Occupational risk between nursing workes in Intensive Therapy Unit

Riscos ocupacionais entre trabalhadores de enfermagem em Unidade de Terapia Intensiva

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ABSTRACT | Background: The global records of occupational accidents and diseases are alarming, having serious consequences for victims and their families. Among hospital settings, the Intensive Care Unit (ICU) is considered to be the most tense, traumatic and aggressive, due to its heavy work routine and the constant risks to which the staff is exposed. Nurses are some among the professionals who are constantly exposed to various risk factors. **Objective:** To analyze the occupational hazards to which ICU nursing professionals are exposed in the national and international literature. **Methods:** Integrative literature review conducted in databases LILACS, CINAHL, MEDLINE and SciELO from July to August 2015. **Results:** Most studies were published in Brazilian journals (66.6%), however, little difference was found by comparison to international studies with the same perspective. **Discussion:** The ICU setting exhibits a wide variety of risks, which are considerably minimized when nursing professionals make correct use of personal protective equipment. **Conclusion:** Hospitals should develop effective educational strategies for professionals to make correct use of the equipment. In addition, workers should have accurate knowledge of the risks to which they are exposed and how they might affect their health and quality of life.

Keywords | occupational risks; intensive care units; accidents, occupational; nursing service, hospital.

RESUMO | Contexto: Os registros de acidentes de trabalho e doenças profissionais no mundo são alarmantes e possuem graves consequências para as vítimas e seus familiares. Entre os ambientes hospitalares, a Unidade de Terapia Intensiva (UTI) é considerada como a mais tensa, traumatizante e agressiva, em decorrência da rotina de trabalho intensa e dos riscos constantes à equipe. Dentre esses profissionais, a enfermagem é uma das equipes que está constantemente exposta a vários fatores de risco. **Objetivo:** Analisar na literatura nacional e internacional quais são os riscos ocupacionais a que os trabalhadores de enfermagem estão expostos em UTI. **Métodos:** Trata-se de uma revisão integrativa da literatura realizada nas bases de dados LILACS, CINAHL, MEDLINE e na biblioteca eletrônica SciELO no período de julho a agosto de 2015. **Resultados:** Os estudos são, em maioria, publicados em periódicos nacionais (66,6%), mas com pouca evidência de diferenças quando comparados a estudos internacionais dessa mesma perspectiva. **Discussão:** O ambiente de trabalho da UTI apresenta os mais diversos tipos de riscos, mas esses são consideravelmente minimizados se os profissionais de enfermagem fizerem o uso correto dos equipamentos de proteção individual. **Conclusão:** Instituições hospitalares devem desenvolver estratégias educativas efetivas para que esses profissionais usem os equipamentos corretamente. Além disso, esses trabalhadores devem conhecer os riscos a que estão expostos e compreender o quanto isso pode afetar a sua saúde e a sua qualidade de vida.

Palavras-chave | riscos ocupacionais; unidades de terapia intensiva; acidentes de trabalho; enfermagem do trabalho.

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INTRODUCTION

According to International Labor Organization (ILO) estimates, 2.34 million people die every year from work-related accidents and diseases. Hazards originated in technological, social and organizational changes severely impair the health of workers¹.

The concern with biological hazards stemmed from the observation, at the beginning of the 1940s, of illnesses occurring among professionals who worked at laboratories where microorganisms and clinical specimens were handled. Yet, workplace safety standards only began to be widely applied for professionals working in clinical fields in the 1980s together with the acquired immunodeficiency syndrome (AIDS) epidemic². The concern with workers' health in the hospital setting was raised in the 1970s, when investigators from University of São Paulo began to focus on the occupational health of this population³.

The Brazilian Ministry of Labor and Employment (MLE) established the so-called Regulatory Standards (RS) which seek to abolish or reduce the high rates of work accidents. The NSs addressing occupational hazards include NS 9, which created the Environmental Hazard Prevention Program (Programa de Prevenção de Riscos Ambientais – PPRA), NS 32, which established measures to ensure safety and health at work in health care services, and NS 7, which made the implementation of the Occupational Health Medical Control Program (Programa de Controle Médico de Saúde Ocupacional - PCMSO) mandatory⁴.

