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ORIGINAL RESEARCH

Health professionals working in a hospital environment have a high prevalence of fatigue and back pain: a cross-sectional study

Profissionais da saúde que atuam em ambiente hospitalar têm alta prevalência de fadiga e dorsalgia: estudo transversal

Los profesionales de la salud que actúan en ambiente hospitalario tienen alta prevalencia de fatiga y dorsalgia: un estudio transversal

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ABSTRACT | This study's objective was to employ Regulation-17 (NR-17) of Brazil's Ministry of Labor to describe the work environment of health professionals of a public hospital, while also evaluating fatigue and estimating their risk of exposure to it, as well as the presence of musculoskeletal discomfort. This was a cross-sectional study consisting of two phases: 1) Observation of the work environment by means of the NR-17, adapted as a checklist; 2) Evaluation of discomfort and fatigue by means of questionnaires. Data were analyzed descriptively. The association between fatigue and discomfort was assessed using the chi-square test, while the Mann–Whitney test was used to compare age, service time at the institution and weekly working hours across the stratified groups (with fatigue/without fatigue, with discomfort/without discomfort). Twenty sectors were evaluated. The sector with the highest frequency of inadequacy was Pharmacy (83% inadequate items), while the Adult ICU was the most adequate (only 24% inadequate items). There was a high prevalence of discomfort, especially in the spine. Fatigue was present in more than 70% of professionals. Older individuals presented more complaints of discomfort. This study demonstrates a high frequency of ergonomic inadequacies in the hospital's work environment, mainly in the Pharmacy and Ambulatory sectors. The high prevalence of spine discomfort and fatigue emphasizes the relevance of preventive actions in the hospital environment.

Keywords | Ergonomics; Occupational Health; Occupational Risks.

RESUMO | O objetivo foi caracterizar o ambiente de trabalho por meio da Norma Regulamentadora 17 do Ministério do Trabalho (NR-17); avaliar a fadiga residual e estimar o risco da sua exposição e a presença de desconforto musculoesquelético de profissionais da saúde que atuam em um hospital público. Trata-se de estudo transversal composto por duas etapas: (1) observação do ambiente de trabalho por meio da NR-17, adaptada em *checklist*; e (2) avaliação do desconforto e fadiga por meio de questionários. Os dados foram analisados descritivamente. A associação entre fadiga e desconforto foi verificada pelo qui-quadrado e o teste

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de Mann-Whitney comparou a idade, tempo de instituição e carga horária (horas/semana) entre os grupos estratificados (com fadiga/sem fadiga e com desconforto/sem desconforto). Foram avaliados 20 setores, dos quais a Farmácia teve a maior frequência de inadequação (83%) e a UTI Adulto mostrou-se o mais adequado (24% de itens inadequados). Verificou-se uma alta prevalência de desconforto, principalmente na coluna. A fadiga estava presente em mais de 70% dos profissionais. Indivíduos com maior idade apresentaram mais queixas de desconforto. O presente estudo demonstrou uma alta frequência de inadequações ergonômicas em ambiente de trabalho hospitalar, principalmente no setor da Farmácia e Ambulatório. A alta prevalência de desconforto na coluna e a fadiga demonstram a relevância de ações preventivas no ambiente hospitalar.

Descritores | Ergonomia; Saúde do Trabalhador; Riscos Ocupacionais.

RESUMEN | El objetivo fue caracterizar el ambiente laboral por medio de la Norma Reguladora n.º 17 del Ministerio de Trabajo (NR-17); evaluar la fatiga residual y también estimar el riesgo de exposición y la presencia de incomodidad musculoesquelética de profesionales de la salud que actúan en un hospital público. Este estudio transversal consta de dos fases: (1) la observación del entorno de trabajo por la NR-17, lista de control adaptada; y (2) la evaluación de la incomodidad y la fatiga por medio de cuestionarios. Los datos se analizaron de forma descriptiva. La asociación entre fatiga y molestia se verificó mediante el test chi-cuadrado, y la prueba de *Mann-Whitney* se utilizó para comparar la edad, el tiempo de institución y la carga horaria (horas/semana) entre los grupos estratificados (con fatiga/sin fatiga y con incomodidad/sin molestias). Se evaluaron 20 sectores, de los cuales la Farmacia tuvo la mayor frecuencia de inadecuación (83%) y la UCI Adulto se mostró la más adecuada (un 24% de ítems inadecuados). Se observó una alta prevalencia de incomodidad, principalmente en la columna. La fatiga estaba presente en más del 70% de los profesionales. Los individuos de mayor edad presentaron más quejas de malestar. El presente estudio demostró una alta frecuencia de inadecuaciones ergonómicas en el ambiente laboral hospitalario, principalmente en el sector de la Farmacia y del Ambulatorio. La alta prevalencia de incomodidad en la columna y la fatiga demuestran la relevancia de acciones preventivas en el ambiente hospitalario.

Palabras clave | Ergonomía; Salud Laboral; Riesgos Laborales.

