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Occupational ergonomic and biomechanical risks in patient transporting in the operating room: Qualitive and Quantitative research of cross-sectional study

Riscos ergonômicos e biomecânicos ocupacionais no transporte de pacientes no centro cirúrgico: pesquisa qualiquantitativa de estudo transversal

Vanessa Silva de Quevedo[1], Arlete Ana Motter[2], Rubia Bayerl[3], Flávia Cristina Miranda[4], Paula Chomem[5], Angela Luiza Cunha Legey[6]

[1]Corresponding author. Federal University of Paraná. Curitiba, Paraná, Brazil. ORCID: 0000-0003-2716-3670. vanessa.quevedoo1997@gmail.com
[2]Federal University of Paraná. Curitiba, Paraná, Brazil. ORCID: 0000-0002-2585-207X. arlete.motter@uol.com.br
[3]Federal University of Paraná. Curitiba, Paraná, Brazil. ORCID: 0000-0001-9004-3490. rubiabayerlufpr@gmail.com
[4]Federal University of Paraná. Curitiba, Paraná, Brazil. ORCID: 0000-0002-9996-0874. flacmiranda@gmail.com
[5]Federal University of Paraná. Curitiba, Paraná, Brazil. ORCID: 0000-0003-4298-6237. paulachomem@gmail.com
[6]Federal University of Paraná. Curitiba, Paraná, Brazil. ORCID: 0000-0002-4295-4182. angelalegey@gmail.com

RESUMO | INTRODUÇÃO: OBJETIVO: Investigar os riscos ergonômicos e biomecânicos ocupacionais em profissionais da enfermagem no transporte de pacientes, no centro cirúrgico de um hospital público. **METODOLOGIA:** Estudo de caráter exploratório, observacional e descritivo. Para tanto, utilizou-se o Questionário Internacional da Atividade Física (IPAQ), que analisa diferentes contextos do cotidiano para estimar o tempo semanal gasto em caminhadas, atividades físicas de intensidade moderada, vigorosa e atividades passivas (tempo sentado). O Questionário Nórdico, possibilita a identificação de distúrbios osteomusculares nos 12 meses e 7 dias anteriores à entrevista. Permite também um diagnóstico do posto de trabalho pela sua relação com a prevalência do local e tempo do surgimento dos sintomas dolorosos. Além disso, aplicou-se a metodologia da Análise Ergonômica do Trabalho (AET). **RESULTADOS:** De acordo com a análise dos dados coletados participaram deste estudo 44 profissionais da enfermagem, 32 (72,7%) eram do gênero feminino e 13 (29,54%) do gênero masculino. Quando analisado a especialidade: 24 (54,5 %) eram auxiliares de enfermagem, técnicos de enfermagem correspondem à 14 (31,8 %) e Enfermeiros 6 (13,6 %). O questionário IPAQ demonstrou que 16 (35%), destes profissionais mantém-se ativos. Por meio da análise ergonômica do trabalho, as variáveis como, tipo de maca, condições de manutenção, tipo de anestesia, idade do paciente, entre outros, interferem em maiores ou menores esforços no transporte de pacientes. **CONCLUSÃO:** Desse modo, tornam-se necessárias a adoção de medidas preventivas que visem a melhoria do estado de saúde prevenindo complicações musculoesqueléticas no desempenho das atividades. Além de promover boas condições de trabalho aos profissionais no seu ambiente profissional, bem como trazer benefícios ao hospital.

PALAVRAS-CHAVE: Análise ergonômica. Enfermagem. Centro cirúrgico. Riscos ocupacionais.