Among hospital areas, the intensive care unit (ICU) is considered to be the most tense, traumatizing and aggressive, as a function of the heavy work routine, the hazards to which the nursing staff (nurses, nursing technicians and assistants) is continuously exposed as a function of the risk of contagion, exposure to X-rays and to sharps injuries, frequent occurrence of critical situations, the intermittent noise of monitors, aspirator pumps and ventilators and the circulation of large number of professionals, among others. Not only the environment is insalubrious, but given the frequent occurrence of emergency situations and the high concentration of critically ill patients — who undergo sudden changes of their state of health — the ICU environment is characterized as stressful, aggressive and emotionally charged for the multi-professional staff⁵.

Moreover, nursing practice is associated with exposure to several risk factors, such as exhausting working hours, with consequent mindlessness of the circadian rhythm, inadequate meal times, inadequate furniture and postural risk, among others. It is worth mentioning the current concern with the working conditions of the nursing staff in hospitals, especially the ones allocated to ICU, which have called the attention of many investigators as a function of the hazards associated with the work environment and activities⁶. The most common risk factors in nursing practice are physical, chemical, biological, ergonomic and accidents⁴.

Therefore, the aim of the present review was to investigate the occupational risks to which ICU nursing staff is exposed in the Brazilian and international literature.

METHODS

We chose to perform an integrative review, because this approach allows synthesizing the state of the art in a given subject and points to gaps that need to be filled through additional studies. To accomplish these goals, integrative reviews include analysis of studies relevant to ground decision making and improve clinical practice. It is a research method that allows synthesizing a wide variety of published studies and drawing general conclusions for a definite field of studies⁷.

The first step of the review consisted in the formulation of the research question, which was: What are the occupational risks to which the nursing staff is exposed in ICU?

Step 2 included the definition of the inclusion and exclusion criteria for articles and a literature search, which was conducted from June through August 2015 on databases Latin American and Caribbean Health Sciences Literature (Literatura Latino-Americana e do Caribe em Ciências da Saúde - LILACS), Cumulative Index to Nursing and Allied Health Literature (CINAHL), Medical Literature Analysis and Retrieval System Online (MEDLINE) and Scientific Electronic Library Online (SciELO). The descriptors used were: “enfermagem” (“nursing”), “riscos ocupacionais” (“occupational risks”), “unidade de terapia intensiva” (“intensive care unit”) and “acidentes de trabalho” (“accidents occupational”). Also operator AND was used (Figure 1).

The search strategy included the following steps: search by descriptors, selection of the publication period and language and analysis of titles and abstracts. Articles on the subject of interest which complied with the study aims were selected for analysis, and the ones which did not meet the selection criteria were excluded.

The inclusion criteria were: original articles with open access to their full text in the investigated databases and electronic library, published in Portuguese, English or Spanish, from June 2005 to June 2015. Duplicates, review articles, dissertations and essays, experience reports, case studies and articles which subject did not correspond to the study aims were excluded.

In step 3 data were extracted from the selected data and entered in a form, including the following information: author, title, publication year, database, category in the Qualis Journal Classification System (Chart 1), study design and types of hazards (Chart 2) in addition to the location where studies were conducted.

In step 4 the articles were assessed based on analytical reading, which allowed obtaining answers to the problem. Step 5 consisted in the presentation of the results in tables containing a detailed analysis of the information gathered and distributed across thematic categories based on the identified types of hazards.

Figure 1. Process of article search and selection per library and database. Teresina, Piauí, 2015.

Finally, step 6 consisted in the elaboration of the present review, in which the main results of the analysis of the selected articles are compiled.

RESULTS AND DISCUSSION

Based on the study design, we found that most studies had been published in Brazilian journals (66.6%). However, the difference in regard to international publications was not large, which evidences a global concern with occupational hazards.