INTRODUCTION

Hospital work is a collective enterprise, involving a large and diversified body of professionals (nurses, psychologists, physical therapists, physicians, among others)[1]. Even considering the knowledge specificities, these professionals must act as cohesive healthcare team focused on the patient[2]. Given the importance of multiprofessional care, emphasis must be put on concepts related to workload and risk factors, as well as the capacity to withstand difficulties during the process of care[1].

Considering these challenges, there are several factors that can explain the occurrence of fatigue and strenuous activities, such as high patient demand and insufficient personnel[3]. While providing specialized services to society, health professionals may be exposed to risk factors associated with the development of injuries[4]. In this context, risk factors are defined as aspects of work that can cause accidents, illness or absenteeism[5].

In fact, musculoskeletal injuries and inadequacies of the work environment have been shown to increase the rates of absenteeism[6]. The etiology of musculoskeletal injuries is multifactorial[7] and may result from a combination of factors related to the organization of work[8], including physical factors such as repetitive work[9] and load handling[10], as well as psychosocial factors[11]. Thus, it is fundamental for ergonomic evaluations to consider the work environment as a whole[6]. In Brazil, there are regulatory norms ratified by Ministry of Labor ordinances aimed at preventing accidents and occupational diseases. The NR-17 specifically contemplates ergonomics and proposes the establishment of parameters to control risk conditions and adapt the work environment[12]. This is a crucial approach, considering that failure to adopt ergonomic principles can increase the risk of injuries[13].

Health care services in a hospital setting entail a great deal of complexity[14,15]. Interpersonal relationships, intense multitasking and insalubrious conditions can be inherent traits of this type of work. Thus, ergonomic, physiological and psychosocial risk factors typical of this work environment may lead to overload conditions[11,16-18]. As a clear example, exhaustion can cause important functions to be executed incorrectly, sometimes even threatening the worker's physical integrity[19].

In this sense, it is of the utmost importance to investigate risk factors potentially affecting health professionals

working in hospitals[15], towards the prevention of fatigue[16, 20]. This is justified by the mutual influence of professional and social demands[20], and also by the need for preventive practices to be implemented[6]. An environment with greater comfort and quality can reflect in the service provided to patients[4]. Thus, the objectives of this study were: (1) to characterize the work environment of a medium-sized public hospital according to the criteria of the NR-17; (2) to evaluate the residual fatigue of health professionals; and (3) to estimate the risk of exposure to residual fatigue, as well as the presence of musculoskeletal discomfort in this population.

METHODOLOGY

This was a cross-sectional study carried out in a public hospital in Brazil's Federal District. The hospital has 20 sectors, providing medium and high-complexity care.

The target group consisted of health professionals who worked exclusively for the hospital (doctors, nurses, nursing technicians, physical therapists, psychologists, occupational therapists, social workers, dentist, plaster technician, nutritionist, laboratory technician, necropsy assistant, audiologist, radiologist, tomography technician, pharmacist, biomedical specialist and hemotherapy technician). The convenience sample consisted of 202 workers from different sectors (Table 2). Participation in the study was limited to public servants of the Secretariat of Health, assigned to the hospital. Exclusion criteria involved: (1) outsourced workers; and (2) servants who were away from work (for health reasons, vacation, among others). All were invited to participate by signing an informed consent form. The study was approved by the Institutional Ethics Committee (Process No. 799,619, 09/22/2014).

Analyzed sectors

The following sectors were analyzed:

(1) Pharmacy: receives medicines and hospital supplies from other hospitals and health centers. Distributes and allocates drugs and materials;
(2) Human milk bank (HML): supports and encourages breastfeeding, provides care to mothers with difficulties in breastfeeding management, processes and distributes human milk-following sanitary and health standards. In addition, this sector develops educational activities related to the training of human resources for the HML and for the hospital's multiprofessional team. It also participates in local and national events that encourage the capture and donation of human milk;
(3) Outpatient clinics I and II: sectors with specialty consultation activities, medium and high complexity outpatient procedures, diagnostic and therapeutic support services;
(4) Orthopedics and Surgical Center: performs elective and emergency surgeries, mainly in the areas of General Surgery, Gynecology, Mastology, Proctology and Orthopedic Trauma;
(5) Emergency Care: the sectors known as the red room and the yellow room, in addition to pediatrics, were included in the analysis. All focus on urgent and emergency care. The red room is managed by the Emergency Medical Services (SAMU). Critical patients under risk of death receive immediate care. Invasive special procedures, such as cardiopulmonary resuscitation, cerebrovascular accident (CVA) intervention, acute myocardial infarction (AMI) intervention, orotracheal intubation, as well as invasive and non-invasive mechanical ventilation and cardiac monitoring, are performed in the red room. The yellow room has seven beds and is intended for patients who have passed through the red room, but still require special care;
(6) Laboratory: responsible for performing exams such as adult and pediatric echocardiography, x-rays, ultrasound, computed tomography, mammary and transvaginal ultrasound, ambulatory electrocardiography, blood pressure monitoring, and laboratory tests;
(7) Intensive Care Unit (ICU): the Adult and Neonatal ICUs were analyzed. The Adult ICU provides a system of continuous surveillance to care for critical patients. The sector counts on an intensivist physician, nurse, physical therapist (all available 24 hours a day), psychologist, nutritionist, nephrologist, infectologist, and dentist surgeon. Meanwhile, the Neonatal and Neonatal Intermediate Care ICUs have an interdisciplinary team consisting of a neonatologist, nurse, physical therapist (all also available 24 hours a day), psychologist, nutritionist, pediatrician, infectologist, occupational therapist, and speech therapist;
(8) Functional Registration Center (NUCAF): an organizational unit directly subordinate to

the Personnel Management Department. It is responsible for registration activities, including updating data entries in the hospital's computerized system, as well as control, classification and reporting of functional information regarding servants. It also surveys administrative irregularities, in order to support inquiries and administrative disciplinary processes concerning faults committed by servants. Finally, it performs the registration and re-registration of active servants.

