

# Prevalence of Work Musculoskeletal Disorder in Patients Handling Tasks Among Nursing Staff in Critical Care-Unit

Bouhafs Mebarki <sup>a,\*</sup>, Brahim Zaoui <sup>a</sup>, Mohamed Mokdad <sup>a,b</sup>, Imed Eddine Mebarki <sup>c,d</sup>

<sup>a</sup> Laboratory of Ergonomics and Risk Prevention, University of Oran 2 Mohamed Ben Ahmed, Oran, 31000, Algeria

<sup>b</sup> Department of Psychology, University of Bahrain, Zellaq, 1054, Bahrain

<sup>c</sup> University of Oran 1 Ahmed Ben Bella, Oran, 31000, Algeria

<sup>d</sup> Centre Hospitalier de Sarrebourg, 57400, France

\* Corresponding Author: [mebarkibouhafs@gmail.com](mailto:mebarkibouhafs@gmail.com)

## ARTICLE INFO

### Article history

Received September 5, 2023

Revised October 2, 2023

Accepted October 25, 2023

### Keywords

Repositioning of patients;

Patients' Transferring;

Awkward postures;

Nursing duties

## ABSTRACT

Awkward postures imposed by nursing duties are a main source of work-related musculoskeletal disorders among nursing staff. The purpose of this article is to describe the prevalence of work-related musculoskeletal disorders among critical care nurses, in two patient handling tasks, transferring and repositioning of patients, and assess their training level and acquaintance of ergonomics rules and principles in patients' handling tasks. Results of the study revealed a large number of nurses in intensive care unit exhibit musculoskeletal disorders symptoms. Nurses knowledge of safe patients handling technics are superficial and lacking basic human factors /ergonomics principles. The study recommended the immediate hiring of an adequate number of physically able nursing staff and providing the necessary work equipment to assist nurses perform patient handling tasks. In the near future, a human factors/ergonomics intervention program should be launched, incorporating a "Safe Patient Handling Training Program" for the critical care-unit staff.

This is an open-access article under the [CC-BY-SA](https://creativecommons.org/licenses/by-sa/4.0/) license.



## 1. Introduction

Work-related musculoskeletal disorders (WMSDs) constitute a real worldwide professional health issue, in which no professional category is safe from its consequences (HSE, 2021; De Kok, et al., 2019; Moradi-Lakeh, et al., 2017). "WMSDs are impairments of bodily structures such as muscles, joints, tendons, ligaments, nerves, cartilage, bones and the localized blood circulation system" (De Kok, et al., 2019). Statistics on prevalence of WMSDs among nurses are alarming (Tang, et al. 2022, Nasaif, et al. 2022, Chan Victor, et al. 2021). For instance, in Britain 2020/21 statistics revealed that, WMSDs accounted for 28% of all work-related ill health cases; they are most prevalent in human health and social work activities, just after construction work activities. Health professional are at the forefront of the workforce affected by WMSDs (HSE, 2021).

Risk factors of WMSDs are multiple, particularly those factors which are related to job physical demands, like awkward postures, high repetition, excessive force, static work, cold or vibration (Nunes and McCauley Bush, 2012). Awkward postures sustained for prolonged periods, imposed by

nursing duties are a main source of WMSDs among nursing staff (Kasa et al.2020; HSE, 2021; Aleid, et al. 2021). Routine activities in health care nursing require lifting and transferring patients out of bed and from the floor, lifting heavy loads, working in awkward postures. Among the etiological factors of WMSDs, studies reported awkward postures, lifting and moving patients' body weight, repetitive movements, and duration of nursing tasks (Wiggermann, et al. 2021; Aleid, et al. 2021). Shortage of adequate working conditions, lack of nursing equipment are the main cases of quitting nursing jobs and/or emigrating in search of better work conditions, which has amplified the phenomena of the shortage of qualified nursing staff in many care giving settings.