ABSTRACT | INTRODUCTION: OBJECTIVE: To investigate occupational ergonomic and biomechanical risks in nursing professionals in patient transporting in the operating room of a public hospital. **METHODOLOGY:** Exploratory, observational and descriptive study. For this the International Physical Activity Questionnaire (IPAQ) was used, which analyzes different daily contexts to estimate weekly time spent walking, moderate, vigorous intensity physical activity and passive activities (sitting time). The Nordic Questionnaire enables the identification of musculoskeletal disorders in the period of 12 months and 7 days prior to the interview. It also allows a diagnosis of the workplace by its relation with the prevalence of the place and time of the onset of painful symptoms. In addition, the methodology of Ergonomic Workplace Analysis (EWA) was applied. **RESULTS:** According to the analysis of the collected data, 44 nursing professionals participated of this study, 32 (72.7%) were female and 13 (29.54%) were male. When analyzing the specialty: 24 (54.5%) were nursing assistants, nursing technicians correspond to 14 (31.8%) and Nurses 6 (13.6%). The IPAQ questionnaire showed that 16 (35%) of these professionals remain active. Through ergonomic analysis of the workplace, variables such as stretcher type, maintenance conditions, type of anesthesia, patient age, among others, interfere with greater or lesser efforts in patient transport. **CONCLUSION:** Thus, it becomes necessary the adoption of preventive measures aimed at improving health by preventing musculoskeletal complications in the performance of activities. Besides promoting good working conditions for professionals in their professional environment, as well as bringing benefits to the hospital.

KEYWORDS: Ergonomic analysis. Nursing. Operating room. Occupational risks.

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Introduction

Work is an essential tool for human beings, as it allows the formation of a professional identity within a social context. However, work is subject to different situations that may be related to the profession itself or the way in which it is structured and develops, which may cause musculoskeletal disorders to the workers including the ones in the health area, more specifically in nursing professionals[1]. Musculoskeletal disorders, frequently observed in the nursing professional working in the operating room, are related to the spine, with higher prevalence in the cervical and lumbar region, and are characterized by the presence of pain, paraesthesia, heaviness, fatigue and restriction in performing some movement[4]. It usually occurs in the upper limbs, but may affect lower limbs resulting in inability to perform the work, and there may be overload of the anatomical structures of the musculoskeletal system, related to lack of time for recovery, repetitive movements, with or without localized effort or adoption of certain positions for prolonged time[2].

These conditions when related to chemical, biological, physical and ergonomic factors can cause health consequences to the nursing worker, constant risks found in an operating room[5].

Among these factors, this study is intended to elucidate the ergonomic risks and occupational biomechanical risks that are absolute predictors for the onset of musculoskeletal disorders. An ergonomic risk can be defined as a condition or practice that hinders productivity, challenges good quality, or harms workers' comfort, safety, and well-being[6]. The occupational biomechanical risk can be defined as improper postures adopted during the work day along with the handling of loads that cause musculoskeletal tensions. Continuously applied lighter loads can cause inflammation due to prolonged stretching of tissues of the requested structures in movement. On the other hand, heavy loads may alter tissues when they exceed physical responsiveness, producing muscle or ligament damage[7].

Repetitive Strain Injury or Work-Related Musculoskeletal Disorders are due to repeated movement, among other factors, any part of the body that may cause pain-accompanied injury in response to inflammation or degeneration of tendons, nerves, ligaments, muscles and periarticular structures in different anatomical structures[8]. In common, these terms refer to localized inflammations, compressive nervous syndromes, or painful syndromes[9].

In addition, the rapid development of health technology and the growth of new procedures and examinations make the required knowledge in the health field larger. Besides, the work rhythm, the contact of the professional with the pacient, pain and death must be considered as elements that contribute to the risks to physical, mental and biological health of the nursing professional. Thus, the operating room is considered a high-risk scenario, where work processes are complex, interdisciplinary, with strong dependence on individual and team performance in environmental conditions dominated by pressure and stress[10].

The nursing team is essential for the excellence of the operation and management of the entire medical team. In an operating room, nursing professionals perform various functions within the work environment, in addition to engaging in several hours or dedicating themselves to extra shifts at another job as a way to supplement income or seek greater success and professional enhancement. The American Nursing Association defines the nursing profession as the protection, promotion and optimization of health, being the intrinsic responsibility of the nursing professional to act in the prevention of disease and injury, in facilitating cure, in the relief of suffering through the diagnosis and treatment of the human being, and in the care of individuals, families, groups, communities and population in general[5].

Likewise in daily exercise, nursing professionals are responsible for the movement and displacement of patients. Given this, these workers stand for long periods of time and work with obsolete equipment from the ergonomic point of view, and are even subject to having few hours of sleep and rest.