(9) Materials and Sterilization Commission (CME): A technical support unit within the health facility, responsible for receiving dirty or contaminated material for decontamination, preparation and sterilization, as well as for preparing and sterilizing clean clothes from the laundry, and storing these articles for future distribution;

(10) Blood Bank: storage and processing of blood samples.

Observation of the work environment

The work environment was observed in order to monitor its NR-17 compliance. To this end, the norm's topics were converted into a checklist format, applied according to the provided manual[12]. The checklist was used as an observational script, aiding in the process of describing the hospital's ergonomic conditions. Live observations were carried out by the researchers in each sector, and photographs were also used. The checklist covered all NR-17 topics, as follows: (1) lifting, transport and discharge of materials; (2) workstations furniture; (3) workstations equipment; (4) environmental conditions of work and; (5) work organization. Each topic contained sub-items, totaling 31 points of evaluation. Each checklist item was rated as "adequate," "inadequate," or "not applicable," based on the presence (adequate) or absence (inadequate) of each requirement, according to the descriptions and recommendations of the NR-17 manual (Table 1).

Table 1. Checklist – NR-17

1. LIFTING, TRANSPORT AND DISCHARGE OF MATERIALS	ADEQUATE	INADEQUATE	NOT APPLICABLE
1A. Has the worker designated to regular manual handling of loads received training and instructions?			
1B. Does he or she use appropriate technical means to limit the amount of or facilitate manual transportation?			
1C. In the lifting of materials performed using equipment, is the effort required compatible with the strength of the worker?			
2. WORKSTATIONS FURNITURE	**ADEQUATE**	**INADEQUATE**	**NOT APPLICABLE**
2A. Is the work station planned for or adaptable to the sitting position?			
2B. Is the furniture compatible with the type of activity performed by the worker, with the required distance from the eyes, and does the seat have an adequate height?			
2b1.Can the work area be easily reached and viewed by the worker?			
2b2. Does it have dimensional characteristics allowing for proper positioning and movement of body segments?			
2C. Can the seat's height be adjusted according to the worker's body type and to the nature of his/her function?			
2c1. Does the base of the seat have little or no conformability?			
2c2.Do the seats have rounded edges?			
2c3. Do the seats have a backrest slightly adjusted to the body?			
2D. For seated activities, does the workstation have a footrest?			
2E. Are there seats for workers (who perform their activities while standing up) to rest during pauses?			
3. WORKSTATIONS EQUIPMENT	**ADEQUATE**	**INADEQUATE**	**NOT APPLICABLE**
3A. Are the pieces of equipment found in the workplace adequate to the psycho-physiological characteristics of the workers and to the nature of the work?			
3B. Is there an adequate support piece for paper documents (document holder), able to be adjusted for reading and typing activities?			
3b1. Are documents designed with legibility in mind?			
3C. Do the computers have sufficient mobility conditions to allow for the adjustment of the display, correct viewing angles, and ambient lighting?			

(continues)

Table 1. Continuation

3. WORKSTATIONS EQUIPMENT	ADEQUATE	INADEQUATE	NOT APPLICABLE
3c1. Is the keyboard used in the device detachable and mobile, allowing for positional adjustments?			
3c2. Are the screen, keyboard, and document holder placed so that the eye-screen, eye-keyboard, and eye-document distances are approximately equal?			
3c3. Is the equipment positioned on a work surface with adjustable height?			
4. ENVIRONMENTAL CONDITIONS OF WORK	**ADEQUATE**	**INADEQUATE**	**NOT APPLICABLE**
4A. Are the environmental conditions adequate to the psycho-physiological characteristics of the workers and to the nature of the work?			
4B. Is the lighting—whether natural or artificial, general or supplementary—adequate to the nature of the activity?			
4b1. Is general illumination evenly distributed and sufficiently diffuse?			
4b2. Is general or supplementary lighting designed and installed so as to prevent glare, uncomfortable reflections, excessive shadows and contrasts?			
5. WORK ORGANIZATION	**ADEQUATE**	**INADEQUATE**	**NOT APPLICABLE**
5A. Is work organization adequate to the psycho-physiological characteristics of the workers and to the nature of the work?			
5B. Were production standards, procedures, time requirements, determination of time contents (i.e., the activities performed within the required time), pace of the work, and the content of the tasks considered in work organization?			
5C. Does the performance appraisal system (for remuneration and benefits of any kind) take into account repercussions on workers' health?			
5c1. Were rest breaks included?			
5c2. After any kind of leave lasting 15 days or more, do production requirements allow for a gradual return to the previously enforced levels of production?			
5D. Does the effective data entry time exceed the 5-hour limit?			
5d1. In data entry activities, in there a break lasting at least 10 minutes for every 50 minutes of work, and is this break considered a part of the regular workday?			

