PREVENTING MUSCULOSKELETAL DISORDERS IN FRONTLINE HEALTHCARE PROFESSIONALS: A SYSTEMATIC REVIEW OF INTERVENTION APPROACHES IN HOSPITAL SETTINGS

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ABSTRACT

Background: Musculoskeletal disorders (MSDs) are a major contributor to decreased work motivation among nurses. These conditions are primarily caused by occupational stress and non-ergonomic working postures involving repetitive movements and prolonged static loading on specific muscles and joints. MSDs manifest as pain, paresthesia, fatigue, and limited range of motion. If left untreated, MSDs may lead to permanent functional impairment, reduced quality of life, decreased work motivation, and a decline in the nursing workforce. Methods: This systematic review included randomized controlled trials (RCTs) published between 2014 and 2024 that investigated stretching interventions among nurses and hospital healthcare workers. A total of 1,488 articles were identified from the Scopus, PubMed, and ProQuest databases. After screening, 1,475 articles were excluded due to inappropriate study design (n = 886), irrelevant populations (n = 350), unrelated outcomes (n = 239), and other reasons (n = 5). Eight articles met the inclusion criteria and were included in the final analysis. Results: All included studies reported a reduction in musculoskeletal discomfort or pain, particularly in the neck, shoulders, back, lower back, hands, and feet following stretching interventions. The duration of stretching per session ranged from 5 minutes (two studies), 10 minutes (three studies), to 20 minutes (three studies). The intervention periods varied from 6 weeks (three studies), 12–15 weeks (two studies), to 6–18 months (three studies). Although different instruments were used, all measured musculoskeletal discomfort or pain. Conclusion: Stretching interventions are effective in preventing and reducing MSD-related discomfort among hospital nurses. Therefore, structured training programs and institutional policies are strongly recommended to promote regular stretching as part of occupational health strategies.

Keywords: Musculoskeletal Disorders; Stretching; Hospital Nurses

BACKGROUND

Musculoskeletal disorders (MSDs) are a common health problem among healthcare workers, particularly nurses. According to the World Health Organization (WHO), MSDs are disorders affecting muscles, bones, ligaments, nerves, and blood vessels, often caused by occupational demands, especially those involving heavy physical activity or repetitive movements. In hospital settings, nurses represent one of the most vulnerable professions to MSDs due to the high physical demands of their work and non-ergonomic working conditions. MSDs such as back pain, neck pain, shoulder pain, and extremity discomfort are frequently reported among nurses working in hospitals.

Nursing tasks often involve physically demanding activities such as lifting and transferring patients, pushing medical equipment, and performing duties that require non-ergonomic postures. In addition, long working hours, irregular shifts, and high job stress further contribute to the risk of developing MSDs among nurses (Stolwijk et al., 2013). Nurses in hospitals are frequently exposed to challenging work conditions, including heavy physical workload and extended working hours. Routine tasks such as transferring patients from bed to wheelchair, repositioning patients, or assisting with daily activities often impose significant physical strain. Incorrect posture or improper lifting techniques may cause excessive stress on muscles and joints, particularly in the lower back, shoulders, and neck (Naoum et al., 2022).

Previous studies (Silva Filho et al., 2020; Erliana, 2023) have shown that MSDs are one of the leading causes of work absenteeism and reduced productivity among nurses. These conditions not only have adverse impacts on the health and well-being of nurses but also compromise the quality of patient care. Moreover, MSDs impose a substantial financial burden on both individuals and healthcare institutions, due to treatment costs, rehabilitation expenses, and productivity losses.

Given the increasing demands of healthcare services and the need to maintain workforce well-being, prevention and management of MSDs among nurses have become increasingly important. Preventive measures may include stretching exercises, ergonomic training, the use of assistive devices to reduce physical load, and workplace modifications to minimize injury risk (Coggon et al., 2019). Several studies have investigated stretching interventions to maintain musculoskeletal flexibility and prevent injury; however, these studies have not provided a detailed description of the movements performed. Furthermore, there is limited evidence on workplace-based training programs to promote healthcare worker fitness, possibly due to constraints in human resources and financial support from hospitals to sponsor such interventions.

