REVIEW

Risk related to data display screens in nurses at a hospital: scoping review

Riesgos relacionados con las pantallas de visualización de datos en enfermeras de un hospital: revisión del alcance

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ABSTRACT

Introduction: currently, occupational risks are considered a health problem with consequences on work performance and personal well-being. Display screens pose an increased risk of musculoskeletal disorders (MD) such as upper limb disorders.

Objective: to map the relationship between the use of display screens and work-related musculoskeletal disorders (WMSD) among nurses, with a focus on identifying specific ergonomic risks and related psychosocial factors by nurses in a hospital setting.

Method: the recommendations of the Joanna Briggs Institute (JBI) for a scoping review were followed. All publicly available sources of information will be considered. Included studies published in English and Portuguese without geographical or cultural restrictions. Duplicates were removed, and two independent reviewers selected abstracts and evaluated the full text of the selected studies based on inclusion criteria. The study selection results will be displayed in a Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) flowchart.

Results: 64 articles published between 2016 and 2021 were found, with 17 articles included. This allowed for the identification of MD as originating from shift work. Consequently, work-family conflict arises, with factors associated with risk being chronic occupational fatigue/burnout. The importance of MD prevention programs related to work is revealed, with benefits for nurses' health.

Conclusions: although WMSD is the main reason for high absenteeism rates among nurses, there is no scientific evidence that these injuries result from the use of display screens. Therefore, conducting studies aiming to correlate this usage with nurses' daily interventions is suggested.

Keywords: Display Screens; Ergonomics; Hospitals; Monitor; Musculoskeletal Diseases; Nursing.

RESUMEN

Introducción: actualmente, los riesgos laborales son considerados un problema de salud con consecuencias en el desempeño laboral y el bienestar personal. Las pantallas de visualización suponen un mayor riesgo de trastornos musculoesqueléticos, como trastornos de las extremidades superiores.

Objetivo: trazar un mapa de la relación entre el uso de pantallas y los trastornos musculoesqueléticos relacionados con el trabajo entre enfermeras, con un enfoque en la identificación de peligros ergonómicos específicos y factores psicosociales relacionados por parte de enfermeras en un entorno hospitalario.

Método: se siguieron las recomendaciones del Instituto Joanna Briggs (JBI) para una revisión de alcance. Se considerarán todas las fuentes de información disponibles públicamente. Estudios incluidos en inglés y portugués sin restricciones geográficas ni culturales. Se eliminaron los duplicados y dos revisores independientes examinaron los resúmenes y evaluaron el texto completo de los estudios seleccionados según los criterios de inclusión. Los resultados de la selección de estudios se mostrarán en un diagrama de flujo de Informes preferidos para revisiones sistemáticas y metanálisis para revisiones de alcance (PRISMA-ScR).

Resultados: se encontraron 64 artículos publicados entre 2016 y 2021, de los cuales 17 artículos fueron incluidos. Esto permitió identificar que el musculoskeletal disorders se originó a partir del trabajo de cambio. Como consecuencia de ello surgen conflictos entre trabajo y familia, cuyos factores de riesgo son la fatiga laboral crónica o el agotamiento profesional. Se revela la importancia de los programas de prevención de EM relacionados con el trabajo, con beneficios para la salud de las enfermeras.

Conclusiones: aunque los trastornos musculoesqueléticos son la principal causa de las altas tasas de ausentismo laboral entre enfermeras, no existe evidencia científica de que estas lesiones sean resultado del uso de pantallas de visualización. Por lo tanto, se sugiere realizar estudios que busquen correlacionar este uso con las intervenciones diarias de las enfermeras.

Palabras clave: Pantallas de Visualización; Ergonomía; Hospitales; Monitor; Enfermedades Musculoesqueléticas, Enfermería.