Such conditions contribute to the occurrence of biomechanical and occupational hazards, which result in high requests for absences, sick leave and disabiity retirement due to overload, as a result of which there is a potentialization of musculoskeletal disorders[11].

In this sense, ergonomics aims to theorically know and understand the way human work develops, always informing professionals about their workload according to the particular activity of each worker. In addition, as a practical objective, firstly it aims at the worker´s well-being, such as health, safety and a good relationship with the work environment[12].

Thus, the aim of the study was to investigate the ergonomic and biomechanical risks in nursing professionals in patient transport in the operating room, taking into account the disorders most frequently encountered in nursing professionals.

Methodology

This is an exploratory, observational and descriptive study, with qualitative and quantitative results analysis. The study was approved by the Research Science Ethics Committee (RSEC) of the Health Science Sector on July 12, 2017, under the number.

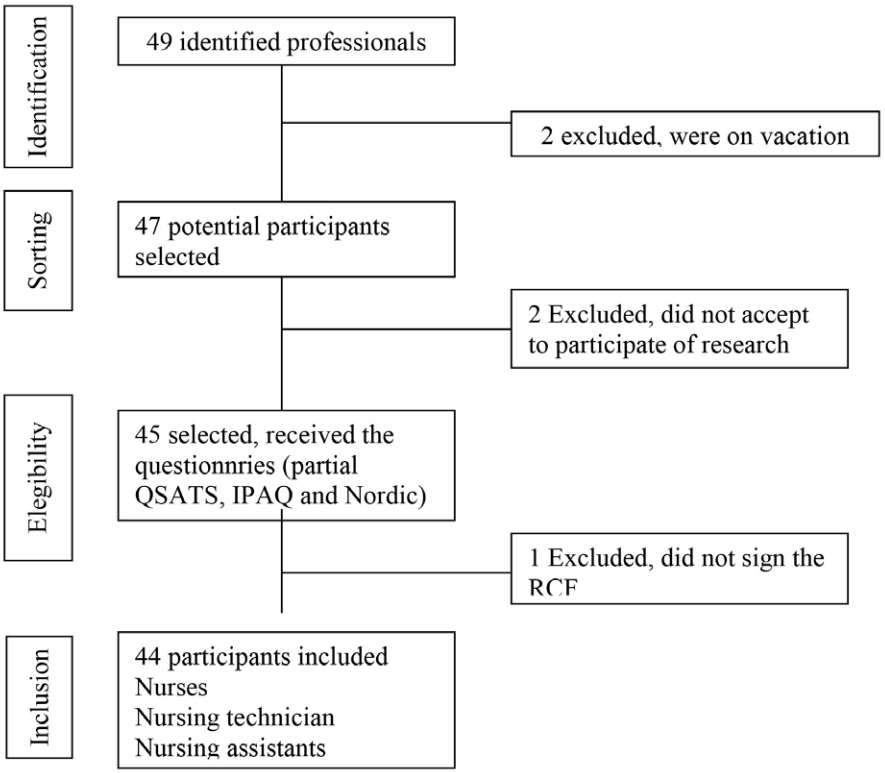
The study was guided by the Ergonomic Workplace Analysis EWA. Which guides actions related to weightlifting, transport and discharge of materials, environmental conditions and work organization[1].

Numerical variables were explored by mean, median and trend; minimum, maximum, standard deviation; absolute frequencies and percentages. All analisis were performed using the free software for statistical computation R, version 3.5.3. The data was organized in tables. The associations among the studied variables were analyzed based on Pearson's correlation coefficient, which measures the degree of linear correlation between quantitative variables and/or categorized variables, having that this coefficient varies between -1 and 1. Negative values show an inverse association among the variables, the positive values are a linear association. Considered strong the correlation closer to 1 and considered weak when values closer to 0.

The study was conducted at the Operation Room Unit (ORU) of a university hospital between January and December 2018. At this site care is given to adult and pediatric on elective, urgent or emergency and surgical patients.