In light of the limited information available on workplace exercise interventions and their potential to reduce both physical and mental stress, the aim of this study was to conduct a systematic review to determine the types of interventions implemented and the duration required for their effective application (Silva Filho et al., 2020).

METHOD

The study population comprised healthcare workers in hospital settings who received physical interventions such as stretching or other forms of exercise aimed at preventing musculoskeletal disorders (MSDs). The methodological approach applied was a systematic review. As highlighted by Moosapour et al. (2021), systematic reviews can also identify areas in which knowledge is assumed to be well established, yet in reality, limited evidence exists to substantiate such beliefs.

The research question was formulated based on the specific needs of this study, focusing on physical interventions undertaken by nurses or other healthcare professionals in hospitals to prevent MSDs. The development of the research question followed the PICO framework, which emphasizes four essential elements: (1) Population (P): Hospital staff and nurses (2) Intervention (I): Stretching. (3) Comparison (C): Other physical exercises. (4) utcome (O): Discomfort and pain associated with musculoskeletal disorders.

Search Strategy

The documents were retrieved and managed using Rayyan.AI**,** an application designed to facilitate the identification and screening of articles in systematic reviews. The first stage involved downloading search results from Scopus, ProQuest, and PubMed databases. The downloaded files were subsequently imported into Rayyan.AI, following these steps:

a. creating a new review,
b. selecting and uploading the downloaded files from the databases,
c. proceeding to the next stage (*continue*),
d. inviting collaborators or supervisors,
e. detecting duplicates, and
f. screening the records.
g. Study Selection and Eligibility Criteria

Inclusion and Exclusion Criteria

The inclusion criteria were as follows: (1) articles with a randomized controlled trial (RCT) design, (2) studies that investigated interventions aimed at preventing and reducing musculoskeletal disorders (MSDs) among nurses and healthcare workers, and (3) publications within the period 2014–2024. The exclusion criteria were: (1) articles that were not RCTs, and (2) studies that did not align with the predefined PICO framework.

Assessment of Study Quality and Data Extraction

Data extraction was conducted through three rounds of screening to ensure that all articles were reviewed comprehensively, achieving 100% screening coverage. The inclusion criteria were restricted to articles published between 2014 and 2024 with a randomized controlled trial (RCT) design. A total of 1,488 articles were initially identified, consisting of 874 from Scopus, 539 from PubMed, and 75 from ProQuest. Following duplicate removal, 155 articles were identified as duplicates. Subsequent screening excluded 1,475 articles: 886 due to inappropriate study design, 350 due to irrelevant populations, 239 due to unrelated outcomes, and 5 for other miscellaneous reasons.

In the end, eight (n=8) articles met the inclusion criteria and were considered eligible. These included studies were then subjected to critical appraisal to further ensure their alignment with the predefined PICO framework established at the outset of the review.

Analysis Statistical

The analysis was conducted using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) framework to ensure transparency in the flow of information from the initial identification and collection of articles through to the screening and final selection process (Syamsul Hadi, 2020).