Evaluation procedures

Fatigue was evaluated by the Need for Recovery Scale (NFR), used to verify the association between need for rest and occupational stress, as well as the existence of residual fatigue in workers. The NFR evaluates the short-term effects of fatigue, such as irritability and lack of focus. The instrument was validated and adapted to Brazil[21, 22]. It identifies factors arising from the occurrence of fatigue by means of items addressing initial symptoms of fatigue at work, emotional exhaustion, sleep disorders and psychosomatic symptoms, among others. The scale is composed of eleven multiple choice questions with four possible answers (always=3, often=2, sometimes=1, and never=0). For each question, the answer "always" is considered unfavorable and receives a score of 3, except in the case of question 4, which has an inverted scale. In this way, the answers allow for a maximum score of 33 points. The obtained score is converted into a scale between 0 (minimum) and 100 (maximum); the higher the score, the greater the residual fatigue.

Complaints of musculoskeletal discomfort were quantified through the Nordic Musculoskeletal Questionnaire, translated and validated for Brazil[23]. In the first part of the questionnaire, socio-demographic information was collected. In the second part, data was collected regarding the frequency of complaints for each body region, according to the prevalence of symptoms in the last 12 months. Information on leaves related to the reported discomfort(s) was also collected. A body diagram shown in the questionnaire was used as reference for the participants to mark the presence of discomfort in the following body regions: head; shoulders; arms; wrists and hands; hip; legs; ankle and foot; cervical spine; thoracic spine, and lumbar spine.

Two evaluators performed the entire process of observing and describing the hospital's sectors (using the NR-17 checklist), and also applied the questionnaires. The evaluators were trained by means of workshops organized by the researchers. These workshops entailed theoretical-practical discussions on the NR-17 (history of the norm's creation, discussions

on its purpose, concepts related to ergonomic analysis and occupational risk factors) and the structuring and standardization of the workplace observation process. They also included training for the application of the employed instruments (NFR and NMQ). In case of disagreement between the evaluators, a third evaluator was consulted. Differences were resolved by discussion and consensus.

Data analysis

The sample calculation was based on the frequency of pain, specifically in the back (dorsalgia). Based on previous study, an expected back pain prevalence of approximately 30% was considered[24], along with ±10% confidence limits, 95% confidence interval, and a total population of 835 workers (total number of health professionals working in the hospital at the time of the study). Sample size calculation indicated that 74 participants were needed[25].

Firstly, the Shapiro–Wilk test was applied to confirm the data's assumption of normality. Since it was not met, nonparametric statistics were adopted. Discomforts were analyzed descriptively by frequency of occurrence in different body regions. For the variables working hours, service time at the institution, age and fatigue (NFR score), data were presented according to medians (quartiles 25% and 75%).

The chi-square test was applied to evaluate the association between NFR scores and the presence or absence of discomfort during the last year. Odds ratio (95% confidence interval – 95%CI) was also calculated to estimate the risk of exposure to fatigue (individuals with and without fatigue) and the presence or absence of discomfort. The Mann–Whitney test was used to establish comparisons among the NFR groups (scores ≤45 or >45: without fatigue or with fatigue, respectively) and among the groups with or without discomfort, considering the following dependent variables: service time at the institution, age (both in years), and working hours (h). For workplace observation, the data were organized into a spreadsheet using Microsoft Excel®, and described according to the relative frequencies of items characterized as "inadequate" or "adequate," for each hospital sector and NR-17 checklist item (Table 2). In cases of sectors with the occurrence of "not applicable" items, the relative frequency was based on the total of applicable items, in order to normalize the values found for each sector.

Data analysis was performed in the SPSS program (Statistical Package for the Social Sciences, version 25.0), with a significance level of 5% (p<0.05).

RESULTS

The socio-demographic data of the health professionals who participated in the study are shown in Table 2. No exclusions were reported. Among the health professionals included, the sample consisted of the following categories: physicians, nurses, nursing technicians, physical therapists, psychologists, occupational therapists, social workers, nutritionist, laboratory technician, speech therapist, radiology technician, pharmacist and biomedical specialist.

The sample was predominantly female (median age 40 years [33; 47]). Most participants were married and had children (55% and 64%, respectively). Participants reported a median of 7.5 years of service time at the institution (2; 14.2), and 40 weekly working hours.