44 nursing professionals (out of 64) participated, who previously signed the Research Consent Form (RCF). Identification, screening and eligibility and inclusion were under the flowchart of Figure 1. Participants received the questionnaires, Nordic and IPAQ (self-administered) were observed during the execution of their activities. The results of the study were presented to participants at the end of the research in a meeting with the presence of their bosses.

Figure 1. Steps followed in the study for selection and inclusion/exclusion of participants



The methodology was based on the Ergonomic Workplace Analysis (EWA) through the steps of demand, task and activity analysis[1]. Demand analysis allows us to delimit the problem to be addressed, which ultimately allows to outline an intervention plan. The task analysis, on the other hand, comprises the investigation of the work as a whole, identifying the differences between the prescribed and the real task. The analysis of the activity, in turn, through the observation of the individual worker, identifies the individual's own and external factors related to the environment and the working conditions, which influence in the work process[12].

In the quantitative phase, the professional was evaluated in the post-work period for it was identified as the largest generator of physical efforts. Observations included two moments: transport of the patient from the operating room to the post anesthetic recovery room or ICU and transport of the patient from this room to the ward. The observed variables included the type of anesthesia used, the patient's age, height, type of stretcher, among others.

For the quantitative analysis the International Physical Activity Questionnaire (IPAQ-short version) and the Nordic Questionnaire were included, which uses different everyday contexts to estimate weekly time spent walking, moderate and vigorous intensity physical activity, and passive activities (sitting time). The short version consists of seven open questions and its information allows to analyze the level of physical activity in a week's time. From the participant's answers they can be classified as very active, active, irregularly active A, irregularly active B and sedentary, according to the frequency and length of vigorous, moderate and walking activities[14].

The highly active individual performs vigorous activities five days a week for at least 30 minutes or performs them three times a week for 20 minutes accompanied by 30 minutes of moderate activity or walking. The active participant was considered to be one who practices 20 minutes of vigorous activity three days of the week, or 30 minutes of moderate activity or walking on five days of the week, or even who practices 150 minutes of activity accounting for vigorous, moderate and walking.

The Nordic Overview questionnaire is an instrument that enables the identification of musculoskeletal disorders in the 12 months and 7 days prior to the interview. Thus, it also allows a diagnosis of the workplace by its relationship with the prevalence of the place and time of the onset of symptoms. The questionnaire includes the regions of the neck, shoulders, upper back, elbow, wrists and hands, lower back, hip and thigh, knees, ankles and feet addressing questions on the presence of pain, tingling and numbness in the last 12 months; limitation to perform activities of daily living and consultation with a health professional.

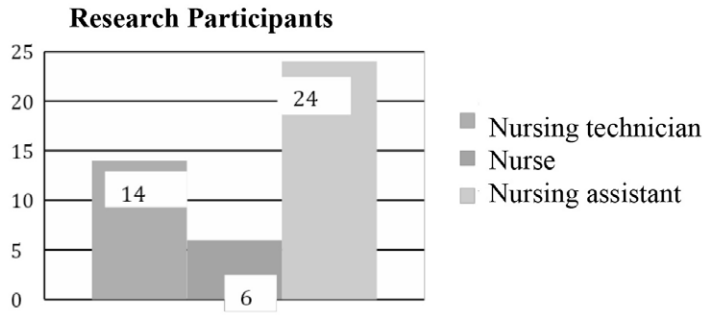
Results

For the description of the results, quantitative data were expressed through descriptive statistics, from the mean, standard deviation and frequency. Based on the qualitative results of the investigation, the diagnosis was made and the economic recommendations presented at a final meeting were proposed in order to provide feedback to professionals. The qualitative data were based on the analysis of the work of the nursing professional of this operating room. The aim was to verify whether the real work has any correlation with the results presented in the questionnaires used in this research.

Participating 44 nursing professionals in the analysed operating center, these professionals being: 24 (54.5%), nursing technicians 14 (31.8%) and nurses 6 (13.6%), of these, 32 (72.7%) were female and 13 (29.54%) of male gender. The average age was 42.3 years, with a minimum age of 26 and a maximum of 75 years. The average time on the job was 16 years, ranging from 2 months to 55 years.