INTRODUCTION

Work is recognized as a human right, essential to individuals, and indirectly has a purpose that implies growth and employment development, providing an opportunity for financial return and, simultaneously, personal, and professional achievements.[1]

In environments subject to significant disparities due to globalization of economies and new information, communication, and automation technologies, there arises a need to establish standards and guidelines that address not only issues such as safety, health, well-being, and sustainability at work (e.g., musculoskeletal disorders) but also new challenges resulting from interaction with these technologies, robotics, artificial intelligence, and digitalization.[2]

When a person enters the workplace, they become subject to occupational risks. Currently, these risks are considered a health problem with a negative impact on work performance and personal well-being.[3]

Occupational diseases are considered work-related disorders, caused, or exacerbated by the workplace environment or the nature of the work performed. It is now known that they are linked to various professions, evolving over the years, and silently occurring in various work environments. Healthcare professionals are exposed to similar occupational risks, with the added risk of biological factors.[4]

Nurses stand out due to their numerous interventions, particularly in direct contact with patients. Most of the nurses' interventions involve long working hours and multitasking, making them vulnerable to various occupational risks, including mechanical, physical, ergonomic, biological, and psychosocial factors.[5] Further studies employing mixed-method approaches and detailed psychosocial measurements are necessary to capture the multifaceted impact.

In 2012, a study on Work-Related Musculoskeletal Disorders (WMSD) in Portuguese nurses was published, mentioning that these types of injuries represent one of the main occupational health problems. It also stated that 50 % of working time is spent on nursing interventions, with 10,29 % of that time being dedicated to computer work, which was the most highlighted activity in the study, although it was not identified as the cause of injuries.[6]

Despite playing a crucial role in generating, documenting, accessing, and referencing daily nursing activity information, display screens carry an increased risk of WMSD, such as back pain, upper limb disorders, visual fatigue, and mental stress.[7]

In a society increasingly focused on indicators and outcomes, nursing activities have undergone adaptations over the years. For example, nursing documentation has become more standardized and comprehensive, covering areas beyond direct patient care. In the field of nursing and at various levels of care provision, health information systems influence the entire work process, supporting all activities, especially those involving constant use of display screens. These daily processes increasingly involve the use of display screens.[8]

WMSD are currently recognized as one of the most common occupational disorders, especially for nurses, who have been identified as a high-risk group.[9]

Issues related to equipment, education, and patient handling/mobilization culture are widespread. It is crucial to consider the context in developing interventions to improve practice. For example, the use of lifting equipment can reduce the risk of injuries resulting from patient interventions.[10]

It is essential to develop current shift system designs and restrict shift hours as much as possible, as well as prevent night shifts for nurses with more than 10 years of service.[11] Therefore, hospital managers and department/service heads should be aware of the need to avoid scheduling nurses for shifts exceeding 10 years and give them the freedom to choose their schedules.[11]

The choice to conduct a scoping review is relevant to verify the need to adequately understand the reality of a nurse's work environment in a hospital context, due to the constant increase in the volume and time spent on screen interventions in recent years. Due to the scarcity of recent studies on this topic, articles published between 2016 and 2021 were selected, resulting in 17 specific articles on the subject.[12] This timeframe was chosen to focus on the most recent evidence, reflecting advances in technology and workplace conditions.

The findings of this scoping review may highlight the relationship between the use of display screens and musculoskeletal disorders (MD), especially in the cervical, lower back, shoulder, wrist, and hand regions among nurses. It may also identify preventive strategies for nurses, thereby reducing the number of injuries resulting from excessive use or improper positioning of screens and, consequently, reducing absenteeism from work.

METHOD

This study is a scoping review. The intended literature review will follow the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) guidelines and align with the Joanna Briggs Institute (JBI) methodology for scoping reviews.[13,14,15,16] Thus, the Population (P), Concept (C), Context (C) mnemonic will guide the establishment of inclusion and exclusion criteria as well as the development of the search strategy. Registration on the Open Science Framework: osf.io/s6e9g.

Review Question

More specifically, this scoping review aimed to answer the research question as follows: What are the ergonomic risks and associated factors linked to the use of display screens by nurses in hospital settings, and how do these risks relate to the prevalence of WMSD?

Inclusion Criteria

Based on the research question, we defined the inclusion criteria for searching databases as follows:

Population: The study defined the population as nurses working in a hospital setting.

Concept: This review considered all studies that addressed the use of display screens (computers) potentially leading to WMSD.

Context: In this systematic review, we chose to focus on the hospital context. The forthcoming review will encompass literature addressing WMSD on hospital context, and irrespective of geographical location (i.e., urban or rural). Studies focused on healthcare settings outside Portugal will be excluded.

