



**USE OF PATIENT TRANSFER AIDS TO REDUCE THE RISK OF
MUSCULOSKELETAL DISORDERS IN NURSES IN THE EMERGENCY
DEPARTMENT: LITERATURE REVIEWS**

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ABSTRACT

Nurses in emergency installations have a job that has a high risk of developing musculoskeletal disorders due to their workload. An activity that is often carried out by nurses is transferring patients, where this activity has the potential risk of increasing physical burden and musculoskeletal injuries on nurses. The effort to reduce the risk of musculoskeletal disorders in nurses is by using patient transfer aids. The aim of this study is to determine the use of patient transfer aids to reduce the risk of musculoskeletal disorders in nurses in the emergency department. Method: The method used was a literature review with six databases (Scopus, Science Direct, Web of Science, CINAHL, ProQuest, and PubMed) in January 2024. Research design inclusion criteria in this study included cohort studies, case reports, research and development, RCT, correlational descriptive studies, and experimental studies. Articles published in 2017–2023 in English involving a population of nurses and/or health workers carrying out patient transfers. Data analysis was carried out using the researcher's critical thinking and PRISMA. A total of 1163 articles were found with 15 articles included for inclusion that could be used in the literature review. Results: The use of patient transfer aids will reduce nurses' workload and reduce the risk of musculoskeletal disorders. Various types of patient transfer aids can be used, such as sliding sheets or slides, friction-reduction sheets, glide sheets, ergonomic belts, air-assisted transfer devices, lift velocities, motorized patient transfer devices, and prototype patient transfer aids. Conclusion: Patient transfer aids can significantly reduce the risk of musculoskeletal disorders in nurses in the emergency department.

Keywords: ergonomic; emergency departments; musculoskeletal disorders; patient transfer

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INTRODUCTION

Nurses who work in emergency departments have a high risk of experiencing musculoskeletal disorders as a form of workload (Sun et al., 2023). Musculoskeletal disorders occur due to individual factors (workers), environmental factors, psychosocial factors, the workplace (work posture, movement, and activity), work organization, and stress (Caponecchia et al., 2020). Limited quality and quantity of human resources is still a problem in the health service system, which causes most nurses not to understand ergonomic principles. Factors in the occurrence of musculoskeletal disorders that are often encountered in health services are standing for more than 6 hours, bending more than 10 times per hour, moving patients repeatedly, and making body-twisting movements (Dewi, 2019).

The incidence of musculoskeletal disorders in nurses increases with increasing age and increasing body mass index (BMI), although currently it is also often found in young nurses (Stanchev & Vangelova, 2022). Not all health service facilities provide transporters to help carry out the task of transferring patients, so the workload and physical burden of nurses increase (Mamalelala et al., 2023). This increase in physical load is one of the factors in the occurrence of musculoskeletal disorders related to work, where health workers, especially nurses, are the biggest risk group and need to be paid attention to (Saberipour et al., 2019).

The emergency installation is a service unit in a hospital that provides first aid and is the main door for patients with emergency conditions (Nurlina et al., 2019). The professional competence of nurses in emergency installations to meet service needs in hospitals appropriately and effectively is very necessary, considering the various types of patient treatment in emergency installations (Prahmawati et al., 2021). However, this is not in line with nurses' understanding of the importance of ergonomic principles, which need to be implemented to reduce potential dangers for nurses while providing care (Dewi, 2019). Poor posture and excessive workload during patient care are the main factors in the increase in the prevalence of musculoskeletal disorders in nurses (Iridiastadi et al., 2019).

Multi-component interventions to reduce the risk of musculoskeletal disorders. The multi-component intervention provided includes theoretical training regarding musculoskeletal disorders that focuses on the importance of ergonomic principles, warm-up and stretching exercises before starting work, and maximizing the use of mechanical aids to carry out patient transfers (Oliver Hernández et al., 2022). Potential dangers resulting from a lack of understanding related to ergonomic principles can be resolved by increasing understanding of ergonomic principles and maximizing the potential for using mechanical aids to reduce nurses' workload (Richarz et al., 2023). The availability of assistive equipment for patient transfers and the implementation of comprehensive prevention of musculoskeletal disorders will help reduce the prevalence of musculoskeletal disorders among nurses (Sousa et al., 2023). The aim of this study is to determine the use of patient transfer aids to reduce the risk of musculoskeletal disorders in nurses in the emergency department.

