consulted a group of patients with various MSDs to gather input on their values and preferences.

ETHICS AND DISSEMINATION

Formal ethical approval is not required as this study involves neither human participants nor unpublished secondary data. The findings of this scoping review will be disseminated through professional networks, conference presentations and publication in a scientific journal.

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Contributors JGA is the guarantor and conceived the idea of this project, established the research question and methodology and led the development of the protocol. LV-M, HF and EM contributed to the methods and gave meaningful contributions to the development and/or editing of the protocol. CMEL and JGA developed the search strategies. JOA, AP and EM helped refine the protocol. All authors approved the final version of the protocol.

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