Types of Sources: We considered both published and unpublished works, including observational studies, retrospective and/or prospective, in Portuguese and English, from January 2016 to December 2021. In this scoping review, studies employing quantitative, qualitative, and mixed methods designs will be eligible for inclusion. Additionally, legislation, healthcare standards, evidence-based practice guidelines, as well as textual and opinion papers will be assessed for potential inclusion in the proposed scoping review.

Search Strategy

The search strategy will target both published and unpublished primary studies, legislation, healthcare standards, evidence-based practice guidelines, as well as textual and opinion papers available in both Portuguese and English. Portuguese was chosen as the native language of the authors, while English is considered the international language most widely used in scientific literature. Initially, a preliminary search of MEDLINE (PubMed) and CINAHL (EBSCO) was conducted to identify relevant articles. Text words found in the titles and abstracts of pertinent articles, along with index terms, were utilized to construct a comprehensive search strategy for MEDLINE (PubMed), CINAHL (EBSCO), SCOPUS, LILACS, and SCIELO. Additionally, sources of unpublished studies and gray literature such as the Open Access Scientific Repository of Portugal (RCAAP) and Open Gray will be explored. Adaptations to the search strategy, including keywords and index terms, will be made for each selected database due to their unique organizational structures. Furthermore, the reference lists of included articles will be scrutinized to identify additional relevant papers meeting the inclusion and exclusion criteria. Guidelines on evidence-based practice will be obtained from the Directorate-General of Health of Portugal (DGS), while governmental health policies will be sourced from the Regulatory Authority of Health (ERS) and Diário da República. This phase will commence upon article acceptance for publication and is anticipated to conclude within one month.

The time frame for finding the most recent evidence was between 2016-2021, and the search was conducted from January 7 to January 23, 2022. This timeframe was chosen to prioritize recent advancements in workplace technologies and nursing practices, reflecting the evolving integration of display screens in healthcare settings. Expanding this range could dilute the relevance to current practices.

Study/Sources of Evidence Selection

After the search, all identified records will be compiled and uploaded into EndNote 19 (Clarivate Analytics, Philadelphia, PA, USA) to facilitate organization, listing, and removal of duplicates identified through the search strategy. The research team will pilot test the criteria for study selection. Subsequently, two independent researchers will screen titles and abstracts against the review's inclusion/exclusion criteria. Relevant articles will be retrieved in full and imported into Rayyan. Two independent reviewers will then assess the full text of selected citations against the inclusion criteria in detail. Any reasons for excluding full-text papers will be documented and included in the scoping review. Any discrepancies between reviewers at each stage will be resolved through discussion or by involving a third reviewer. The results of the search will be fully reported in the final scoping review and depicted in a PRISMA-ScR flow diagram.[14]

Data Extraction

Two independent reviewers extract data from the articles selected for inclusion by utilizing the data extraction matrix outlined. The extracted data will encompass specific details concerning the authors and country of publication, outcomes, type of literature, study design where applicable, and other findings pertinent to the review question. The extracted data will be transferred to Microsoft Excel (Redmond, Washington D.C. USA). The initial data extraction matrix devised by the reviewers will be adjusted and refined as needed during the extraction process. Any modifications made will be comprehensively documented in the scoping review report. Any discrepancies between reviewers will be resolved through discussion or by involving a third reviewer. When necessary, the research team will reach out to the authors of the articles or documents to request additional data.

Data Analysis and Presentation

The gathered data will undergo synthesis and thematic analysis,[17] focusing on the data extraction domains concerning the structural, procedural, and outcome-related elements of WMSD. A narrative description of the literature characteristics will accompany this analysis. Subsequently, a secondary synthesis of the evidence regarding WMSD will be conducted at the macro, meso, and micro levels.

Ethics Approval of Research

This type of research did not involve human subjects. Therefore, it did not require ethical review by an ethics committee. However, it followed the rules of good scientific conduct, characterized by rigor in referencing and respect for the authors' perspectives.