Patients' handling activities are among the most strenuous load handling tasks. For their particularity, compared to other loads, patient cannot easily be handled. The ergonomics load handling requirements (ISO 11228-1:2021) are not easily applicable while dealing with tasks of repositioning and transferring patients. As they are in a pain suffering state, patients are bulky, have no handles, cannot always be held close to the body and can be unpredictable, (ISO 11228-1:2021). Ergonomic requirements outlined in "ISO/TR 12296: 2012" are most appropriate in situations of manual handling of people in the healthcare sector. Thus, master and use of ergonomics training skills by the critical-care nursing staff, beside the necessary assistive devices and equipment to handle non- or partially cooperating patients, and the appropriate organizational issues (number of caregivers, number of non-cooperating patients), optimum space organization are among the necessary requirements in critical-care nursing work (ISO/TR 12296: 2012).

Patients' handling tasks, have to be performed by skilled nursing staff members who are well trained on how to deal with patients' handling (Adamczyk, 2018; Choi and Cramer, 2016). Most of safe patient handling programs emphasize in the first place, on the training of nursing staff, rather than simply purchasing patient lifting equipment (Adamczyk, 2018, Olinski and Norton, 2017; Venditelli, 2016).

However, data on musculoskeletal health of nurses in Algerian health settings are scarce. One of the rare published studies (Boukerma, et al., 2014) estimated low back pain among nurses to exceed 60%. During a routine visit to the critical care unit of the University hospital of Oran, Algeria by the authors (BM) and (BZ) upon a request of author (IM), exercising at the same critical care unit, which suffer from high rates of turnover, sickness leave, absenteeism and back pain complaints among the nursing staff of the unit. The visit coincided with the fourth wave of Covid-19 pandemic, which showed an acute shortage in medical and nursing personnel in intensive care units. A first diagnosis pinpoint ergonomics roots of the problem. The contribution of this research to unveil the epidemiologic situation of WMSDs in this critical-care unit. Therefore, the purpose of this research is to describe the prevalence of WMSDs in two patient handling tasks, the transferring and the repositioning of patients.

## 2. Method

### 2.1. Sample

All nurses of the critical care-unit participated in the study (3 males and 7 females), which roughly represent the gender distribution of nursing staff in the Oran hospital (Algeria). Age: 25-55 years, ( $X= 35.5$ ,  $SD: 9.56$ ), with a seniority range of 5 to 25 years ( $X= 14.9$ ,  $SD= 8.92$ ). A mean working time of 48 hours a week (8 hours/day), distributed among day, night and irregular work shifts of three, three and four nurses each shift, respectively. The Total number of nurses in the critical care-unit used to be 20–25 nurses, but for the bad work conditions, the unit register a high turnover rate compared to other units in the hospital.

## 2.2. Data Collection Instrument

For screening the musculoskeletal disorders among caregivers in intensive care unit, adapted versions of previous instruments (Kuorinka et al., 1987; Corlett and Bishop, 1976; Hignett and McAtamney, 2000; McAtamney and Corlett, 1993; ISO/TR 12296, 2012) were used to collect data. The adopted instruments consisted of a questionnaire, a subjects' assessment figure and a video recording system. The questionnaire consisted of demographic characteristics of the sample, the prevalence of WMSDs, nurses training in patients' handling tasks, and subjects' rating of pain/discomfort in different body parts. Each subject was video recorded for a mean time of six minutes while performing two patient handling tasks (transferring and repositioning of patients). VSDC Video Software was used to analyze videos (<https://www.videosoftdev.com/>).