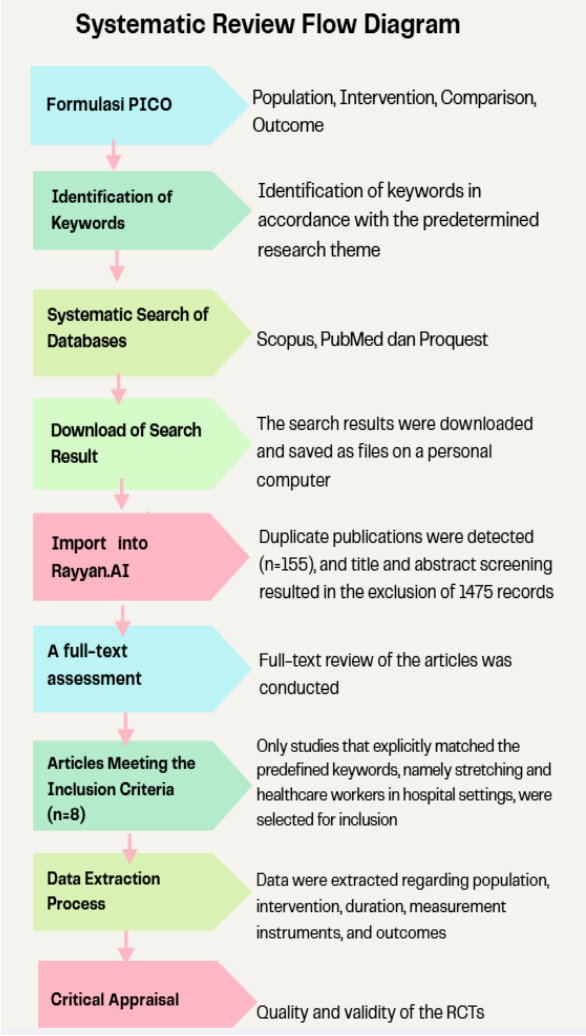

Figure 1 : Systematic Review Flow Diagram

RESULTS

All eight included articles employed stretching interventions, and all were designed as randomized controlled trials (RCTs). Of these, five studies implemented the intervention among nurses, while three targeted other hospital healthcare workers. The overarching aim of these studies was to examine the relationship between stretching interventions and the reduction of musculoskeletal disorders (MSDs) in hospital staff.

The studies differed in terms of intervention duration and measurement instruments. For example:

1. Moreira (2021): 5 minutes per working day (25 minutes/week) for 15 weeks, assessed using the Borg Scale.
2. Natalia (2022): Three sessions per week for 12 weeks, measured with the Numeric Pain Scale.
3. Beyan (2020): An 18-month ergonomic training program, assessed with the Cornell Score.
4. Burbridge (2020): 15 minutes daily for one year, evaluated with the Roland Morris Questionnaire.
5. Alqhtani (2023): Three sessions per week for six weeks.
6. Otto (2024): 30 minutes per session during lunch breaks, three times per week for six weeks, measured with the Nordic Musculoskeletal Questionnaire (NMQ).
7. Imai (2021): 20 minutes, three times per week for six months, assessed with the Widespread Pain Index (WPI).
8. Jalalvandi (2023): 15 minutes daily for six weeks, evaluated with the McGill Pain Questionnaire (MPQ).

Across these studies, the most frequently reported areas of discomfort or pain included the neck, shoulders, back, lower back, hands, and feet. Short-duration interventions (e.g., 5 minutes) were shown to provide some benefit but lacked long-term sustainability. In contrast, interventions lasting 10–20 minutes per session, performed at least three times per week for a minimum of six weeks, were more consistently effective in reducing musculoskeletal pain over the long term. Moreover, multifaceted interventions—such as combining stretching with ergonomic posture correction—were found to yield superior outcomes compared to stretching alone.

Tabel 1. Summary of Studies on Stretching Interventions for Reducing Musculoskeletal Pain Among Healthcare Workers