RESULTS

After the process of article selection and evaluation, 17 articles were included according to the previously established criteria. From the selection of articles, it was found that the studies were conducted in Australia (1), Brazil (1), China (1), Iran (1), Israel (2), Italy (1), Lebanon (1), Saudi Arabia (1), Slovenia (1), Switzerland (1), United States of America (4), Vietnam (1), and Zimbabwe (1). Publication year: 2016 (1); 2017 (3); 2018 (3); 2019 (3); 2020 (6); and 2021 (1). Study design: cross-sectional study (15) and randomized controlled trials (2) with evidence levels: 4.b (15) and 1.a (2). Sample sizes ranged from 40 to 2852, including nurses, healthcare professionals, hospital staff, and university students.

The most frequently mentioned musculoskeletal symptomatology includes low back pain, followed by neck/cervical pain, shoulder pain, and subsequently wrist and foot pain. As contributing factors (associated risk factors), shift work and chronic fatigue are noted. Regarding the effect/consequence, work-family conflict and burnout were identified. In terms of training programs/interventions for prevention, workplace-based programs to reduce WMSD and work-family conflict are highlighted.

Based on the information gathered through the full reading and analysis of the articles, a summary table was constructed to facilitate the analysis of the articles and the subsequent understanding of the evidence. The analysis was based on the content of these bibliographies and the convergence of themes that are subsequently organized.[18]

According to the results presented by the authors of the selected articles, it was found that there are individual factors (age, sex, body mass index, among others), physical, and psychological factors that can promote the occurrence of MD. In general, women have a higher risk for the development of MD, as well as nurses who work in shift patterns. Concurrently, working conditions are also described as risk factors for the

onset of these types of injuries. The length of professional practice, years in the current position, and the number of nurses per shift are also described in the literature as predictors of musculoskeletal injuries (table 1).

Table 1. Principal results of selected articles
Results
A1[34] Several factors interfere with the outcomes obtained, such as: individual factors (age, BMI, foot problems); physical factors; psychosocial factors.
A2[31] Among the six subscales of the NASA-TLX workload, the performance, frustration, and overall workload scales were associated with increased risk of WMSD in nurses working night shifts compared to nurses with fixed daytime work. High prevalence of WMSD, especially in the knees, upper back, lower back, neck, and shoulders.
A3[24] The prevalence of WMSD in nurses was higher in the lower back region, followed by the neck/cervical and shoulders. Obesity is associated with an increased risk of WMSD. This study also found that nighttime chronotype, prolonged sleep onset latency, and regular use of sleep-promoting substances were associated with increased risks of WMSD among hospital nurses.
A4[33] Therapeutic exercise program for muscle strength and reduction of lower back symptoms contributes to increasing trunk flexor strength and controlling lower back symptoms.
A5[27] It revealed that WMSD are more prevalent in the right shoulder (85,8 %), left shoulder (80,9 %), neck/cervical (62,4 %), right wrist (62,2 %), and lower back region (60,4 %). Causal analysis indicated that as computer usage in hospitals became more common, nurses spent more time using them.
A6[32] The risk of WMSD showed a decreasing pattern, although the finding was not significant.
A7[23] The results can be divided into two major categories: i) facilitators for safe patient handling/mobilization practice; ii) barriers to safe patient handling/mobilization practice.
A8[28] Prevalence of lower back pain in 85,9 % of the respondents. Factors associated with relevant risk included female gender, age, length of service, years in current position, shift work, and number of nurses per shift.
A9[29] High prevalence of WMSD in various body areas and generalized musculoskeletal symptoms among nurses. Prevalence in nurses increases with age, length of service, and history of musculoskeletal disorders.
A10[25] Low back pain was the most described symptom, followed by neck/cervical pain and shoulder pain, with a high prevalence among nurses. Women had about 2 times the risk of pain in the upper limb region and neck compared to men. The most common unusual radiological findings were disc herniations.
A11[20] The prevalence of the comorbidity of MD and depression was 14,5 % in the studied sample. The reported prevalence of musculoskeletal pain in nurses was higher in the lower back region, followed by the neck and shoulders. Work-family conflict was significantly associated with the comorbidity of MD and depression among nurses.
A12[35] Compared to the control group, the intervention group showed improvement in REBA scores and in posture, which is considered a risk factor for WMSD, but there were no significant differences in the number of body parts with pain or the level of musculoskeletal pain.
A13[26] Improvement in posture, which is seen as a risk factor for WMSD, but no significant differences in the number of body parts in pain or the level of musculoskeletal pain.
A14[30] WMSD were associated with years of experience, nurse-to-patient ratio, and chronic occupational fatigue. A high level of chronic occupational fatigue is linked to education, age, years of experience, nurse-to-patient ratio, and care model.
A15[36] WMSD are the result of physical workload or poor posture at work and only secondarily a consequence of stress, while sleep disorders have been primarily revealed because of stress at work and outside of it.
A16[19] The first episodes of WMSD were experienced within the first 5 years of work, with low back pain being the most common. WMSD were significantly associated with work experience.
A17[22] It showed discomfort in the last 12 months in the lower back region, followed by the shoulders. The discomfort decreases work activity and leisure activity.

