



Postural biomechanical risks for nursing workers

Riscos biomecânicos posturais em trabalhadores de enfermagem

Douglas Reis Abdalla^[a], Fábio Sisoneto de Freitas^[b], João Paulo Chierogato Matheus^[c],
Isabel Aparecida Porcatti de Walsh^[d], Dernival Bertoncetto^[e]

^[a] MSc, professor, Faculdade de Talentos Humanos, Uberaba, MG - Brazil, e-mail: abdalladr@hotmail.com

^[b] Specialist, Universidade de Uberaba, Uberaba, MG - Brazil, e-mail: fabio_sisoneto@hotmail.com

^[c] PhD, professor, Universidade de Brasília, Brasília, DF - Brazil, e-mail: jpcmatheus@unb.br

^[d] PhD, professor, Universidade Federal do Triângulo Mineiro, Uberaba, MG - Brazil, e-mail: ewalsh@terra.com.br

^[e] PhD, professor, Universidade Federal do Triângulo Mineiro, Uberaba, MG - Brazil, e-mail:
bertoncetto@fisioterapia.ufm.edu.br

Abstract

Introduction: In the hospital environment, several types of professionals must be involved in continuous working shifts, under working conditions that are often unsatisfactory. **Objective:** The objective of the present study was to analyze the biomechanical risk factors for work-related musculoskeletal disorders (WRMD). **Material and methods:** This was a cross-sectional, exploratory, descriptive and quantitative study and its analysis considered 15 workers, in three shifts. A questionnaire containing personal information and general data regarding the work environment was applied. The REBA protocol was used for posture assessment, once the workers were recorded while performing their activities. The results were presented descriptively. **Results:** In light of the results obtained, the working day was found excessive, particularly considering the weekly frequency and period of time of the working shifts. The REBA protocol showed that the positions adopted presented high risk for the development of WRMD in all nine activities evaluated. **Conclusion:** The nursing activities were characterized as stressful for the workers involved.

Keywords: Ergonomics. Occupational health. Nursing.

Resumo

Introdução: No ambiente hospitalar, há a necessidade do envolvimento de diversos tipos de profissionais em turnos de trabalho contínuos em condições de trabalho muitas vezes insatisfatórias. **Objetivo:** O objetivo deste

trabalho foi analisar os fatores de riscos biomecânicos para os distúrbios osteomusculares relacionados ao trabalho (DORT). **Material e métodos:** Tratou-se de um estudo transversal, exploratório, quantitativo e descritivo, e a análise envolveu 15 trabalhadores, em 3 situações de trabalho. Aplicou-se um questionário contendo informações pessoais e dados gerais sobre o ambiente de trabalho. Para avaliação foi utilizado o protocolo REBA, aplicado após filmagens dos indivíduos em suas atividades. Os resultados foram apresentados de forma descritiva. **Resultados:** Dentre os resultados obtidos, verificou-se que a jornada de trabalho é superior à normalidade, considerando-se frequência semanal e tempo diário de trabalho. O protocolo REBA mostra que as posições adotadas são de alto risco para o desenvolvimento das DORTs, nas 9 atividades avaliadas. **Conclusão:** As atividades de enfermagem foram consideradas com alto índice de estresse físico aos trabalhadores envolvidos.

Palavras-chave: Ergonomia. Saúde ocupacional. Enfermagem.

Introduction

Hospital has been mentioned as a privileged place for developing an illness process, being recognized as an unhealthy, painful and dangerous environment for those who work there, evidencing that the characteristics of the daily activities of nursing professionals in large hospitals are causes of physical and psychic suffering (1), taking into account the influence of personal, biomechanical, organizational and psychosocial factors related to their work.

From the biomechanical aspect, the risks are characterized by load lifting, frequency and intensity of execution of the tasks, repeatability, excessive use of force, vibrations and mechanical compressions, usually associated with incorrect postures (2).