The analyzed operating center is considered to be large, with 14 operating rooms, on average 35 surgeries per day. Nursing transports the patient still under anesthetic effect, from the operating table to the stretcher. During the workday, professionals take long walks and remain standing for long.

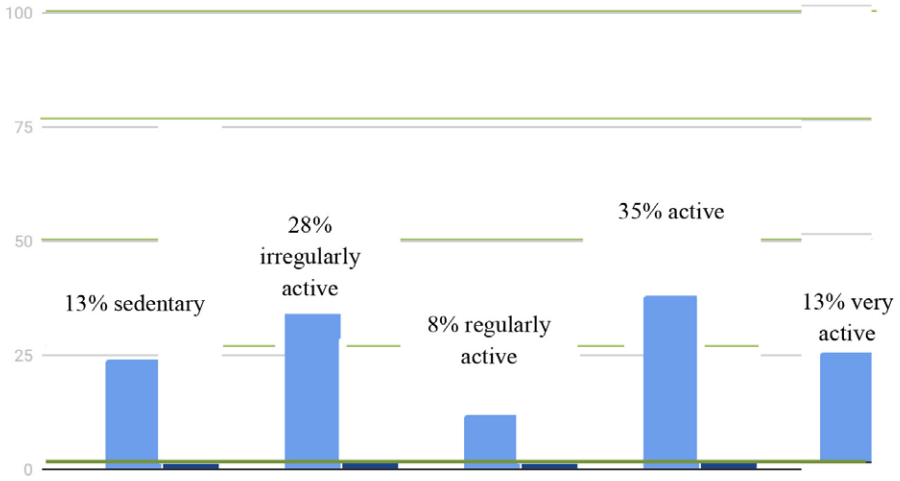
Figure 2. Research participants characterization



Source: The authors.

The IPAQ results have shown that 6 (13%) were sedentary, 12 (28%) irregularly active, regularly active 4 (8%), active 16 (35%), very active 6 (13%).

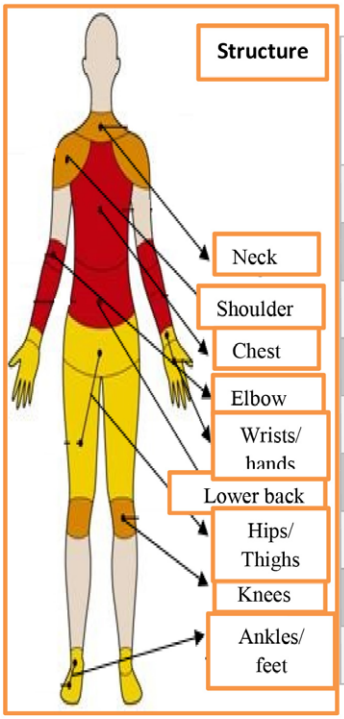
Figure 3. IPAQ Questionnaire



Source: The authors.

The Nordic questionnaire demonstrated that the region affected by pain was the lower back, followed by the shoulder, chest, knees and ankles.

Figure 4. Nordic Questionnaire results



In the last 12 months had problem on (%)	Was hindered from doing normal activities (%)	Visited a health care professional (%)	In the last 7 days (%)
15 (31,81%)	4 (9,09%)	8 (18,18%)	6 (13,63%)
17 (34,09%)	3 (6,81%)	5 (11,36%)	7 (15,90%)
17 (38,63%)	8 (18,18%)	5 (11,36%)	10 (22,72%)
5 (11,36%)	4 (9,09%)	4 (9,09%)	1 (2,27%)
14 (31,81%)	8 (18,18%)	6 (13,63%)	2 (4,54%)
23 (52,27%)	9 (20,45%)	9 (20,45%)	15 (31,81%)
10 (22,72%)	2 (4,54%)	4 (9,09%)	2 (4,54%)
15 (34,09%)	6 (13,63%)	9 (20,45%)	9 (20,45%)
16 (38,63%)	6 (13,63%)	7 (15,90%)	7 (15,90%)

Source: The authors.