Referensi	Sampel	Intervensi	Durasi	Frekuensi	Alat Ukur	Lokasi nyeri
(Moreira dkk., 2021)	Hospital Nursing	*stretching*	5 menit tiap hari kerja atau 25 menit/minggu,	5 kali seminggu selama 15 minggu	*Borg scale*	Penurunan nyeri leher dan punggung bawah
(Silva Filho dkk., 2020)	Hospital employe	*stretching*	selama sepuluh menit.	3 kali seminggu selama 12 minggu	*Numerik pain scale (NPS).*	Penurunan nyeri dan ketidaknyamanan ekstremitas atas dan bawah
(Beyan dkk., 2020)	Nurses	*stretching*	10 menit sebelum mulai kerja	5 x seminggu selama 18 bulan	*score Cornell.*	Ketidaknyamanan pada leher, punggung, bahu, lengan, panggul, tungkai bawah.
(Gelfman dkk., 2024)	Nurses	*stretching*	15 menit setiap hari	7 kali seminggu selama 12 bulan	*Numeric Rating Scale (NRS).*	Leher, punggung, ekstremitas atas dan bawah
(Alqhtani dkk., 2023)	*healthcare professionals*	*stretching*	5 menit di jam istirahat tiga kali seminggu	3 kali seminggu selama enam minggu	*Nordic Musquloskeletal qoesioner (NMQ)*	Nyeri pada leher, punggung bawah dan lutut
(Otto & Wollesen, 2022)	Nurses	*stretching*	selama 30 menit (Jam Istirahat makan)	3 kali seminggu selama 6 minggu	*Nordic musculosceletal aquesionaire* (NMQ)	Leher, punggung bawah dan lutut
(Imai dkk., 2021)	*health care workers*	*stretching*	20 menit	3 kali seminggu selama 6 bulan	*Indeks Nyeri Luas Widespread Pain Index (WPI)*	Leher, bahu, punggung, pinggang, kaki
(Jalalvandi dkk., 2022)	*Nurses*	*stretching*	15 menit	7 kali selama 6 minggu	*McGill Pain Questionnaire (MPQ)*	Nyeri punggung, pinggang