Table 2. Socio-demographic characterization of the evaluated health professionals

Characteristic	Category	n	%
Sex*	Female	157	78.50
	Male	43	21.50
Age group (years)**	20–25	12	6.27
	26–35	70	36.63
	36–45	66	34.54
	46–55	38	19.89
	56–66	5	2.61
Marital status†	Single	62	30.85
	Married	111	55.22
	Lives with a partner	3	1.49
	Divorced	21	10.45
	Widowed	4	1.99
Children‡	Yes	126	63.96
	No	71	36.04
Sector#	Outpatient clinic 1	5	2.48
	Outpatient clinic 2	4	1.98
	Breast milk bank	3	1.49
	Blood Bank	7	3.47
	Obstetric Center	8	3.96
	Surgical Clinic	17	8.42
	Medical Clinic	11	5.45
	SMC	17	8.42
	Pharmacy	4	1.98
	Laboratory	8	3.96
	Maternity ward	19	9.41
	NUCAF	3	1.49
	Nutrition	13	6.44

(continues)

Table 2. Continuation

Characteristic	Category	n	%
Sector#	Orthopedics	17	8.42
	Pediatrics – Hospitalization	10	4.95
	Emergency care	17	8.42
	Radiology	2	0.99
	Adult ICU	5	2.48
	Neonatal ICU	30	14.85
Service time at the institution (in years)##	1–10	94	54.65
	11–20	49	28.49
	21–30	27	15.70
	31–40	2	1.16
NFR	With fatigue (score >45)	146	73.7
	Without fatigue (score ≤45)	52	26.3

*2 participants did not report sex; **11 did not report age; ǂ1 did not report marital status; ǂ5 did not report whether or not they had children, and how many; #2 did not report the sector where they worked; ##30 did not report their service time at the institution.
Source: prepared by the authors (2018).

Observation of the work environment

In the 20 observed hospital sectors, several items failed to meet NR-17 requirements. Percentage distributions of items that did not comply with the NR-17, across the 5 main topics of the norm, and considering all sectors, were: (1) lifting, transport and discharge of materials (65.38%); (2) workstations furniture (48.74%); (3) workstations equipment (67.69%); (4) environmental conditions of work (36%); and (5) work organization (61.44%).

Information for each observed sector is presented in Figure 1. Among sectors, the one with the highest frequency of items that did not meet the NR-17 requirements was Pharmacy (83.33%, 25 inadequate items out of a total of 31). In contrast, the Adult ICU sector had only seven items classified as inadequate (24.99%).

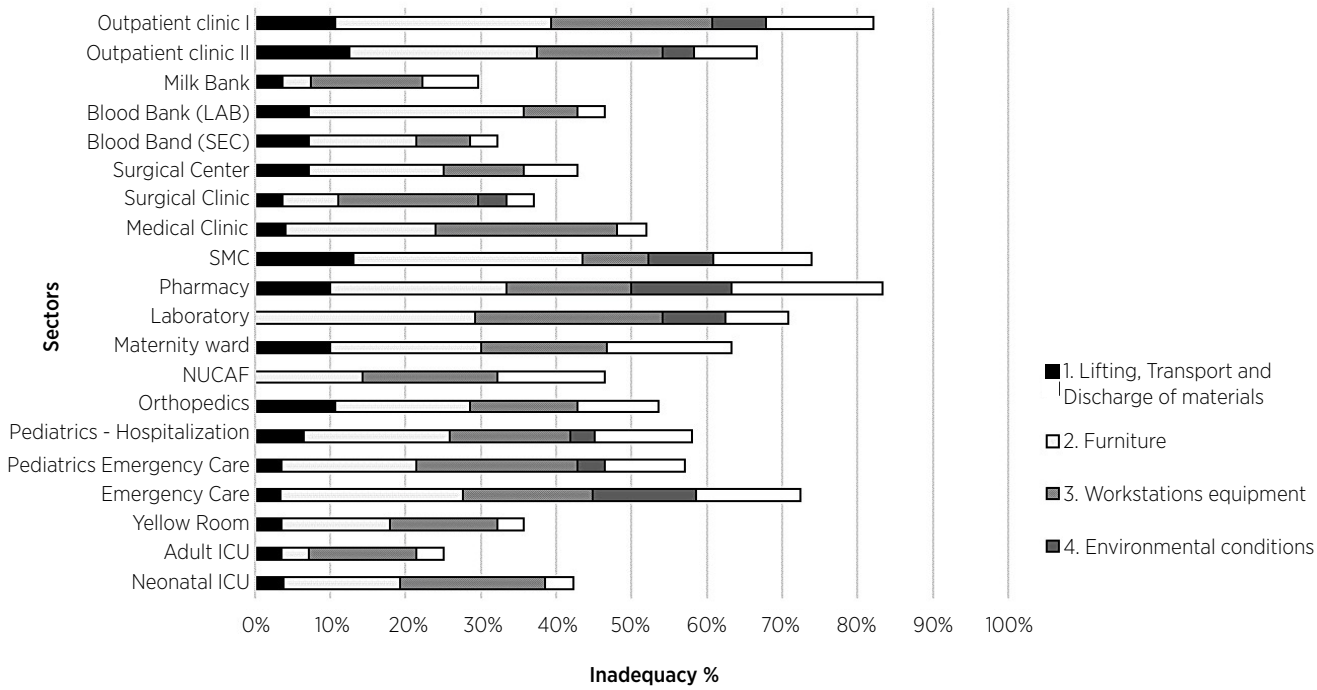

Figure 1. Percentage distribution of items that did not comply with the NR-17, by sector (NUCAF – Functional Registration Center; CME – Materials and Sterilization Commission; SEC – Blood Bank Secretariat; LAB – Blood Bank Laboratory)

Source: prepared by the authors (2018).