From the articles included in the review, we were able to identify, in parallel with the subject of our study, some data that we considered relevant and that could be developed in a future research project. During this reading, we observed/verified that several articles mentioned common body areas as the most affected by WMSD. From the analysis, we numbered the articles and identified the body areas mentioned in them. The extracted data were in percentage, in relation to the sample size of the respective studies (table 2).

Table 2. Analysis of the literature review, considering the areas of the body most affected in each article

Article	Cervical	Shoulder (right/left)	Back	Lower back	Elbow	Wrist & hand	Thigh	Knee	Ankle & feet	Upper limbs	Lower limbs
A1[34]				It´s based on the lower limbs							
A2[31]	65 %	62 %	70 %	66 %	29 %	49 %	50 %	73 %	39 %		
A3[24]	50,6 %	42,4 %		63 %		24,2 %		35 %	39,3 %		
A4[33]				It´s based on back symptoms							
A5[27]	62,4 %	85,8 % | 80.9 %	32,9 %	60,4 %	53,3 % (right)	62,2 % & 38,2 %		47,3 % | 47 %			
A6[32]	37,9 % & 41,5 %	32,5 % | 39,6 %		52,4 % & 55,4 %		26,6 % & 30,7 %					
A7[23]				No framed data							
A8[28]				It is based on the lower back region							
A9[29]			Lower back region, neck/cervical, upper back and shoulder/arm in the last 12 months.								
A10[25]	43,4 %	31,2 %	18,2 %	51,4 %						13,5 %	20,2 %
A11[20]				No framed data.							
A12[35]	34,5 %	25,2 %		44,3 %		24,4 %		23,3 %			
A13[26]				No framed data.							
A14[30]			83,7 %								
A15[36]				No framed data.							
A16[19]			Most prevalent – Lower back								
A17[22]	40,4 %	50 %	48,9 %	63,8 %	11,7 %	34 %	36,2 %	23,4 %	41,5 %		

Articles A7, A8, A11, A13, and A15 were excluded because their data did not align with our analytical focus. Articles A1 and A8 were also excluded due to their singular focus on specific body regions (lower limbs and lumbar region, respectively). After these exclusions, 12 articles were retained for in-depth analysis.

Table 3. Representation of the four areas of the body most affected in each article

Article	1	2	3	4
A2[31]	Knee 73 %	Back 70 %	Lower back 66 %	Cervical 65 %
A3[24]	Lower back 63 %	Cervical 50,6 %	Shoulder 42,4 %	Ankle and feet 39,3 %
A5[27]	Shoulder 85,8 %	Cervical 62,4 %	Wrist and hand 62,2 %	60,4 %
A6[32]	Lower back	Cervical	Shoulder	Wrist and hand
A9[29]	Lower back	Cervical	Lower back	Shoulder/arm
A10[25]	Lower back 51,24 %	Cervical 43,4 %	Shoulder 31,2 %	Lower limbs 20,2 %
A12[35]	Lower back 44,32 %	Cervical 34,45 %	Shoulder 25,17 %	Wrist and hand 24,37 %
A14[30]	Back and Lower back 83,7 %	Lower limbs 12,3 %	Wrist and hand 0,8 %	
A16[19]	Lower back			
A17[22]	Lower back 63,8 %	Shoulder 50 %	Back 48,9 %	Ankle and feet 41,5 %

Thus, in the remaining articles that were fully read, it is observed that the three most affected body areas are the lumbar region, identified 10 times, the cervical region, and the shoulder, each identified 7 times (table 4).