According to the statistical analysis it was possible to establish a positive relationship in accordance with the neck pain variable, according to the time on the job (0.22 p-value = 0.14), not directly related to gender (0.03 p-value = 0.83) and age (0.66 p-value = 0.00), that is, the level of pain was invariably present in females and males. Regarding shoulder pain was positive when related to age (p = 0.14) and the participants' time on the job (p = 0.06).

The presence of pain in the upper back was not related to gender and not even with time on the job, but afirmatively with age, that is, the greater the statistical probability for the occurrence of pain in the upper back in older individuals. The presence of hand and wrist pain was positively correlated when related to female gender, age and was negative in relation to time on the job. In the lower limbs, pain was correlated with age and female gender. The pain in the ankles and feet was positive only when correlated with the female gender and negative for age and time on the job, data presented in figure V.

Still in the correlation of responses shown in figure V, the item sleeping at unusual times to the work shift, there was a correlation that tended to be moderate and negative. That is, those who have a day shift do not feel disturbed by sleep, which was expected. Other variables were analyzed as shown below (Figure V).

Figure 5. Correlations with the Nordic Questionnaire, containing Pearson correlation test p-value

Variable	Age (p-value)	Gender (p-value)	Time on the job (p-value)	Sleep disturbance (p-value)
Neck pain	0.66 (<0.001)	-0.06 (0.64)	0.22 (0.14)	-
Upper back pain	0.02 (0.88)	-0.02 (0.86)	-0.14 (0.34)	-
Wrist and hand pain	0.06 (0.64)	0.03 (0.79)	-0.02 (0.89)	-
Lower member pain	0.05 (0.69)	0.09 (0.54)	-0.07 (0.86)	-
Ankle and feet pain	-0.05 (0.69)	0.10 (0.48)	-0.09 (0.54)	-
Sleep in unusual times	-	-	-	-0.41 (0.94)

Source: The authors.

The operating room nursing job has often surpassed the prescribed task. There are emergency surgeries that cause changes in the entire work routine and the need to implement strategies that do not harm patients; poor maintenance of the stretchers was also observed, due to the lack of professionals who perform this task, forcing the nursing staff to perform the repairs, a condition that poses a risk, since they use inadequate postures and materials to resort to improvisations. Concerning the equipment used in the hospital, a concern arises, as it must be safe and periodically maintained. It is indispensable to evaluate the scarcity of equipment for transportation, especially of stretchers, with the intuit of avoiding their absence or malfunctions during transport.

During the making of observations during data collection in the operating room, some professionals reported some complaints due to the work and which are frequent, which is directly related to the answers obtained in the Nordic questionnaire. The questioning was obtained during the postoperative period, when the patient is still under anesthetic effect and therefore facilitated the interaction of the researchers with the professionals. Here are some brief reports from participants who are identified in numerical order (P1, P2, P3, and so on):

Female 30, "I have severe lower back and cervical pain" (P1).

Male sex 43, "I feel trapezoid and back pain" (P2).

Male sex 25, "Left arm pain, but I think that's because I fell when coming here riding a bike "(P3).

Female Sex 40," I have a lot of headache and trapezoid pain"(P4).

In the activity analysis it was observed that in the transportation of the patient after the recovery period, back to the ward, the stretcher must be maneuvered, with efforts to pull and to push (in addition, the practitioner states that there is no such rule). They transfer the patient to the ward stretcher with the help of the unit's nurse; then, they transmit the patient's medical record information to the nurse in charge and return to the operating room. Following are some reports obtained during the analysis of the activity:

Female 40: "Many times, we have to do the stretcher operator's task, and it bothers me a lot, because I have to go back and continue taking care of the patient, besides taking him to bed. What bothers me most, which has taken away my satisfaction to the job, doing other tasks. In addition, the beds are heavy, I had a shoulder problem, a spine problem because of carrying too much weight, pushing, pushing, pushing "(P4)

Female 34: "Our job of pulling stretcher, you know, always causes a back pain... They only know how to boss us around, bossing, bossing, if we say something ... You can not complain about anything, so it gets us mentally tired, it ruins our mental health "(P5).

Male gender 30: "I had a shoulder injury a year ago (...) tendon ruptured, waiting for a position from the doctor... He said it is the wearing of the job itself and working all life pulling, excessive forcing"(P6).