METHOD

This literature review has been adapted to structured planning procedures and appropriate protocols. The protocol used in this study includes determining the topic, searching and selecting strategies for appropriate articles, analyzing and synthesizing articles to reduce the risk of information bias, as well as collecting and presenting the results of data synthesis. Literature review This uses Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) (Ziam et al., 2020). This literature review uses six electronic databases, including Scopus, Science Direct, Web of Science, CINAHL, ProQuest, and PubMed. The literature search process was carried out in January 2024. The process of developing keyword combinations for literature searches using MESH and using Boolean logic (and, or). The keywords used in the literature search process in this study were 'Patient Handling OR Patients Moving AND Musculoskeletal Disorder AND Nurse'. Articles published within the last seven years (2017-2023) in English, and access the full article. A total of 1163 articles were found with 15 articles included for inclusion that could be used in the literature review. The selection of articles is shown below in the figure 1.

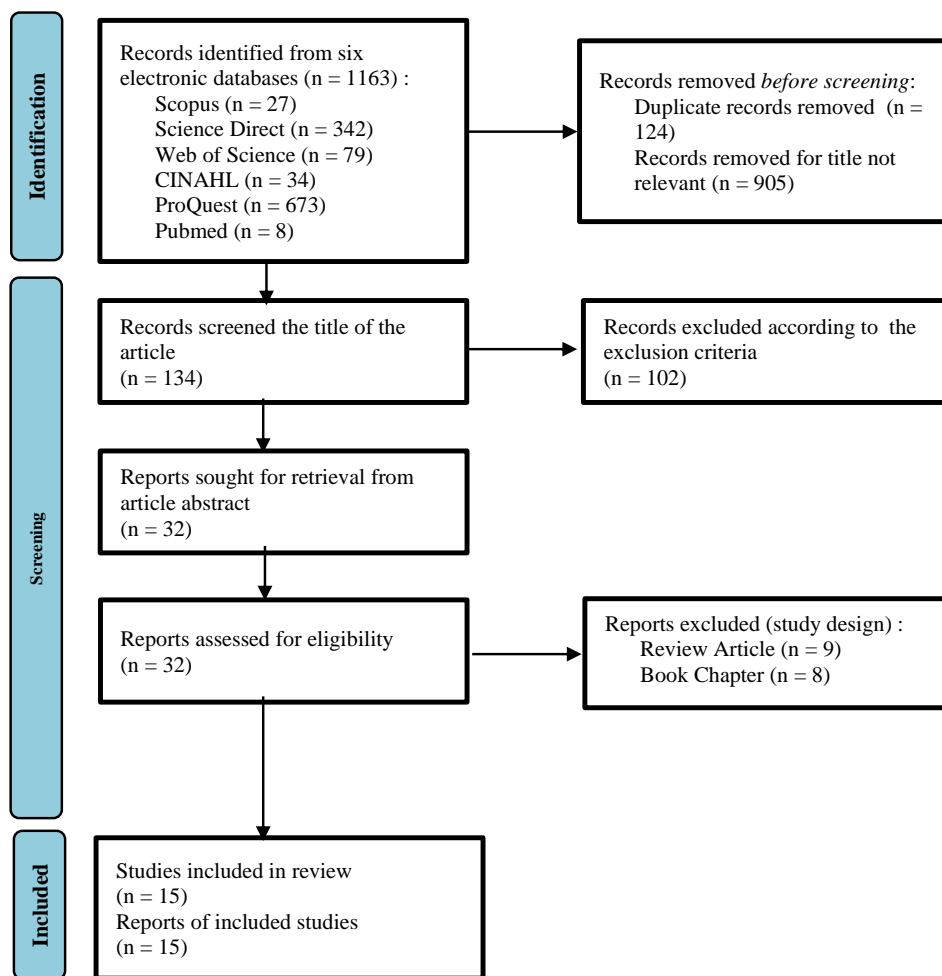


Figure 1. Flow diagram Study Selection

RESULTS

The results of the identification and filtering of articles were selected from 15 articles published in 2017–2023. The total number of respondents in all articles reviewed was 3430 nurses and/or health workers, with a total population ranging from 7 to 2080 participants (Table 1). Inclusion criteria include research subjects who are nurses and/or health workers who carry out patient transfers and carry out transfer techniques using assistive devices. Exclusion criteria include literature research design review, systematic review, book chapters, conference abstracts, and proceedings.

Table 1.
Study Characteristics and Findings

Author	Research design	Number of Samples	Results
Amini Sommerich Lavender	Pay, and Quasi-Experimental Study	20 Nurses and Caregivers	Slide sheet tools for repositioning and moving patients can provide biomechanical benefits for nurses and reduce the risk of musculoskeletal disorders occurring in nurses.
Omura <i>et al.</i>	Quasi-Experimental Study	30 pairs of Nurses and	Sliding sheet require much longer time compared to handling techniques without tools.