Musculoskeletal discomfort and residual fatigue

Our findings demonstrated a high prevalence of musculoskeletal discomfort during the last year (81.5% of professionals reported some type of discomfort). Regarding fatigue, a median score of 52 (quartiles [45; 61]) was found. Likewise, there was a high prevalence of residual fatigue (73.7% of participants with NFR scores greater than 45), as shown in Table 3. There was no significant association between fatigue and discomfort (χ^2=1.13, p=0.28, OR=1.52 and 95%CI [0.69; 3.32]). However, among the professionals with fatigue, 61.6% reported musculoskeletal discomfort during the last year.

Table 3. Prevalence of musculoskeletal discomfort in the assessed health professionals

	Category	n	%
Musculoskeletal discomfort (within the last 12 months)#	Yes	161	81.7
	No	36	18.3
Body regions affected by discomfort (within the last 12 months)*	Head	24	6.6
	Shoulder	37	10.1
	Arm and wrist	32	8.8
	Hands	34	9.3
	Hip	11	3.0
	Legs	24	6.6
	Ankle and foot	27	7.4
	Cervical spine	87	23.8
	Thoracic and lumbar spine	89	24.4

#5 individuals did not answer this question.

*'n' indicates the total of reports, as participants were allowed to report more than one affected region.

Source: prepared by the authors (2018).

When comparing participants who reported discomfort with those who did not, a significant difference was observed only for age: workers who reported discomfort were older in comparison to workers without discomfort (p=0.017). This data is shown in Table 4. No significant differences were found regarding age, working hours and service time at the institution between groups with and without fatigue (p>0.05).

Table 4. Comparisons of age, working hours (WH) and working time in the institution among groups A) with and without fatigue, and B) with and without discomfort. Data presented in medians (quartiles 25%;75%)

	With fatigue	Without fatigue
Age (years)	38 (32;45)	42 (35;49)
WH (hours)	40 (40;40)	40 (24;40)
Service time (years)	6 (2;13)	10 (3;19.5)
	With discomfort	**Without discomfort**
Age (years)*	40.5 (33;46)	36 (29;41)
WH (hours)	40 (40;40)	40 (40;40)
Service time (years)	8 (2;14)	5 (2;13)

*Significant difference: p=0.017.

Source: prepared by the authors (2018).

DISCUSSION

We found that a large portion of the NR-17 requirements was not in compliance. The furnitures used in various sectors were evaluated as inadequate, possibly leading to inappropriate posture[26], for example during the manipulation of medications or the search for electronic forms. Pharmacy was the sector with the highest frequency of inadequacies. Among those, the improper and insufficient physical space stood out; as well as the inadequate furniture, including seating, tables, shelves, and cabinets; and the ramp, which had a lift incompatible with the height of the vehicle used in the transport and unloading of goods. Personnel numbers were also insufficient (as reported by professionals in the sector). In fact, the lack of organization of cabinets and drawers, or the distribution in adjacent locations of different products that have similar packaging, are issues commonly found in hospitals' pharmaceutical sectors[27]. A previous study[27] found problems involving the preparation and dispensation of medicines, demonstrating the need for an integrated workflow, in order to avoid errors.

The sector that presented the lowest frequency of inadequacy was the Adult Intensive Care Unit (ICU). Such findings can be explained by the high complexity of the environment, which requires care in the installation of equipment with advanced technological standards, as well as the implementation of systematized routines and safety procedures. However, previous studies have highlighted a high prevalence of postural and ergonomic problems in environments that deal with technological processes, such as the ICUs[28]. Thus, there is a contradiction between our observations, which indicated few inadequacies in the ICU, with the high prevalence of low back pain and fatigue found in our study. This goes to show that, even when ergonomic aspects are contemplated, there is no complete exemption of the impacts of risk factors inherent to the activities of sectors such as the ICU. In any case, this contradiction must be analyzed with caution, considering that the checklist used here had a descriptive purpose, not appropriate for the establishment of causal relations. Thus, evaluations that contemplate, for example, demands of material handling and transportation, should be used in order to separately analyze personnel, equipment types and other items, establishing causal relationships between aspects of ergonomic inadequacy factors and risk and safety factors in this sector[18].

Our study demonstrated a high prevalence of musculoskeletal discomfort, especially in the spine. Such findings corroborate previous studies that analyzed similar populations and contexts[17,29,30]. In addition, it should be noted that older professionals presented a higher prevalence of discomfort, which reinforces the importance of specific actions directed towards this population. In fact, the impacts of age and occupational

context have been highlighted in recent years, with evidence pointing that the capacity for work and health deteriorate with increasing age[31]. Back pain is one of the most disabling conditions found in this type of environment, may lead to disabilities and, consequently, affect physical performance[32]. Traditionally, the approaches used to prevent musculoskeletal dysfunction in the health sector have largely focused on minimizing physical risks, such as lifting or transferring of patients[4]. In this sense, a systematic review[4] emphasized the importance of considering other aspects, such as location, specificities of the activity, job control, stress and experience of the worker in performing their role.