Table 4. Sum of the number of times each area of the body was mentioned

	No. of times mentioned
Lower back	10
Cervical	7
Shoulder	7
Back	3
Wrist and hand	3
Ankle and feet	2
Lower limbs	2
Knee	1

In the analysis of the collected information that reflected WMSD in nurses, there is a need for an evaluation

of the work environment, as suggested by Chiwaridzo, in an attempt to identify possible work-related risk factors that may contribute to the development of WMSD.[19]

DISCUSSION

The results of this review have identified MD as originating from shift work. Consequently, work-family conflict appears, with associated risk factors being chronic occupational fatigue/burnout. The importance of WMSD prevention programs with benefits for nurses' health is highlighted.

It is worth noting the interconnection between the onset, the cause, and the consequence of WMSD in this result.

Zhang[20] estimates that direct healthcare costs account for 7,7 % of the United States' national Gross Domestic Product (GDP). He mentions that in 2015, over 10 000 nurses experienced work-related MD, leading to lost workdays, with an incidence rate of 48 % in healthcare institutions.

According to Chiwaridzo,[18] the prevalence of WMSD among nurses is high, with the first episodes experienced within the first five years of work by most nurses. Some nurses had to take a day off from work, and others reported taking medication for pain relief. Lower back problems were more common as the most prominent cause of discomfort.[21,22]

Osborne[23] in the article reporting on the emergency context, reveals that WMSD are only related to patient transfers.

Musculoskeletal Disorders

Zhang[24] states that MD represent almost half of all occupational injuries in nurses, with many of them responsible for causing pain and consequently sleep disturbances. It also relates these injuries to work chronotype and sleep quality, as well as the development of strategies and education programs for healthy sleep practices.

D'Agostin[25] compared a group of nurses with a reference group of university staff and concluded that the prevalence of MD is higher in nurses than in the reference group. The prevalence of MD is associated with physical, psychosocial, and individual factors and has a multifactorial origin.

The prevalence of low back pain in nurses is attributed to the lifting and transferring of patients, often in unfavorable postures, which is a daily practice for this profession. Additionally, there was a significant relationship found between sitting position and neck pain, the amount of time spent working on a computer with the neck in a forward-leaning position for extended periods[25], and Hashem mentions that neck discomfort reduces activities.[22] The prevalence of musculoskeletal symptoms was significantly higher among workers who use computers.[26]

Lin[27] determined the prevalence of MD in different parts of the body in nurses, concluding that the shoulder, neck, and back were the areas with the highest prevalence rates. Causal analysis indicated an increase in computer use in a hospital setting, which, combined with ergonomic factors, poor posture, and workstation adequacy, could underlie the increased prevalence of shoulder and neck pain.

Skela-Savič[28] revealed a prevalence of low back pain of 85,5 % in Slovenian hospital nurses, with women being the most affected gender. Age, length of employment, and years in the current position increase the risks of low back pain. Nguyen[29] compared the prevalence of symptoms in various anatomical regions with symptoms in only one anatomical location in nurses.

Younan[30] found that 71 % of the study participants reported having acquired MD in the past 12 months, with the majority (82 %) related to patient mobilization. The prevalence of MD in nurses providing care to acutely ill individuals in Lebanon is 71 %, with low back pain being the most prevalent disorder. Inadequate breaks and lifting/transferring dependent patients are related to WMSD and the reporting of low back pain.[19]

Shift Work

Bazazana[31] and Zhang[20] mention that MD are prevalent among emergency department nurses, increasing when related to night shifts and low job satisfaction. According to Younan[30], most nurses who experienced WMSD reported that it happened while caring for patients, with low back pain being common, and only a small number requiring medical treatment. The nurse-to-patient ratio of 1 to 2 exists in intensive care units, which impose a higher physical burden, as well as in regular wards where the nurse-to-patient ratio increases.

Zhang[20] correlates the increase in work-related injuries, including stress. It also states that nurses working primarily on permanent shifts in hospitals have a higher prevalence of WMSD comorbidities and depression, with night work associated with an increased risk of depression. They also report that the health impact of irregular shifts is less severe when chosen by the professional.