Author	Research design	Number of Samples	Results
		Patients	However, when it is related to the level of subjective fatigue felt by nurses in repositioning patients, techniques using sliding sheet has a positive influence. The use of assistive devices reduces the workload of nurses in repositioning patients.
Alperovitch-Najenson <i>et al.</i>	Prospective Cohort Study	76 Nurses and Nursing Assistants	The use of sliding sheet as a tool for repositioning patients has the effect of reducing musculoskeletal pain and increasing job satisfaction for nurses and nursing assistants. Sliding sheet is a low-cost tool that can reduce musculoskeletal disorders.
Weiner <i>et al.</i>	Quasi-Experimental Study	48 Nurses	The use of sliding sheet as a tool has a better effect on reducing the musculoskeletal load when transferring patients compared to using regular sheet and carrier. Reducing the musculoskeletal burden on nurses is in line with reducing the risk of musculoskeletal disorders.
Noble and Sweeney	Cross-sectional Study	107 Nurses	The use of assistive devices is one way to prevent musculoskeletal disorders in nurses. In addition, a comprehensive ergonomic program and the availability of a safe and adequate environment and facilities will significantly reduce the risk of injury.
Wiggermann, Zhou and McGann	Quasi-Experimental Study	10 Nurses	FRS and glide sheet can reduce the burden when repositioning patients weighing more than 50 kg. The air-assisted transfer device can reduce the burden when repositioning patients with all types of body weight. Apart from using assistive devices, it is necessary to use ergonomic positions for nurses to reposition patients to significantly reduce the risk of musculoskeletal disorders.
Zakerian <i>et al.</i>	Quasi-Experimental Study	60 Health Workers	The ergonomic belt showed a significant reduction in the prevalence of musculoskeletal disorders in health workers. Apart from that, the perception of health workers always having to add human resources when transferring patients has also decreased.
Anderson <i>et al.</i>	Prospective Cohort Study	2080 Health Workers	The availability of patient transfer aids as a facility available in health services can reduce the physical burden on health workers regarding the workload of carrying out patient transfers. Collaboration in the availability of aids for transferring patients, reducing the physical burden of health workers in transferring patients, and competent human resources who understand how to prevent musculoskeletal disorders are a series that has a significant impact on reducing the incidence of musculoskeletal disorders.
Law <i>et al.</i>	Quasi-Experimental Study	7 Nurses	A motorized patient transfer device (MTPD) has been proven to reduce the risk of musculoskeletal disorders more effectively compared to using sliding boards to carry out patient transfers. The advantage of MTPD is that it can help transfer patients of various sizes and weights.

Author	Research design	Number of Samples	Results
Oliver Hernández <i>et al.</i>	Randomized Controlled Trial	24 Nursing Assistants	Multi-component intervention implemented can reduce musculoskeletal risks in nursing assistants. The multi-component intervention included theoretical training on musculoskeletal disorders focusing on the importance of ergonomics, warm-up and stretching exercises before starting work, and postural feedback. Nursing assistants need to understand ergonomic positions for transferring patients, maximizing the use of mechanical aids, especially when the patient is overweight.
Kong <i>et al.</i>	Quasi-Experimental Study	10 Nurses	The availability of assistive devices for repositioning patients can significantly reduce the physical workload of nurses, thereby reducing the risk of musculoskeletal disorders due to increased musculoskeletal activity.
Iridiastadi, Vani and Yamin	Quasi-Experimental Study	12 Nurses	The use of prototypes as tools to move patients can reduce the increased load on muscles and bones, where nurses also report that prototypes can significantly reduce physical workload, thereby reducing the risk of musculoskeletal disorders.
Iwakiri, Sotoyama and Takahashi	Quasi-Experimental Study	12 Caregivers	Lift velocity facilities as a tool to reposition patients during treatment has a positive impact on caregivers. This is shown by reducing the physical workload of caregivers, which can reduce the risk of musculoskeletal disorders. However, the lift velocity still needs to be re-evaluated to suit maintenance needs.
Ziam <i>et al.</i>	Cross-sectional study	399 Nurse	The implementation of prevention measures for musculoskeletal disorders has been carried out well by nurses. However, preventing musculoskeletal disorders must also be balanced with nurses' understanding of how to prevent musculoskeletal disorders. The availability of patient repositioning aids, the layout of the room, and the physical workload of nurses also need to be considered in order to achieve a reduction in musculoskeletal disorders in nurses.
Lee, Kang and Lee	Cross-sectional study	535 Nurse	Safe program patient handling has a good impact on reducing symptoms of musculoskeletal disorders in nurses. However, overall, hospitals have not been able to provide mechanical aids to reposition patients, so there is no significant impact due to uneven facilities.