The retrieved studies were conducted in four countries: Brazil (66.6%), France (11.1%), Taiwan (11.1%)

and Turkey (11.1%); the largest number of studies on the subject of interest were conducted in Brazil. The studies were published from 2007 to 2015; it is worth observing that the period set for the literature search was from 2005 to 2015.

The results were categorized as a function of the thematic core identified in the analyzed articles. Therefore, the discussion is based on four categories: physical, biological, chemical and ergonomic hazards.

PHYSICAL HAZARDS

Exposure to high levels of noise for long periods of time might result in physical, mental and social

Chart 1. Methodological characterization of studies on occupational hazards for ICU nursing professionals included the integrative review. Teresina, Piauí, 2015.

No.	Author	Title	Publication year	Database	Qualis
1	Correa CF, Donato CM.	Biossegurança em uma Unidade de Terapia Intensiva – a percepção da equipe de enfermagem	2007	LILACS	B1
2	Leitão IMTA, Fernandes AI, Ramos IC.	Saúde ocupacional: analisando os riscos relacionados à equipe de enfermagem numa Unidade de Terapia Intensiva	2008	LILACS	B2
3	Oliveira EB, Souza NVM.	Estresse e inovação tecnológica em Unidade de Terapia Intensiva de cardiologia: tecnologia dura	2012	LILACS	B1
4	Lapa AT, Silva JM, Spindola T.	A ocorrência de acidentes por material perfurocortante entre trabalhadores de enfermagem intensivista	2012	LILACS	B1
5	Mauro MYC, Paz FAA, Mauro C, Pinheiro M, Silva NVS.	Trabalho da Enfermagem nas Enfermarias de um Hospital Universitário	2010	LILACS	B1
6	Campos JF, David HSL.	Avaliação do contexto de trabalho em terapia intensiva sob o olhar da psicodinâmica do trabalho	2011	SciELO	A2
7	Ribeiro EJG, Shimizu HE.	Acidentes de trabalho com trabalhadores de enfermagem	2007	SciELO	A1
8	Sezgin D, Esin MN	Predisposing factors for musculoskeletal symptoms in Intensive Care Unit nurses	2015	CINAHL	A1
9	Jones G, Salomon MHJS, Dab W, Temime L	Demographic and occupational predictors of stress and fatigue in French intensive-care registered nurses and nurses' aides: a cross-sectional study	2015	CINAHL	**
10	Chiou ST, Chiang JH, Huang N, Wu CH, Chien LY.	Health issues among nurses in Taiwanese hospitals: National survey	2013	CINAHL	**
11	Bonini AM, Zeviani CP, Facchin LT, Gir E, Canini SRMS.	Exposição ocupacional dos profissionais de enfermagem de uma Unidade de Terapia Intensiva a material biológico	2009	CINAHL	B1
12	Gomes AC, Agy LL, Malaguti SE, Canini SRMS, Cruz EDA, Gir E	Acidentes ocupacionais com material biológico e equipe de enfermagem de um hospital-escola	2009	CINAHL	A1
13	Pinheiro J, Zeitoune RCG.	O profissional de enfermagem e a realização do teste sorológico para hepatite B	2009	CINAHL	A1
14	Molinier P.	A dimensão do cuidar no trabalho hospitalar: abordagem psicodinâmica do trabalho de enfermagem e dos serviços de manutenção	2008	CINAHL	B1

**Journal has no Qualis classification for nursing.

consequences for individuals. Damage to the auditory system is the best defined and quantifiable among such consequences⁸.

Equipment used in ICU, such as continuous infusion pumps and mechanical ventilator alarms, causes irritation, impairs communication among the staff and induces sleep/rest disorders, which make difficult for nursing professionals to fall asleep. These workers might wake up in the middle of night with the impression of listening to alarms and/or exhibit short episodes of insomnia and dream with situations at the workplace⁸.