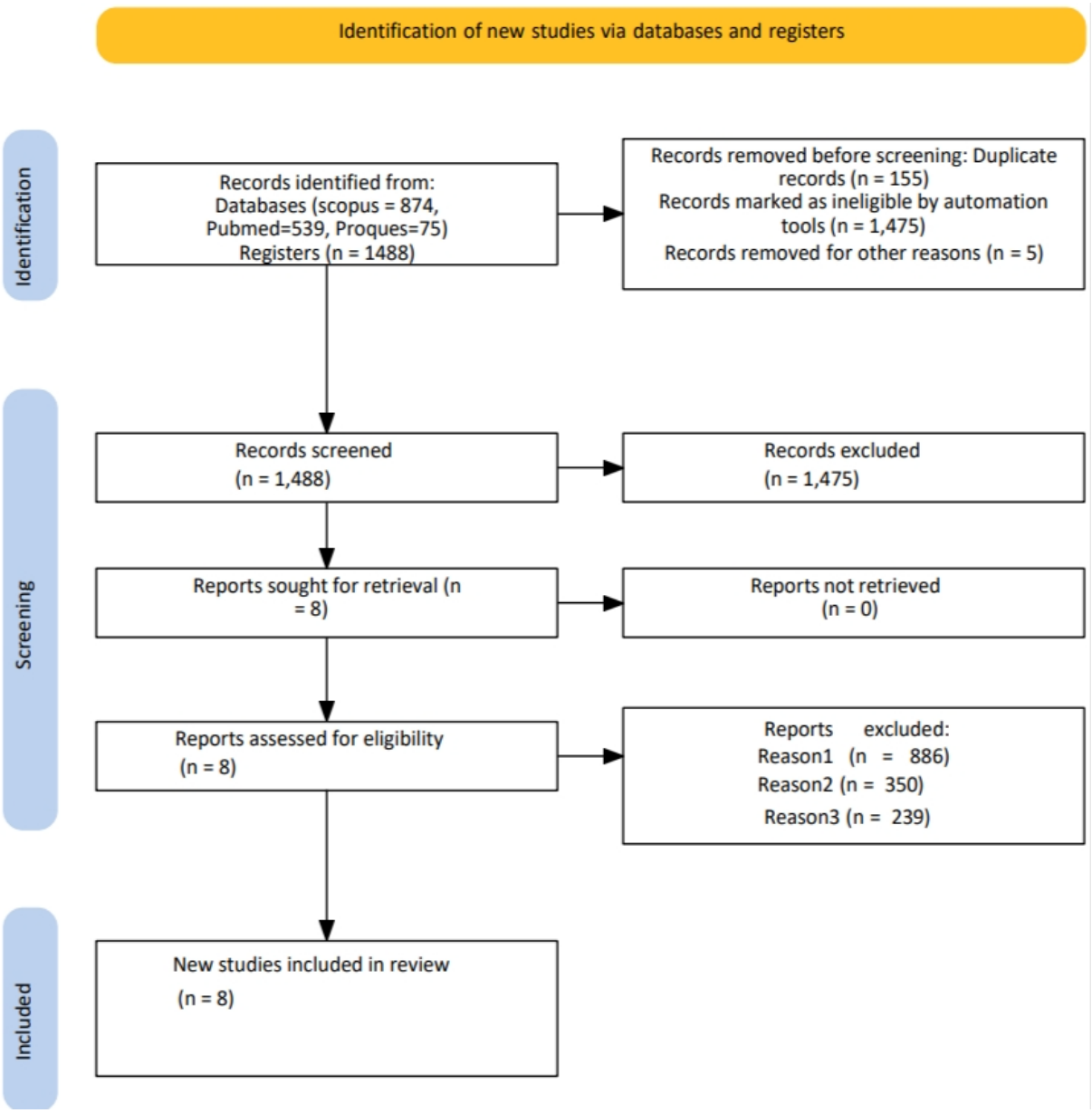

Figure 2 PRISMA Flow Diagram of the Study Selection Process

DISCUSSION

Among the eight included articles, five targeted nurses while three involved other hospital healthcare staff. All studies addressed musculoskeletal disorders (MSDs) experienced by nurses and hospital employees, with nurses forming the majority of participants. MSDs in this population are attributable to a range of occupational factors, such as repetitive daily nursing tasks, patient handling, prolonged standing or walking, and postures involving pushing, lifting, or bending, all of which exert repetitive strain on the same musculoskeletal structures.

According to Ditchburn (2020), nurses have the highest prevalence of low back pain (77.1%), followed by physicians, physiotherapists, technicians, secretaries, and hospital assistants, in a study investigating MSD prevalence and risk factors among Turkish healthcare workers. Similarly, Ziam et al. (2020) highlighted that patient handling tasks, such as transferring patients from beds to stretchers, often impose substantial biomechanical loads. These tasks involve lifting, repositioning, or rotating, each of which generates varying degrees of torque and lumbar compression.

The current review sought to evaluate the impact of stretching interventions on MSDs among healthcare workers, particularly nurses. Across all eight included RCTs, stretching was consistently associated with a positive effect in reducing musculoskeletal pain and discomfort. However, substantial heterogeneity was observed in

intervention duration and frequency, which influenced clinical effectiveness.

For instance, Gelfman et al. (2024) demonstrated that a 15-minute daily stretching program sustained over one year significantly reduced work-related disability, as measured by the Numeric Rating Scale (NRS). In contrast, Moreira et al. (2021) employed a shorter protocol of 5 minutes per day (25 minutes per week) for 15 weeks, which yielded more limited yet still positive outcomes for low back pain. These findings suggest that duration and consistency are critical determinants of intervention effectiveness.

Stretching interventions lasting 10 to 20 minutes per session, as evidenced by Silva Filho et al. (2020) and Imai et al. (2021), produced more substantial and long-lasting reductions in MSD symptoms compared to shorter durations. From a theoretical perspective, longer sessions allow for greater muscle relaxation and improved blood circulation, both of which are essential in preventing repetitive strain injuries common in nursing practice.