The lack of maintenance of stretchers, among other factors, can lead to greater nursing professional overload while transporting patients besides the possible biomechanical and occupational hazards due to higher rate of efforts and energy waste. For example, in the post-anesthetic recovery room, a nursing technician cleaned the stretchers that were out of order and had no provision for regular specialized maintenance. Thus, he was removing excess threads and debris deposited on the wheels of the stretcher with a scissors or a pen, at the risk of injury by sharp instruments. The following account illustrates the difficulty of this situation, which has repercussions on musculoskeletal pain complaints:

"I sit on the floor to clean the wheels, at the end of the day I have a huge backache" (P2).

The EWA also allowed to see other factors that may impact the physical efforts made by nursing professionals: a) the type of anesthesia used which will affect its effect or reaction time to the drug, later or faster, and besides that, in the extent of the anesthetic effect in the patient's body (for example, the patient with local anesthesia may assist moving, while the one who has had a raquidian anesthesia will contribute less); b) type of surgical procedure, because according to the extension of the surgery, it will allow more or less patient movement; c) patient age, since it was observed that when the patient was older or infant they responded less to the nursing voice commands at the moment of transportation;

d) weight and height, as the patient with higher weight and height resulted in greater effort performed by the professional at the time of transportation; e) lack of maintenance of stretchers; f) the type of stretcher, because the older stretchers are heavier for the operator, however, they are available in greater number in this operating room, this observation was possible from what one of the opertors reported:

"This stretcher in the ward is much better to discharge, I noticed that the patient feels safer too, since he does not feel so much recurrence"(P4), his colleague then replies: "Wow, I prefer it too, besides being comfortable to the patient it is much lighter to carry"(P5).

Discussion

This study was verified a larger contingent of female professionals, consistent with a study on the profile of Brazilian nursing conducted by the Federal Council of Nursing (Conselho Federal de Enfermagem - COFEN), which evidenced the predominance of nurses in the professional category (84.6%)15. For Nauderer & Lima Mads20, the historical context of care linked to the female figure projected some stereotypes about nursing care that were rooted in the social imaginary throughout the ages.

Regarding to the working conditions and the great efforts taken place by the professionals who participated of this study, there is an overload associated with nursing work, due to the lack of technical means that can support the issues related to the maintenance of objects and equipment that are useful and indispensable to the professional practice itself.

The health system is the result of a complex socio-technical system, making it vulnerable to the conditions of insecurity in which the nursing professional becomes susceptible[1], observing as a result, that patient safety can be compromised, as found in a study by Gonçalves & Andolh[21] in an Intensive Care Unit (ICU), when there is a higher workload, and consequently, a higher frequency of adverse events in the sector.

Care with working conditions (including workload, workload and availability of resources) are related to the improvement of the performance of these professionals' tasks, which consequently results in greater safety in care. In order to provide all this, it is necessary for managing to understand that the use of better working conditions is closely related to the qualification of care and that, in neglecting this aspect, their conduct will be counterproductive to the principles of quality management[19].

It is up to managing to review the work processes and reinforce the communication lines, because only in this way it will be possible to establish strategies that allow to prevent faults that are related to care and that make the system fragile.

In relation to complaints regarding the work equipment maintenance studies reveal that the lack of adequate physical structure and human resources leads to overload of work, subjecting the employee to strong impositions and unpredictable situations, causing physical and emotional fatigue[6].

In Brazil, about 60% of Brazilians do not practice any kind of physical activity observed in a study conducted in a Basic Health Unit (Unidade Básica de Saúde – UBS) in the city of Floriano, Piauí, Brazil, which verified the prevalence of sedentary behavior in nurses, nursing technicians and community health agents. In the study cited, it was identified that 55.6% of the professionals participating in the research are considered to be sedentary[2].

Regarding the presence of pain through the Nordic questionnaire, we obtained pain in the neck, spine, hands, wrists, lower limbs, foot and ankles. Regarding pain in the ankle and lower limbs, it can be inferred that it is related to individual factors, work-related factors, such as workload and aspect of each sector are relevant for the emergence of complications, which eventually reflects on pain in the spine area, as proposed in the study by Reed LF, Battistutta D, Young J & Newman B[18].