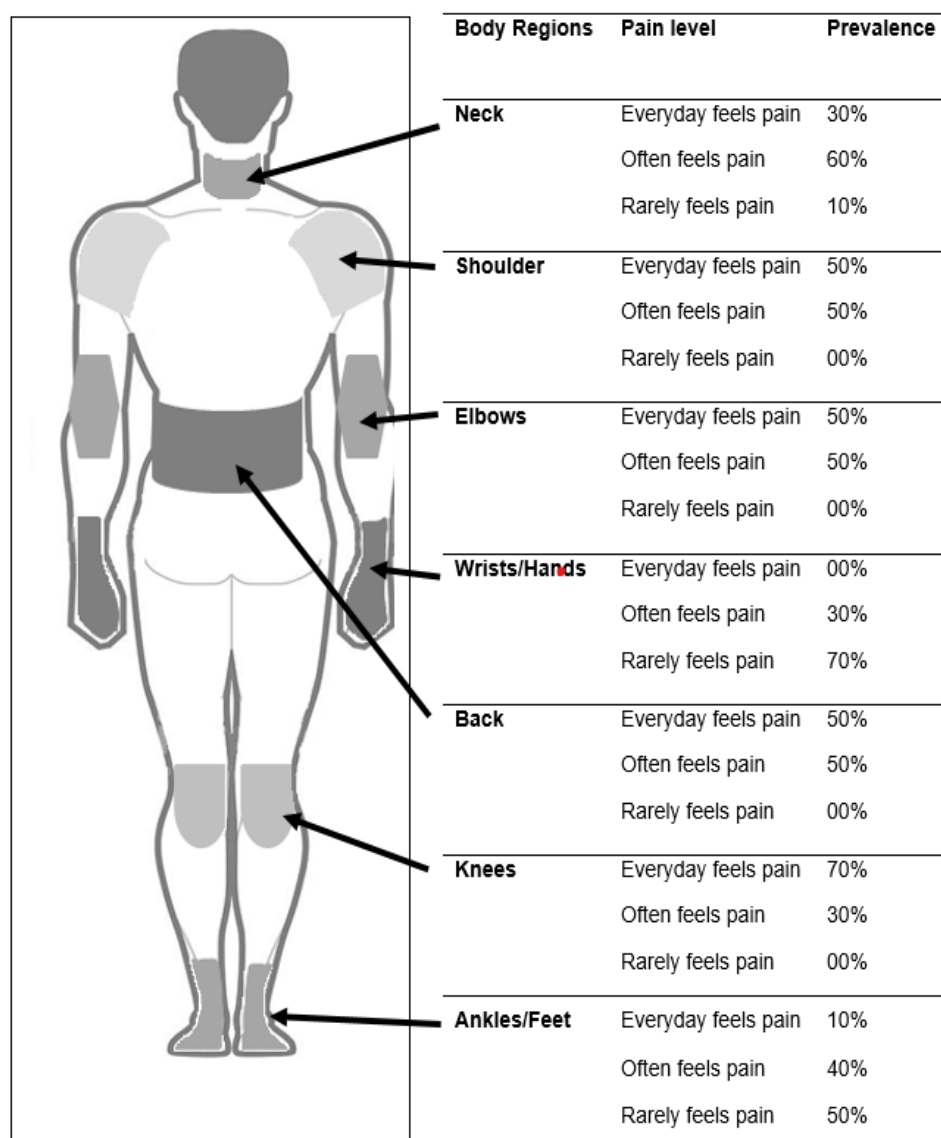
## 3. Results and Discussion

Results of the study revealed that eight nurses (80% of the sample) complained of musculoskeletal disorders during the last 12 months, while only two nurses (20%) did not report any complaints. The high rate of turnover, sickness leave, absenteeism and Back pain complaints among the nursing staff of the critical care-unit caused a shortage in nursing staff, which used to go up to 25 nurses, now the unit is running by only 10 nurses, a situation which has escalated by Covid-19 pandemic situation. When asked about participation in Safe Patient Handling Training Programs, none of the sample members has participated in such programs. Even more, they do not know if such programs exist. When asked if they know the relevant ergonomics and safety technics of patient's handling tasks, the majority have heard about such technics, but they have not been trained or used them (Adiyanto, et al.2023).