We also found a high prevalence of fatigue. Even though the association was not significant, more than 70% of professionals with discomfort also had high levels of fatigue. These are relevant findings, highlighting the negative impacts of fatigue over this population[33, 34]. Fatigue is linked to intrinsic processes of hospital work, such as performing muscular actions for a prolonged period and the absence of adequate rest periods[33]. In this context, there is an important link between chronic fatigue and more severe disorders and symptoms, such as decreased muscular strength[33]. Moreover, fatigue is related to physical and mental exhaustion caused by the demands of the hospital work process, such as shift work, repetitiveness, constant attention and accelerated rhythms[34].

Our findings indicate that efficient interventions could be made feasible by means of simple measures, such as the implementation of workshops for disseminating knowledge about ergonomics.

This study had several limitations. Initially, there was a low rate of adherence in some sectors, especially those with high labor demand and restricted access, such as the Emergency Room, the Milk Bank and the Surgical Center. This factor prevented more detailed analyzes, with the comparison of fatigue and prevalence rates according to sector and professional category. Although the NR-17 checklist was useful as a "guide" to descriptive observations, it is worth noting that it has not been validated as an instrument. For more in-depth and inferential analyzes, such validation would have to be carried out. Finally, further studies in the hospital environment are suggested, keeping in mind the need to stratify and compare professional categories and sectors, so as to better understand how risk factors affect each health profession.

CONCLUSION

This study demonstrated that a large amount of items was not in accordance with the provisions of the NR-17, mainly in the Pharmacy and Outpatient sectors of the evaluated hospital. On the other hand, the Adult ICU and the Milk Bank had a high degree of compliance. An important finding was the higher prevalence of spinal musculoskeletal discomfort in older professionals.

REFERENCES

1. Mauro MYC, da Paz AF, Mauro CCC, Pinheiro MAS, Silva VG. Working conditions of the nursing team in the patient wards of a university hospital. Esc Anna Nery. 2010;14(2):13-8. doi: 10.1590/S1414-81452010000200006
2. Mota RA, Martins CGM, Véras RM. Papel dos profissionais de saúde na política de humanização hospitalar. Psicol Estud. 2006;11(2):323-30.
3. Lima Junior J, Alchieri JC, Maia EM. Assessment of the work conditions in hospitals of Natal, Rio Grande do Norte State, Brazil. Rev Esc Enferm USP. 2009;43(3):670-6. doi: 10.1590/S0080-62342009000300024
4. Anderson SP, Oakman J. Allied health professionals and work-related musculoskeletal disorders: a systematic review. Saf Health Work. 2016;7(4):259-67. doi: 10.1016/j.shaw.2016.04.001
5. Mauro MYC, Muzi CD, Guimarães RM, Mauro CCC. Riscos ocupacionais em saúde. R Enferm UERJ. 2005;12:338-45.
6. Punnett L, Cherniack M, Henning R, Morse T, Faghri P, Team C-NR. A conceptual framework for integrating workplace health promotion and occupational ergonomics programs. Public Health Rep. 2009;124(Suppl 1):16-25. doi: 10.1177/00333549091244S103
7. Burdorf A, Sorock G. Positive and negative evidence of risk factors for back disorders. Scand J Work Environ Health. 1997;23(4):243-56. doi: 10.5271/sjweh.217
8. Rumin CR, Schmidt MLG. Influências das condições e organização do trabalho de uma indústria de transformação de cana-de-açúcar na ocorrência de acidentes de trabalho. Saude Soc. 2008;17(4):56-67. doi: 10.1590/S0104-12902008000400007
9. Jones T, Kumar S. Physical ergonomics in low-back pain prevention. J Occup Rehabil. 2001;11(4):309-19.
10. Carregaro RL, Coury HJCG. Does reduced hamstring flexibility affect trunk and pelvic movement strategies during manual handling? Int J Ind Ergonom. 2009;39(1):115-20. doi: 10.1016/j.ergon.2008.05.004
11. Giurgiu DI, Jeoffrion C, Grasset B, Dessomme BK, Moret L, Roquelaure Y, et al. Psychosocial and occupational risk perception among health care workers: a Moroccan multicenter study. BMC Res Notes. 2015;8:408. doi: 10.1186/s13104-015-1326-2
12. Brasil. Ministério do Trabalho e Emprego. Secretaria de Inspeção do Trabalho. Manual de aplicação da Norma Regulamentadora nº 17. 2a. ed. Brasília: Ministério do Trabalho; 2002. p. 101.