Work-related musculoskeletal disorders (WMSDs) have been highly prevalent among nursing professionals from several countries, and represent one of the major health problems of such population (3, 4, 5, 6, 7).

According to the North American Union of Nursing, the high levels of absenteeism and missed work days, the development of chronic pain and change of professional activity are some of the consequences of WMSDs (8).

These professionals are exposed to the risks of developing such injuries in their workplace, since among other aspects, they are exposed to inappropriate ergonomic and environmental factors in many activities that require physical exertion. These activities include moving and transporting patients, removing and placing monitors in shelves and side tables, organizing equipment and accessories at the bedside and in special rooms and arranging the consumables in the work station, using an incorrect body posture

which leads to continuous tension of the most requested muscles, causing muscle pain or discomfort, dissatisfaction and fatigue (9, 10).

Thus, the high prevalence of musculoskeletal disorders among nursing professionals is associated with a high physical burden, among other aspects. Extreme postures have been recognized as presenting strong association with the development of such injuries (11, 12).

The association between inappropriate postures and the development of injuries evidences the need to record the movement that occurs at the occupational environment, since through this recording it is possible to quantify and identify the postures whose spatial configuration determines minor biomechanical advantages to the execution of tasks. In addition, from the postural analyses it is possible to implement interventions that contribute to the reduction of musculoskeletal discomfort, increase in the efficiency of the movements within safe limits, prevention of accidents and improvement of the performance of the workers (13).

The aim of the present study was to evaluate the risks to the development of musculoskeletal injuries from the postures adopted by the nursing workers of a teaching hospital.

Material and methods

This is a cross-sectional, investigative, quantitative and descriptive study, conducted and approved by the local Research Ethics Committee by the registration number 017/2008 of the College of Human Talents (FACTHUS).

Nine activities developed by 15 nursing technicians of the Surgical Center (SC), Intensive Care Unit

(ICU) and Medical Clinic (MC) of a teaching hospital in the state of Minas Gerais were analyzed.

These activities were chosen based on the systematic observation of four hours of work, being the most commonly performed by such workers.

The participants received oral explanations with respect to the development of the study and the need to record images during the execution of their activities. All of them signed a Free and Informed Consent Form.

Data were collected during regular working hours without any onus to the workers in the form of wage or increased hours. A questionnaire containing the information below was applied to characterize the sample: age; sex; length of service; weekly workload; daily workload; and number of jobs.

The biomechanical risks of the workplace were evaluated through the tool Rapid Entire Body Assessment (REBA), proposed to evaluate the risk of developing musculoskeletal injury from the physical posture assessment. It provides a scoring system to the muscle activity caused by static and dynamic postures of unstable or rapid changes. The codification of the body regions is performed through representative diagrams associated to scoring tables. It divides the body in coded segments with references to the movement plans, also taking into account the handled load and the type of grip. The final score of the REBA is associated with the scores that categorize the actions, indicating which level of procedure should be taken to meet the demand. The risk levels are classified into: Negligible (1), Low (2-3), Medium (4-7), High (8-10) or Very High (11-15). The method proposes four levels of intervention related to the risk level, namely: none necessary; may be necessary; necessary; necessary soon; and necessary now, respectively (14).

Resources such as video recordings and photos of all of the workplaces with the use of a 7.2 MP Sony Cyber Shot DSC-W70 digital camera and a 7.0 MP HP Photosmart M627 camera were used for the assessment through the REBA.

For the analysis of the results, data were tabulated using the software *Microsoft Office Excel 2007*, and grouped into categories to the general data of the workers. For the analysis of the REBA protocol, the scores were adjusted by the mean found for each activity performed by all of the workers and presented descriptively. The quantity of values in each category was grouped and compared. Student's t-test was applied for analysis considering the significance level of 0.05.