Patients' critical care beds are adjustable-height beds, when asked how often during the working day, you adjust the bed height, 40% of the nurses responded "sometimes", while 60% of them responded "none at all". Which means that the majority of nurses do not use ergonomic facility of the equipment. The subjects' evaluation of pain/ discomfort in body parts with a 3-point Likert scale (rarely feels pain, often feels pain and everyday feels pain), revealed the following results (Figure 1).







A large number of nurses in intensive care unit exhibit WMSDs symptoms, 80% of WMSDs complaints in different body region during the last 12 months. Only 20% of the sample members did not report any complaints. Demographic characteristics of this segment of the sample indicate that these are two young nurses (1 male and 1 female) having less than 5 years seniority in the job. Job seniority in nursing activities is a well-established factor behind WMSDs among both males and females, as has been reported in many studies (Lin, et al. 2020; Clari et al. 2019; Vendittelli, 2016; Camerino et al. 2001).

Nurses knowledge of safe patients handling techniques are superficial and lacking basic human factors /ergonomics principles, absence of Safe Patient Handling Training Programs, the spread of pain/ discomfort in different body parts, and non-use of ergonomic facilities of the equipment (60% do not adjust the patient's bed height when performing patients handling tasks). All these factors combined are behind the high rate of WMSDs revealed by the present study. This is a well-established fact in the literature (Olinski, 2017; Vendittelli, 2016; Lin, et al. 2020, ISO/TR 12296:2012).



**Fig.1.** Prevalance of pain in different body regions in transferring and repositioning of patients tasks

Analysis of video recordings revealed three (3) main postural categories while performing patients' handling tasks (Figure 2). Hence, the need to introduce Human Factors & Ergonomics in nursing staff training programs is evident, in order to promote a safety culture among health care professionals (Oakman, et al. 2020, Choi, et al. 2016; ISO/TR 12296: 2012). Safe Patient Handling Training Programs are totally absent in critical care-unit. Thus, the need is urgent to introduce such training programs in caregiving settings, for the safety of both the caregivers and the patients, as is recommended by HSE (2021); De Kok, et al., (2019).

Posture Category	Sub-category postures	
Standing		
	Standing head bent, Upper limbs bent below shoulder level.	Standing, Upper limbs straight at/ above shoulder level
Stooping		
	Stooping back totally bent	Stooping back slightly bent
Squatting		
	Full squat	Knees bent

**Fig. 2.** Shows the postural categories adopted while transferring and repositioning of patients in critical care unit

Results of this study should be considered as a warning alert to healthcare authorities and management of healthcare settings on the situation of WMSDs among nursing staff. In order to improve the situation, and promote health and wellbeing of health care professionals, immediate actions are needed like, Performing a needs analysis action, in the first place, then call in the specialists intervention to trace a strategic plan to eradicate WMSDs, through a human factors/ergonomics intervention program. In the meantime, urgent actions are needed like, hiring an adequate number of physically able, well trained nursing staff members and providing the necessary work equipment to assist nurses in patient handling tasks.

#### 4. Conclusion

This study aimed at describing the prevalence of WMSDs in two patient handling tasks, the transferring and the repositioning of patients in a critical care-unit of a public hospital in Oran, Algeria. For designing a Patient Safe Handling Program at a later stage, and promoting Human Factors & Ergonomics practices in Algerian healthcare settings, some necessary steps were taken, like, the classification of postures adopted by nurses while performing these two tasks and the evaluation of the spread of pain/discomfort in different body parts of caregivers. Beside a basic assessment of nursing staff training level and acquaintance of ergonomics rules and principles in patients' handling

tasks. Meanwhile, some urgent steps are outlined, to address the situation, to preserve the health of caregivers and promote their safety, wellbeing and that of the patients.

**Author Contribution:** All authors contributed equally to the main contributor to this paper. All authors read and approved the final paper.