In addition, nursing professionals are susceptible to psychophysical exhaustion resulting from the periodic checking of patients and equipment whenever an alarm sets off. Anxiety is exacerbated, the professionals are subjected to mental overload and learn how to live with the unpredictability that derives from the loss of control of the patient and equipment conditions⁹.

According to Brazilian Standard 10152, the acceptable levels of noise in hospital environments, including ICU, ranges from 35 to 45 decibels (dB). Higher levels of noise are considered to cause psychological discomfort and might pose a risk to health when the period of exposure is long and the level is much above the

recommended ones. Being an enclosed environment, the local acoustics at ICU is unfavorable, resulting in higher sensitivity to noise¹⁰.

In addition, the staff is rather large in intensive care services, given the complexity and severity of patients. The high level of activity, discussions of cases, and even communication among staff further contribute to increase the level of noise in ICU¹⁰.

In regard to thermal comfort, the energy expenditure increases when the temperature rises, which is a common complaint among ICU staffs. The reason is that the human body needs to perform twice as much work to adjust the body temperature to the ideal physiological range. As a result, the energy expenditure increases, the level of performance in tasks decreases, and the feeling of physical exhaustion increases, which factors also influence the state of health of patients⁸.

Health care workers are continuously exposed to ionizing radiation at the workplace. For this reason, they must use personal dosimeters and subject them to periodic readings. The dose absorbed over the course of an individual's lifetime must comply with the standards formulated by the International Commission on Radiological Protection (ICRP)⁸.

Chart 2. Description of the studies included in the integrative review according to study design and types of hazards. Teresina, Piauí, 2015.

No.	Study design	Categories of risk
1	Exploratory, descriptive, qualitative approach	Biological risk
2	Descriptive, exploratory	Physical, biological, chemical and ergonomic risk
3	Descriptive, qualitative approach	Physical risk
4	Quantitative, descriptive, exploratory, use of the document analysis technique	Biological risk
5	A part of a cross-sectional exploratory study	Physical and ergonomic risk
6	Cross-sectional	Ergonomic risk
7	Cross-sectional	Ergonomic risk
8	Cross-sectional	Ergonomic risk
9	Descriptive, exploratory	Biological risk
10	Descriptive, exploratory	Biological risk
11	Descriptive, qualitative approach	Biological risk
12	Descriptive, qualitative approach	Biological risk
13	Non-experimental, quantitative approach	Ergonomic risk
14	Descriptive and exploratory case report	Physical risk

Bedside radiographs are a part of the routine procedures at ICU. However, not only patients, but also the nursing professionals who are near them or are performing their routine tasks in the unit are exposed to radiation. These professionals absorb small doses of radiation every day, which accumulate over time and cause undesirable effects, especially since no protection is afforded to the nursing staff, and the levels of radiation to which they are exposed is not monitored. Several studies found that the staff is aware of the risk inherent to exposure to radiation and of the medium- and long-term damage it can cause to the health of individuals undergoing repeated exposure⁸.

CHEMICAL HAZARDS

The second category corresponds to chemical hazards, represented by color red, which include dust, gases and vapors. Several gases and vapors might be present in the atmosphere of hospital work environments, and when inhaled, they cause irritation mainly of the airways. In liquid state, they might also affect the skin, causing burns or inflammation⁸.

The chemical hazards to which nurses are exposed “result from the handling of a wide variety of chemicals, and also from the administration of medications which might trigger from simple allergies to significant neoplasms.”¹¹

Irritating gases and vapors induce inflammation of airway tissues, which might lead to pulmonary edema, pleural effusion and other reactions. They might also cause other conditions, such as rhinitis, pharyngitis and laryngitis, cough and chest pain. These disorders should be considered as a sign of aggravation and as an alert to prevent excessive exposure that might have serious effects on the respiratory system, and eventually cause chronic damage to the airways when no system of personal or collective protection is available to avoid the contact of the body with such irritants⁸.