Results

The sample was characterized by the prevalence of young adults (mean age: 29.2 ± 10.03 years old), with five men and ten women. The work profile of the research volunteers is represented by the Figure 1. They present a weekly workload of over 12 daily hours (100% of the workers) and have over five years of experience in their roles.

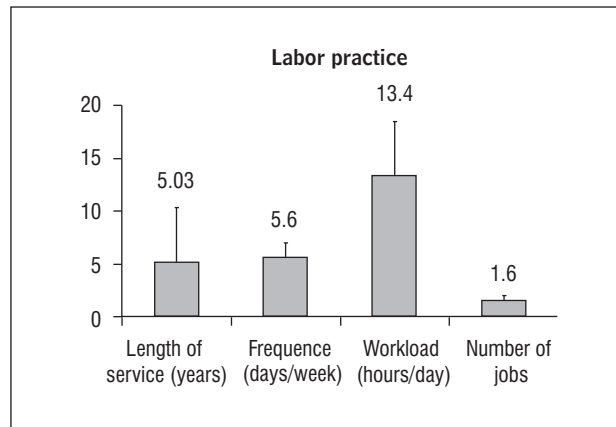


Figure 1 - Graphic representation of the mean and standard deviation of the variables related to the labor practice

Source: Research data.

The postures analyzed by the REBA protocol are identified in Figure 2.

The data shown in Table 1 indicate that among the ten evaluated activities, one indicated the need for urgent corrective actions (placing the patient in bed, which requires large movement of the upper limbs), six indicated high risk for occupational injuries, requiring interventions soon and two indicated medium risk. None of them indicated low risk of injury. There was a significant difference between the number of postures of the workers considered as presenting biomechanical risk requiring urgent interventions and those that presented medium risk ($p = 0.048$).

Discussion

The REBA method identified that the exposure to inappropriate postures lead to relevant biomechanical risks in all of the activities analyzed, requiring intervention.



Figure 2 - Postures evaluated by the REBA protocol

Note: (A) Administration of medications - standing (MC); (B) Administration of medications -bending (ICU); (C) Handling bed cranks – position 1 (ICU); (D) Handling bed cranks – position 2 (ICU); (E) Placing the serum in the IV pole (MC); (F) Disposal of material (ICU); (G) Bed bath (ICU); (H) Placing the patient in bed (ICU); (I) Follow-up of the patients (SC).

Source: Research data.

Table 1 - Biomechanical risks of the postures evaluated by the REBA method

Postures	Risk level	Scoring	Intervention
A: Administration of medications - standing	High (8-10)	8	Necessary soon
B: Administration of medications - bending	High (8-10)	9	Necessary soon
C: Handling the bed cranks – position 1	Medium (4-7)	7	Necessary
D: Handling the bed cranks – position 2	High (8-10)	9	Necessary soon
E: Placing the serum in the IV pole	High (8-10)	8	Necessary soon
F: Disposal of material	Medium (4-7)	7	Necessary
G: Bed bath	High (8-10)	9	Necessary soon
H: Placing the patient in bed	Very High (11-15)	11	Necessary now
I: Follow-up of the patients	High (8-10)	8	Necessary soon

Source: Research data.

According to Guimarães and Portich (15), inappropriate postures require greater internal force to execute a task. A “good” posture is that in which the joints are in neutral position: the center of gravity of the body parts involved in the execution of the task is vertically aligned, passing as close as possible to the axes of rotation generated by the joints. To be comfortable and efficient, the operational levels must be reduced so that the task is not executed in the

limit (or next to it) of the physical capacity in order to avoid early fatigue or even serious damages to the health of the worker.

Maintenance of inappropriate postures in the transportation of patients, distribution of overloading tasks, use of beds with manual adjustment devices, stretchers without height adjustment, monitors with insufficient parameters and alarms and lack of equipment for mobilization and transference of patients

are factors that contribute to the development of WRMDs (16). These data are also corroborated by Stucke and Menzel (17).