A survey of 29 nursing professionals, being three assistants, 23 technicians and three nurses, was observed the prevalence of musculoskeletal pain (96.6%) in at least one of the 17 body regions in the last 12 months. The main anatomical regions affected by the analyzed professionals were the lower and upper back (79.3 and 75.9%, respectively), the neck (65.5%), the shoulders (62.1%), the ankles/feet (55.2%) and wrists/hands (51.7%). In addition, 65.5% of respondents reported having taken time off work for health reasons in the last 12 months[2].

These results differ from the findings of this research considering the regions with the highest pain rates: neck (0.22 p-value = 0.14), spine (0.09 p-value = 0.79), hands (0.03 p-value = 0.79), wrists (0.06 p-value = 0.64), lower limbs (0.10p-value = 0.48), foot and ankles (-0.02 p-value = 0.89). Positive correlations are found when related to the presence of pain in females (0.03 and p value = 0.83), there are consistent hypotheses and which are also found in other articles, refer to the fact that the double workday of women, greater repression generating fear, tension and stress, and female workers are often responsible for more thorough work and have a proportion of different muscle fiber types than men.

When relating pain and age, a significant relationship was not observed, as in the literature no relationship was found between age and the propensity for developing occupational pains, so further research is needed. We have a positive relationship when related to time on the job, since performing repetitive character movements predisposes to musculoskeletal pathologies such as repetitive strain injury (RSI) or work-related musculoskeletal disorders (WRMSD).

The journey of the nursing professional who performs the transportation of patients and materials in the Operating Center is endowed with complications according to the observations, from the patient's departure from the operating room to the post-anesthetic recovery room. Afterwards, after the patient recovers his vital signs, must return to the ward, this return most of the times is performed by the circulating nurse.

There are episodes such as the lack of human resources, problems related to equipment maintenance and communication failures that need to be analyzed, since they compromise the safety of care and may lead to the occurrence of an adverse event. And even when combined with an ergonomic and or occupational hazard it can lead to some accident in the workplace[6].

For Novaretti MCZ, Santos E de V, QuMaria LM, and Daud-Gallotti RM22. The most prevalent notifiable circumstances are the nursing team's working conditions, largely marked by the inadequate personal dimensioning and work overload, these factors compromise the health of the professional and interfere with the care provided to the patient.

One of the ways to prevent stress and maintain quality of life is the practice of regular physical activity; Labor gymnastics performed in the workplace is an important promotional factor for health, generating organic, emotional and social benefits. In the present study, about the offer of Labor gymnastics, 69.1% said that the hospital offers labor gymnastics, but only 35.7% participate17. Kleinubing25 emphasizes that knowledge of stressor factors can help institutions and professionals to rethink their work process to make daily life more productive and less weary, which will reflect on the quality of care provided.

Conclusion

The presence of pain was higher in women, regardless of age, and was influenced by the occupied sector and the role of nurse, assistant or technician. Regarding the signs and symptoms, the complaints were greater when frequently aggravated, in the head, spine, arms. In addition, the occurrence of discouragement, anxiety or irritability when related to eventualities were in the head, chest, spine, stomach and arms.

The justification for the repetition of these complaints is related to the musculoskeletal and psychological system, as they play a greater role during nursing work performance. Thus, it is necessary to adopt preventive measures aimed at improving health by preventing musculoskeletal complications at work.

In addition, the improvement and adequacy of the insertion of the physical therapist professional in this work environment should be thought to better perform preventive measures, and also in the correct prescription of exercises, according to the unique characteristics of each individual, towards the daily demands proposed in their work environment.

Author contributions

Quevedo VS participated in the collection of qualitative research data, data interpretation and writing of the scientific article. Miranda FC participated in the correction and collection of quantitative research data. Chomem P participated the collection of the quantitative data, writing and critical review of the article. Bayerl R participated in the data collection, data interpretation and writing of the results. Legey ALC participated in the data collection and interpretation. Motter AA participated in the conception, design, research supervision and critical review of the article.

Competing interests

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