In regard to the air circulating in the environment, one of the analyzed studies found that gas release is not rigorously controlled. Oxygen and compressed air systems often remained turned on even when not being used, due to lack of attention, hurry and unawareness of the risk they involve. Disposal of secretions and of the fluid condensed in ventilator and tracheal tubes is not adequate and contributes to the contamination of the

environment. In association with this, authors call the attention to the irregular and/or inadequate use of masks for personal protection⁸.

As is known, within the hospital setting nursing professionals are exposed to chemical hazards as a function of the handling of medications, including antibiotics and chemotherapy agents. In addition, they have contact with a large number of toxic substances employed for cleaning and disinfection and other uses¹².

The nursing staff is daily exposed to the risk of absorbing the substances they handle without proper use of personal protective equipment (PPE). Examples are accidental spilling of substances on the skin and eyes, inhalation during administration of drugs delivered as aerosols or spray or during the maceration and mixing of medications, and direct or indirect accidental ingestion from taking the hands to the mouth or spilling to the mouth⁸.

The main chemicals to which nursing professionals are exposed are: medications, disinfectant solutions, descaling and sterilizing agents, antiseptics, chemotherapy agents, analgesic gases, dermatological acids, latex (contact with rubber materials) and cigarette smoke¹¹.

These hazards result in several consequences for nursing professionals, including sensitization to antibiotics and allergic and irritant contact dermatitis. The main agents involved in occupational dermatoses are antibiotics, antiseptics, disinfectants, detergents, rubber gloves and soap, the risk for which could be avoided through adequate use of PPE during the handling and preparation of medications⁸.

BIOLOGICAL HAZARDS

Occupational hazards are widely distributed across health care services, and exposure proportionally increases the closer and more direct the contact with patients is. Biological agents might be transmitted through the hands or through the use of uncleansed, non-disinfected or non-sterilized materials, as well as by means of indirect contagion, involving contact with contaminated patients' belongings or through the air¹³.

The more nursing professionals handle sharps, blood and organic fluids, the higher their exposure to biological hazards. The nursing staff is one of the main victims of occupational exposure to this type of hazards for being in constant direct contact with biological materials and as a function of the type and frequency of the procedures they perform¹⁴.

Some nursing professionals do not wear PPE during the disposal of excretions, airway suctioning and while changing contaminated clothes, among other procedures. Prevention measures should be rigorously observed to minimize risk and the accidents caused by inadequate practices. Use of PPE does not reduce the risk to zero, but does diminish the amount of inoculated secretion/blood in up to 75%, and in consequence also the risk of infection⁸.

As a rule, biological agents are transmitted through inhalation, transdermal penetration, contact with the skin or mucous membranes or ingestion. Infections due to blood transmission of pathogens are considered to be the ones that pose most risk to health care professionals. AIDS and hepatitis B and C are the diseases to which this population is most exposed. Among the airborne diseases, tuberculosis deserves special mention by comparison to others such as influenza, varicella, whooping cough and meningococcal disease. The reason is that several studies found that, for having more direct contact with patients, the risk for nursing professional to acquire tuberculosis is eight times higher compared to other health care professionals¹⁴.

Several studies found that sharps injuries are associated with lack of experience as one of the factors that contribute to their occurrence, in addition to lack of attention, hurry, work overload, urgent care delivery, lack of use of PPE, personnel shortage and stress¹⁵.

Blood is the body fluid most often involved in accidents. Needles are the most frequent sources of accidents with sharps contaminated with biological materials, followed by coats and scalpel blades¹⁶.

The most relevant pathogens transmitted per parenteral route are the hepatitis B (HBV) and C (HCV) viruses and the human immunodeficiency virus (HIV). While nurses allocated to the Family Health Strategy do not have many occasions to administer intravenous injections, they are exposed to risk of parenteral contamination during the administration of vaccines or medicines per intramuscular route¹⁷.

In association with the implementation of biosafety measures, pre- and post-exposure prophylactic measures for this population of workers, such as immunizations and chemoprophylaxis, might be indicated as a function of the type of exposure and the infectious agent involved

to avoid the occurrence of occupational hospital-acquired diseases¹⁴.