Frequency was also a key factor. Interventions implemented three times per week demonstrated significant efficacy across multiple studies, particularly when combined with a minimum session length of 10 minutes. This regimen appears feasible within demanding hospital environments without significantly disrupting clinical operations.

The most commonly reported pain sites across the eight studies included the neck, shoulders, back, lower back, hands, and feet, reflecting the body regions most affected by routine nursing tasks such as lifting, bending, prolonged standing, and repetitive movements (Naoum et al., 2022; Otto & Wollesen, 2022).

Moreover, despite the heterogeneity of measurement instruments—including the Borg Scale, Numeric Pain Scale (NPS), Nordic Musculoskeletal Questionnaire (NMQ), McGill Pain Questionnaire (MPQ), and the Widespread Pain Index (WPI)—the findings were consistent in showing that stretching reduces musculoskeletal discomfort when delivered under rigorously designed RCT conditions. This consistency strengthens the reliability of stretching as an effective intervention.

Importantly, the evidence underscores that stretching should not be viewed merely as an ancillary activity but rather as a potential component of evidence-based workplace wellness programs. Integrating structured stretching routines into hospital occupational health policies can provide both preventive and therapeutic benefits. Routine implementation may mitigate long-term costs associated with absenteeism, reduced productivity, and medical or rehabilitation expenses attributable to MSDs (Erliana, 2023; Ditchburn et al., 2020).

RECOMMENDATION

Based on the available evidence, it is recommended that hospitals adopt structured stretching programs with the following characteristics:

1. Duration: 10–20 minutes per session.
2. Frequency: Three times per week.
3. Program Length: A minimum of six weeks to observe initial outcomes, with continuation as an annual program for sustained benefits.
4. Evaluation Instruments**:** Selection should be aligned with available resources and objectives, for example, the Nordic Musculoskeletal Questionnaire (NMQ) for site-specific complaints or the McGill Pain Questionnaire (MPQ) for broader pain dimensions.

CONCLUSION

Musculoskeletal disorders (MSDs) represent a serious occupational health concern with significant implications for quality of life, work productivity, and the sustainability of the nursing profession in hospital settings. Based on the findings of this systematic review, which analyzed eight intervention studies with randomized controlled trial (RCT) designs published between 2014 and 2024, stretching interventions were consistently shown to be effective in reducing pain and discomfort associated with MSDs among nurses and other healthcare workers.

The main findings highlight that both the duration and frequency of stretching interventions play critical roles in their effectiveness. Interventions lasting 10 to 20 minutes per session, performed regularly three times per week or daily, and sustained for periods ranging from 6 weeks to 18 months, produced the most significant reductions in musculoskeletal pain affecting the neck, shoulders, back, lower back, and extremities. Longer-term interventions were more likely to provide durable benefits in both the prevention and reduction of pain intensity.

Across the included studies, a variety of validated measurement tools were employed, such as the Borg Scale, Numerical Pain Scale (NPS), McGill Pain Questionnaire (MPQ), Cornell Discomfort Index, Widespread Pain Index (WPI), and the Nordic Musculoskeletal Questionnaire (NMQ). Despite methodological differences, all consistently demonstrated the positive impact of

stretching in alleviating musculoskeletal symptoms.

Beyond clinical benefits, stretching interventions also confer substantial economic and organizational advantages, including reducing absenteeism, improving workplace productivity, and lowering the costs of treatment and rehabilitation. Consequently, stretching should be regarded as an integral component of evidence-based occupational health programs within hospital environments.

Structured and sustained stretching interventions are therefore strongly recommended as an effective preventive strategy for addressing MSDs among hospital nurses. Optimal implementation requires institutional support through policy adoption, routine training, dedicated time allocation, and continuous monitoring to ensure adherence. In this context, stretching interventions should be considered a core element of workplace health strategies for nurses, aimed at preventing and mitigating the burden of MSDs.

DECLARATION OF CONFLICTING INTERESTS

The authors declare that there are no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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