Through reliable psychometric properties, studies show that the ICU is the unit that presents the highest percentage of patients (64%) whose handling in beds offer high ergonomic risk to the workers. The surgical units present patients offering medium risk and most of the patients who offer low ergonomic risk are in clinical units (18). The data found here corroborate these findings, since positioning the patient in the ICU bed was the highest risk activity.

The bed bath in the ICU presented a high risk of injury. To Mazullo Filho et al. (19), during the bath of patients, nursing workers are subject to maintenance of static postures in the orthostatic position, overload of the weight of the patient and repetitive movements of upper limbs in order to perform the cleaning/bath process.

Although positioning the patient in the bed of the ICU has been found to be the highest risk activity, it was observed that, regardless of the nursing sector, the postures related with bending the body, neck flexion, shoulder elevation beyond 90°, repetitive movements — associated or not with load supporting — were used by most of the workers.

In addition, postures that apparently did not offer high risk of occupational injuries, such as administration of medications and follow-up of patients, were also characterized with high risk to them (score of 8 to 10).

Thus, although patient handling activities receive more attention in the studies previously published in the literature for being more associated with the development of lumbar spine injuries (20, 21), all the activities performed by these workers should be analyzed in risk assessments.

It is known that the posture of the head adopted during work presents a strong association with the development of musculoskeletal injury (11, 12). There is evidence that extreme postures affect the joint kinematics and muscle recruitment, promoting an increase of the compressive load on the neck, with pain and disorders in this region (22). Ariens et al. (23) observed that the flexion of the head beyond 20° for at least 70% of the working period increased the risk of neck pain. In these terms, all the tasks performed by the nursing workers may be considered as being hazardous, and they should be ergonomically re-planned in order to control the head flexion extent.

In relation to the arms, postures in abduction or flexion beyond 60° are considered to be extreme (24) and may be leveraged by other aspects, including the use of force (25), present in the activities performed by the nursing workers, especially in intensive care units.

Extreme postures of the arms have been associated with the development of musculoskeletal injury (11) for promoting an increase of the mechanical load on the shoulder and peripheral nerves, which may cause damages to the tissues of this region (26).

Therefore, planning of the procedures to be performed, acquisition of auxiliary materials and provision of training programs to the professionals are of paramount importance to reduce the damages to their health.

Other stressors appointed by the study with these workers include work organization, particularly in environments with poor working conditions, noisy environments, conflicting relationships and the requirements of the job (27).

Coutrin, Freua and Guimarães (28) reported that Brazilian nursing professionals are exposed in a cumulative and progressive manner to stress and other biopsychophysiological consequences that are triggered by factors such as work environment, work overload, interpersonal relationships, night-shift work, length of service, personal conditions and personality characteristics.

Therefore, the ergonomic analysis cannot be exclusively based on the evaluation developed through biomechanical assessment tools, but also on the association of the analyses of environmental factors and work and personal organization, performed through participatory ergonomics considering the knowledge of the worker in order to ensure higher chances of more appropriate results.

However, ergonomic studies have been conducted to analyze the physical postures used in the execution of the nursing work activities aiming to adjust such activities to respect the principles of biomechanics. Thus, the findings in this study emphasize that the nursing service presents significant biomechanical factors that may result in WRMDs, and which corrective measures are required in relation to the labor activity and work environment. However, the lack of verification of the workload supported by the workers is a limitation of this study. These measures may be directed to the availability of equipment to mitigate the postures that present risks to the spine and

upper limbs. Therefore, the use of tools related to the postures adopted by the workers in the development of their activities is important in order to quantify the risks for injuries, as these may be compared before and after the implementation of changes, ensuring satisfactory results from the perspective of work equipment and accessories.

Conclusion

The present study indicated the risks to the upper limbs and spine associated with the biomechanical factors present in the performance of nursing activities, which are related, among other factors, to poor physical postures during their activities. The REBA protocol is efficient to indicate hazardous postures of nursing workers.

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