ERGONOMIC HAZARDS

Nursing professionals are daily exposed to risk, however, they fail to protect and care for themselves as if it were a natural attitude, while as a fact, such behaviors are essential for a profession which aim is to provide care. Staffs frequently do focus on care, but on the care of others only¹⁸.

Fatigue is meant to be a signal to warn the human body it has reached its limits and needs to set a time to rest for symptoms to recede. Whenever this call to rest goes unheard, physical and mental exhaustion ensues together with abnormal changes in the physiological functioning of organic functions⁸.

Fatigue might manifest in many different ways: physical (low and upper back ache, shoulder and neck pain), mental (mental exhaustion) and nervous (manifested as anxiety, fear and frustration)¹⁰.

Some factors were described as sources of fatigue in nursing work: tiresome body posture; excessive displacement; work overload; night shift and/or consecutive shifts; work involving high-complexity procedures and continued maximum attention; lack of adequate rest breaks; strong pressure for results and rigid standards; challenging working conditions, including personnel shortage and equipment defects; and unpleasant work environment and conflicting professional relationships^{8,10,19-21}.

In addition, work in ICU is characterized by strong time pressure – all is urgent and involves high complexity. For this reason, more specialization and better training is required from professionals, resulting in a circle of rigidity, demands and rhythm. All these characteristics might result in physical, cognitive and affective costs likely to cause suffering and even illness¹⁰. Headache and gastrointestinal disorders are some of the occupational diseases most often reported by nursing professionals⁸.

The body posture might also pose ergonomic risk to the nursing staff, inasmuch as it is influenced by furniture and the work environment, the organization of work, age and individual anthropometric characteristics. Lifting or transferring excessive weights during bed baths or transportation of equipment and gurneys are some of the most frequent causes of accidents⁸. Cupboards inadequately placed at a level incompatible with the height of most

employees, or alternatively too low, thus compelling professionals to adopt inadequate body postures, are also risk factors¹⁰.

A study conducted in Turkey found that ICU nurses exhibit high rates of musculoskeletal injuries and are considerably exposed to ergonomic hazards. Almost all the analyzed nurses (95.9%) reported musculoskeletal pain, most frequently involving the back, shoulders and neck¹⁷.

Nursing professionals spend much of their working hours standing, bent over beds, tiptoeing and hyperextending the arms and spine. Bath beds should be performed together with another member of the staff to minimize the effort required by the mobilization of unconscious patients unable to cooperate. Such activities might cause muscle and joint pain to nursing professionals⁸.

The work of nurses is associated with high prevalence of occupational hazards. Hospitals need to consider such occupational hazards to improve the work environment and strategies should be developed to reduce them²¹.

FINAL CONSIDERATIONS

According to several studies, much has already been achieved in the field of workers' health. Together with the implementation of environmental (PPRA) and medical (PCMSO) programs, issuance of health certificates and

recognition of the relevance of workers' participation, a new view on occupational health developed centered on the health of specific groups of workers who are both individually and collectively assessed²². Based on the analysis of studies, the work environment of nursing professionals can be understood as comprising several hidden hazards, of physical, chemical, ergonomic and biological nature, as shown here, which might impair the health of this population of workers. In the case of ICU, such hazards might become potentiated as a function of the dynamics, complexity and high degree of specialization of this particular setting. Therefore, the health of nursing professionals allocated to ICU should be the target of continuous assessment and control.

To conclude, occupational hazards are considerably minimized when nursing professionals make adequate use of PPE. For this reason, hospitals should promote actions targeting the health of workers in all its physical, mental and social dimensions, through the development of effective educational strategies. In addition, they should inform employees about the full scope of hazards to which they are exposed for them to understand how much they might affect their health and quality of life.

Thus being, studies involving intervention actions with ICU professionals, the nursing staff in particular, are crucial for this population to include actions aiming at the prevention and maintenance of their own health into their everyday practice.

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