Chronic occupational fatigue / Burnout

According to D'Agostin and colleagues[25], they confirm the multifactorial origin of WMSD with both physical

and psychosocial work factors (such as the type of work and physical loads). Younan[30] describes chronic occupational fatigue (COF) as having a relationship with an increased number of patients during the work shift, intensifying after six or more years of work. The probability of developing WMSD is higher in nurses with COF. These authors also reveal that low back pain is one of the predictors of burnout.[30]

Work-family conflict

Zhang[20] addresses work-family conflict as being associated with the comorbidity of MD. It states that nurses have a high risk of conflict due to their involvement in multiple professional and family responsibilities. This conflict can be greatly influenced by working conditions (physical and psychological demands).

According to Zhang[20] reducing work-family conflict involves involving nurses in decision-making regarding work activities, including: reducing nurses' workload by increasing staff numbers; listening to their expectations and opinions regarding work or family life difficulties; and finally, offering a support program for nurses to receive psychological counseling, due to the relationship between work-family conflict and musculoskeletal and mental injuries in nurses.

Injury prevention programs

Lee[32] emphasizes the importance of health promotion policies for nurses. Moreira[33] concluded that a specific physical exercise program resulted in clinically relevant health outcomes.

Li[34] based on a literature review, proposes an ecological model to understand lower limb musculoskeletal injuries in nurses. Ratzon[21] discusses the existence of an individual intervention program based on the identification of ergonomic risk factors, where interventions take place in the workplace to facilitate changes in their implementation. They advocate for ergonomic training that allows the execution of exercises tailored to the individual pain characteristics of nurses. They state that it is essential to demonstrate the benefits of the program, with ergonomic principles, so that nurses do not revert to their previous ways of working, leading to proper prevention of musculoskeletal injuries. Similarly, Ratzon[35] found that an intervention program identifying individual ergonomic risk factors reduces the risk scores for musculoskeletal injuries.

Bazazana[31] and Sanaeinasab[26] highlight that educational programs aimed at promoting behavioral change are successful, especially in improving ergonomic posture in hospital computer users. They demonstrated that incorrect postures can result in health problems such as musculoskeletal injuries, which lead to reduced productivity. Educational interventions in these programs should include regular office stretches to significantly reduce musculoskeletal injuries. Sanaeinasab[26] showed that a transtheoretical educational program designed to improve posture in hospital professionals working with computers yielded positive results in terms of adherence to healthy postures.

Zhang[20] suggests the development of workplace education and training programs that simultaneously reduce the conflict between work and family and help nurses cope effectively with night work or extended hours to reduce musculoskeletal injuries and depression indirectly.

Hashem[22] recommends the need for frequent breaks during working hours to reduce the accumulated physical stress on nurses' bodies. They also emphasize the importance of providing an ergonomically appropriate environment with the implementation of proper body mechanics to reduce the likelihood of musculoskeletal injuries in nurses.

Limitations of the Study

It is considered a limitation that only studies in Portuguese and English were included in this review, as well as studies that were available in full text, and the time frame, which may have excluded other studies with potentially important results for the topic.

Contributions to the nursing field

The results of this review have allowed us to identify the five dimensions that reflect musculoskeletal injuries in nurses and identify the danger and the need for risk assessment.

CONCLUSIONS

After analyzing the selected articles, it is concluded that, although musculoskeletal injuries are the main reason for high absenteeism rates in nurses, there is no scientific evidence that these injuries result from the use of visual display screens. Therefore, it seems pertinent to conduct further scientific studies aimed at correlating this use with the daily activities of nurses.

Despite the lack of scientific evidence to answer our review question, we maintain the conviction that excessive use of visual display screens is increasingly a factor to consider in the number of MD and, consequently, an increase in the absenteeism rate among nurses. This leads us to raise new questions that require investigation, such as: Is there no relationship between musculoskeletal injuries and the use of visual display screens? What

are the reasons why nurses do not associate musculoskeletal injuries with the use of visual display screens?

Although the review question remained unanswered, the reading of the selected articles allowed for a parallel analysis of our topic. Many of the articles reference the body areas that are most affected by musculoskeletal injuries depending on the activities under consideration. This analysis allowed for the construction of a table with the body areas most affected and their ranking, with the lumbar region being the most affected, followed by the cervical region and the shoulder. Taking these results into consideration, new discussions related to the prevention of musculoskeletal injuries through targeted strengthening of the most affected areas may arise.

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CONFLICT OF INTEREST
The authors declare that there is no conflict of interest.

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