DISCUSSION

Nurses are health workers who help meet patient needs, starting with providing care independently, transferring patients from one place to another, changing the patient's position in bed, and helping them walk (Johnson *et al.*, 2023). Changing the position of bedridden patients to increase comfort and prevent harm caused by lying down too often is a task frequently carried out by nurses and nursing assistants (Alperovitch-Najenson *et al.*, 2020). The task of repositioning patients during treatment is the most common nursing activity and is associated with the incidence of musculoskeletal disorders in nurses (Zhou & Wiggermann, 2021). Carrying out manual patient mobilization can increase the risk of musculoskeletal disorders and is a major

contributor to the high prevalence of musculoskeletal disorders in nurses (Kayser et al., 2020). Musculoskeletal disorders include inflammatory and degenerative diseases that affect the muscles, ligaments, tendons, joints, peripheral nerves, and blood vessels that support them, resulting in pain, soreness, and discomfort (Kibret et al., 2023). Apart from the job demands that nurses have, other factors such as anxiety, depression, and stress further increase the risk of nurses experiencing musculoskeletal disorders (Sharma et al., 2022).

Nurses in the emergency department have a difficult task related to accuracy and time efficiency in dealing with patient problems. Nurses working in emergency departments tend to experience physical and emotional fatigue, which increases the risk of musculoskeletal injuries (Kim et al., 2022). Apart from that, not all hospitals provide facilities that help ease the work and physical burden of nurses, where the availability of equipment as a facility for lifting and moving patients is one way to prevent and reduce the risk level of musculoskeletal disorders (Pangkey et al., 2023). The use of assistive devices for moving patients provides biomechanical benefits and a physical workload for nurses (Amini Pay et al., 2021). The use of patient transfer aids also gives nurses a sense of job satisfaction compared to manual methods because it reduces the burden on nurses and the fatigue that nurses may feel (Alperovitch-Najenson et al., 2020).

Various types of assistive devices can be used to move or reposition patients. Slide sheet or sliding sheet tools, including patient transfer aids, can help reduce musculoskeletal stress and provide biomechanical benefits for nurses at a relatively low cost (Amini Pay, Sommerich and Lavender, 2021; Omura et al., 2019; Alperovitch-Najenson et al., 2020). Use of slide sheets or sliding sheets shows a decrease in muscle activity; however, for the task of repositioning patients, using this type of assistive device does not reduce muscle activity significantly and requires a slightly longer time (Amini Pay et al., 2021). For the use of slide sheet or sliding sheet tools, there need to be a variety of methods for their use; this is related to the limitations of using the tool. The use of a sliding sheet or slide sheet can be an option to reduce muscle activity and the risk of musculoskeletal disorders at a low cost compared to using manual methods in moving patients (Omura et al., 2019).

Friction-reducing sheets and glide sheets It can also be an option to help reposition the patient, but it will only be effective if the patient's weight is above 50 kg (Wiggermann et al., 2021). Use of additional tools, such as ergonomic belts It has been proven to prevent pain and the risk of musculoskeletal injury; however, the use of this tool requires understanding regarding intervention with good ergonomic principles, and the weakness of this tool is not significant in preventing injury to the wrist area (Zakerian et al., 2021). The use of air-assisted transfer devices can reduce the burden when repositioning patients with all types of body weight, but this tool is rarely owned by hospitals (Wiggermann et al., 2021). Other types of tools, such as prototype moving tools, lift velocity, and motorized patient transfer devices (MPTD), have higher effectiveness and are proven to reduce musculoskeletal disorders; however, the weakness of these tools is related to the speed of the tool's response, which needs further evaluation and is still rarely used in hospitals (Law et al., 2022; Iridiastadi, Vani and Yamin, 2020; Iwakiri, Sotoyama and Takahashi, 2021).

One way to reduce the risk of musculoskeletal disorders in nurses can be done by adding assistive equipment facilities for transferring patients. The need for patient transfer equipment can be adjusted to the capabilities and needs of health care facilities, especially in emergency departments. The availability of patient transfer aids will not provide maximum results if it is not balanced with reducing the workload of nurses, increasing competent human resources, and understanding how to prevent musculoskeletal disorders, the importance of understanding

ergonomic principles, a positive work environment, and organization (Andersen et al., 2019; Oliver Hernández et al., 2022; Kong et al., 2023; Ziam et al., 2020). Collaborative programs implemented to reduce the prevalence of musculoskeletal disorders in health services will provide more significant results, along with the availability of tools to reduce nurses' workload.

CONCLUSION

The use of assistive devices to reduce the risk of musculoskeletal disorders occurring in nurses in the emergency department has a significant impact. The tools that can be used are sliding sheets or slides sheets, friction-reduction sheets, glide sheets, ergonomic belts, air-assisted transfer devices, lift velocities, motorized patient transfer devices, and prototype patient transfer aids. The use of assistive devices can be adjusted to the needs and capabilities of health services in providing these facilities, where each assistive device has its own advantages and disadvantages. Things that need to be considered apart from the availability of patient transfer aids are reducing the workload of nurses, increasing competent human resources, understanding how to prevent musculoskeletal disorders, understanding ergonomic principles, and creating a positive work environment and organization.

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