13. Grant MP, Okechukwu CA, Hopcia K, Sorensen G, Dennerlein JT. An inspection tool and process to identify modifiable aspects of acute care hospital patient care units to prevent work-related musculoskeletal disorders. Workplace Health Saf. 2017;66(3):144-58. doi: 10.1177/2165079917718852

14. Hilleshein EF, Lautert L. Capacidade para o trabalho, características sociodemográficas e laborais de enfermeiros de um hospital universitário. Rev Latino-Am Enferm. 2012;20(3):520-7. doi: 10.1590/S0104-11692012000300013

15. Janowitz IL, Gillen M, Ryan G, Rempel D, Trupin L, Swig L, et al. Measuring the physical demands of work in hospital settings: design and implementation of an ergonomics assessment. Appl Ergon. 2006;37(5):641-58. doi: 10.1016/j.apergo.2005.08.004

16. Duarte NS, Mauro MYC. Análise dos fatores de riscos ocupacionais do trabalho de enfermagem sob a ótica dos enfermeiros. Rev Bras Saúde Ocup. 2010;35(121):157-67. doi: 10.1590/S0303-76572010000100017

17. Souza DBdO, Martins LV, Marcolino AM, Barbosa RI, Tamanini G, Fonseca MdCR. Capacidade para o trabalho e sintomas osteomusculares em trabalhadores de um hospital público. Fisioter Pesqui. 2015;22:182-90. doi: 10.590/1809-2950/14123722022015

18. Peled K. Workplace safety assessment and injury prevention in hospital settings. Work. 2005 [cited 2017 Jul 18];25(3):273-7. Available from: https://content.iospress.com/articles/work/wor00463

19. Moriguchi CS, Trevizani T, Oliveira AB, Gil Coury HJC. Avaliação de diferentes parâmetros para interpretar a necessidade de descanso em ergonomia. Fisioter Mov. 2013;26(4):823-33. doi: 10.1590/S0103-51502013000400011

20. Silva Junior SHA, Vasconcelos AGG, Griep RH, Rotenberg L. Validade e confiabilidade do índice de capacidade para o trabalho (ICT) em trabalhadores de enfermagem. Cad Saude Publica. 2011;27(6):1077-87. doi: 10.1590/S0102-311X2011000600005

21. Moriguchi CS, Alem MER, Veldhoven Mv, Coury HJCG. Cultural adaptation and psychometric properties of Brazilian Need for Recovery Scale. Rev Saude Publica. 2010;44(1):131-9. doi: 10.1590/S0034-89102010000100014

22. Moriguchi CS, Alem MER, Gil Coury HJC. Sobrecarga em trabalhadores da indústria avaliada por meio da escala de necessidade de descanso. Braz J Phys Ther. 2011;15(2):154-9. doi: 10.1590/S1413-35552011000200011

23. Barros EN, Alexandre NM. Cross-cultural adaptation of the Nordic musculoskeletal questionnaire. Int Nurs Rev. 2003;50(2):101-8. doi: 10.1046/j.1466-7657.2003.00188.x

24. Hoy D, Bain C, Williams G, March L, Brooks P, Blyth F, et al. A systematic review of the global prevalence of low back pain. Arthritis Rheum. 2012;64(6):2028-37. doi: 10.1002/art.34347

25. Dean AG, Sullivan KM, Soe MM. OpenEpi: open source epidemiologic statistics for public health. OpenEpi. 2018 [cited 2014 Feb 14]. Available from: http://www.openepi.com

26. Lis AM, Black KM, Korn H, Nordin M. Association between sitting and occupational LBP. Eur Spine J. 2007;16(2):283-98. doi: 10.1007/s00586-006-0143-7

27. Pichler RF, Garcia LJ, Seitz EM, Merino GSAD, Gontijo LA, Merino EAD. Erros de medicação: análise ergonômica de utensílios da sala de medicação em ambiente hospitalar. Cad Saude Col. 2014;22:365-71. Doi: 10.1590/1414-462X201400040004

28. Sezgin D, Esin MN. Predisposing factors for musculoskeletal symptoms in intensive care unit nurses. Int Nurs Rev. 2015;62(1):92-101. doi: 10.1111/inr.12157

29. Nery D, Toledo AM, Oliveira Júnior S, Taciro C, Carregaro R. Análise de parâmetros funcionais relacionados aos fatores de risco ocupacionais da atividade de enfermeiros de UTI. Fisioter Pesqui. 2013;20:76-82. doi: 10.1590/S1809-29502013000100013

30. Serranheira F, Cotrim T, Rodrigues V, Nunes C, Sousa-Uva A. Lesões musculoesqueléticas ligadas ao trabalho em enfermeiros portugueses: "ossos do ofício" ou doenças relacionadas com o trabalho? Rev Port Saude Publica. 2012;30(2):193-203. doi: 10.1016/j.rpsp.2012.10.001

31. Sampaio RF, Augusto VG. Aging and work: a challenge for the rehabilitation schedule. Rev Bras Fisioter. 2012;16(2):94-101. doi: 10.1590/S1413-35552012000200003

32. Padula RS, Carregaro RL, Melo B, Silva CR, Oliveira AB. Low back pain disability and stay at work: contradiction or necessity? Work. 2012;41(Suppl 1):2417-9. doi: 10.3233/WOR-2012-0476-2417

33. Freitas JRS, Lunardi Filho WD, Lunardi VL, Freitas KSS. Distúrbios osteomusculares relacionados ao trabalho em profissionais de enfermagem de um hospital universitário. Rev Eletr Enf. 2009;11(4):904-11.

34. Mininel VA, Baptista PCP, Felli VEA. Psychic workloads and strain processes in nursing workers of Brazilian university hospitals. Rev Latino-Am Enfermagem. 2011;19:340-7. doi: 10.1590/S0104-11692011000200016