**Funding:** This research received no external funding

**Conflicts of Interest:** The authors declare no conflict of interest.

## References

- Adamczyk, M. A., (2018). Reducing intensive care unit staff musculoskeletal injuries with implementation of a safe patient handling and mobility program. *Critical Care Nursing Quarterly*, 41(3), 264-271. <https://doi.org/10.1097/CNQ.000000000000205>.
- Adiyanto, O., Mohamad, E., Jaafar, R., & Faishal, M. (2023). Life cycle assessment of eco-brick production using PET particle reinforced epoxy resin composites. *Multidisciplinary Science Journal*, 5(3), 2023023-2023023. <https://10.31893/multiscience.2023023>.
- Aleid, A. A., Eid Elshnawie, H. A., & Ammar, A., (2021). Assessing the Work Activities Related to Musculoskeletal Disorder among Critical Care Nurses. *Critical Care Research and Practice*. Volume 2021, Article ID 8896806. <https://doi.org/10.1155/2021/8896806>.
- Boukerma, Z., Behlouli, A. L., & Reggad, M., (2014). Epidemiology of low back pain among nurses of the hospital of Sétif (Algeria). *Occupational and Environmental Medicine*, 71(Suppl 1), A113-A113. <https://doi.org/10.1136/oemed-2014-102362.357>.
- Camerino, D., Cesana, G. C., Molteni, G., De Vito, G., Evaristi, C., & Latocca, R., (2001). Job strain and musculoskeletal disorders of Italian nurses. *Occupational ergonomics*, 2(4), 215-223. <https://doi.org/10.3233/OER-2001-2402>.
- Chan, V. C., Ross, G. B., Clouthier, A. L., Fischer, S. L., & Graham, R. B., (2022). The role of machine learning in the primary prevention of work-related musculoskeletal disorders: A scoping review. *Applied Ergonomics*, 98, 103574.
- Choi, J., & Cramer, E., (2016). Reports from RNs on safe patient handling and mobility programs in acute care hospital units. *The Journal of Nursing Administration*, 46(11), 566-573. <https://doi.org/10.1097/NNA.0000000000000406>.
- Clari, M., Garzaro, G., Di Maso, M., Donato, F., Godono, A., Paleologo, M., & Pira, E., (2019). Upper limb work-related musculoskeletal disorders in operating room nurses: a multicenter cross-sectional study. *International Journal Of Environmental Research And Public Health*, 16(16), 2844. <https://doi.org/10.3390/ijerph16162844>.
- Corlett, E. N. & Bishop, R. P., (1976). A technique for measuring postural discomfort. *Ergonomics*, 19(2):175-82. <https://doi.org/10.1080/00140137608931530>.
- De Kok, J., Vroonhof, P., Snijders, J., Roullis, G., Clarke, M., Peereboom, K., ... & Isusi, I., (2019). Work-related musculoskeletal disorders: prevalence, costs and demographics in the EU. *European Agency for Safety and Health at Work*, 1. <https://doi.org/10.2802/66947>.
- Faishal, M., Mohamad, E., Asih, H. M., Rahman, A. A. A., Ibrahim, A. Z., & Adiyanto, O. (2024). The use of Lean Six Sigma to improve the quality of coconut shell briquette products. *Multidisciplinary Science Journal*, 6(1). <https://10.31893/multiscience.2024005>.
- Hignett S. and L McAtamney, (2000). Rapid entire body assessment (REBA). *Applied Ergonomics*, 31(2), 201-205. [https://doi.org/10.1016/s0003-6870\(99\)00039-3](https://doi.org/10.1016/s0003-6870(99)00039-3).

- HSE, (2021). Work-related musculoskeletal disorders statistics in Great Britain, 2021 Data up to March 2021 Annual statistics Published 16th December 2021. <https://www.hse.gov.uk/statistics/causdis/msd.pdf>
- ISO 11228-1:2021, (2021). Ergonomics — Manual handling — Part 1: Lifting, lowering and carrying. <https://www.iso.org/standard/76820.html> (retrieved: 01/03/2022).
- ISO/TR 12296:2012, (2012). Ergonomics — Manual handling of people in the healthcare sector. <https://www.iso.org/standard/51310.html>. (retrieved: 01/03/2022).
- Kasa, A. S., Workineh, Y., Ayalew, E., & Temesgen, W. A., (2020). Low back pain among nurses working in clinical settings of Africa: systematic review and meta-analysis of 19 years of studies. *BMC Musculoskeletal Disorders*, 21(1), 1-11. <https://doi.org/10.1186/s12891-020-03341-y>.
- Kuorinka, I., Jonsson, B., Kilbom, A., Vinterberg, H., Biering-Sørensen, F., Andersson, G., & Jørgensen, K., (1987). Standardised Nordic questionnaires for the analysis of musculoskeletal symptoms. *Applied ergonomics*, 18(3), 233-237. [https://doi.org/10.1016/0003-6870\(87\)90010-x](https://doi.org/10.1016/0003-6870(87)90010-x).
- Lin, S. C., Lin, L. L., Liu, C. J., Fang, C. K., & Lin, M. H., (2020). Exploring the factors affecting musculoskeletal disorders risk among hospital nurses. *Plos one*, 15(4), e0231319. <https://doi.org/10.1371/journal.pone.0231319>.
- McAtamney, L., & Corlett, E. N., (1993). RULA: a survey method for the investigation of work-related upper limb disorders. *Applied ergonomics*, 24(2), 91-99. [https://doi.org/10.1016/0003-6870\(93\)90080-s](https://doi.org/10.1016/0003-6870(93)90080-s).
- Moradi-Lakeh, M., Forouzanfar, M. H., Vollset, S. E., El Bcheraoui, C., Daoud, F., Afshin, A., & Mokdad, A. H., (2017). Burden of musculoskeletal disorders in the Eastern Mediterranean Region, 1990–2013: findings from the Global Burden of Disease Study 2013. *Annals of the rheumatic diseases*, 76(8), 1365-1373. <https://doi.org/10.1136/annrheumdis-2016-210146>.
- Nasaif, H., Alaradi, M., Hammam, R., Bucheeri, M., Abdulla, M., & Abdulla, H., (2022). Prevalence of Self-reported Musculoskeletal Joint Symptoms among Nurses: A Multicenter Cross-Sectional Study in Bahrain. *International Journal of Occupational Safety and Ergonomics*, 1-18. <https://doi.org/10.1080/10803548.2021.2025315>.
- Nunes, I.L., and McCauley Bush, P., (2012). Work-Related Musculoskeletal Disorders Assessment and Prevention. In Nunes, I. L. (Ed.), 2012. *Ergonomics: A Systems Approach*. BoD–Books on Demand. <https://doi.org/10.5772/37229>.
- Oakman, J., Hignett, S., Davis, M., Read, G., Aslanides, M., Mebarki, B., & Legg, S., (2020). Tertiary education in ergonomics and human factors: quo vadis?. *Ergonomics*, 63(3), 243-252. <https://doi.org/10.1080/00140139.2019.1701095>.
- Olinski, C., & Norton, C. E., (2017). Implementation of a safe patient handling program in a multihospital health system from inception to sustainability: Successes over 8 years and ongoing challenges. *Workplace Health & Safety*, 65(11), 546-559. <https://doi.org/10.1177/2165079917704670>.
- Tang, L., Wang, G., Zhang, W., & Zhou, J., (2022). The prevalence of MSDs and the associated risk factors in nurses of China. *International Journal of Industrial Ergonomics*, 87(2):103239. <https://doi.org/10.1016/j.ergon.2021.103239>.
- Vendittelli, D., Penprase, B., & Pittiglio, L., (2016). Musculoskeletal injury prevention for new nurses. *Workplace Health & Safety*, 64(12), 573-585. <https://doi.org/10.1177/2165079916654928>.
- Wiggermann, N., Zhou, J., & McGann, N., (2021). Effect of repositioning aids and patient weight on biomechanical stresses when repositioning patients in bed. *Human Factors*, 63(4), 565-577. <https://doi.org/10.1177/0018720819895850>.