ANALYSIS OF NON-CLINICAL RISKS IN A MATERIAL AND STERILIZATION CENTER

Análise dos riscos não clínicos em um centro de material e esterilização

Análisis de los riesgos no clínicos en un centro de material y esterilización

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ABSTRACT: Objective: To analyze the non-clinical risks of a material and sterilization center (MSC). **Method:** This is an observational, analytical and longitudinal study conducted between March and November 2017 at the MSC of a regional hospital in the countryside of Piauí. Data collection took place in different shifts, using a form. The analysis was performed according to the classification of degree of severity and likelihood of risk. **Results:** Ergonomic hazards are partially in line. The risks of burns, electric shocks and fire were worrisome, as they have issues in non-compliance. As for the biological hazards, there is a lack of training/qualification of the professionals about the contamination by sharps equipment. The most common risks were those of class 1 and the least found ones, those of class 3. **Conclusion:** There was a greater register of factors for class 2 risk, that is, medium risk.

Keywords: Risk. Occupational risks. Risk management.

RESUMO: Objetivo: Analisar os riscos não clínicos de um centro de material e esterilização (CME). **Método:** Trata-se de um estudo observacional, analítico e longitudinal, realizado entre março e novembro de 2017 no CME de um hospital regional do interior do Piauí. A coleta de dados ocorreu em turnos distintos, utilizando um formulário. A análise foi realizada conforme classificação do grau de severidade e probabilidade do risco. **Resultados:** Os riscos ergonômicos estão parcialmente em conformidade. Os riscos de queimaduras, choques elétricos e incêndio se mostraram preocupantes, pois têm quesitos em não conformidade. Quanto aos riscos biológicos, existe falta de treinamento/capacitação dos profissionais acerca da contaminação por equipamentos perfurocortantes. Os riscos mais encontrados foram os de classe 1 e os menos encontrados, os de classe 3. **Conclusão:** Houve maior registro de fatores para risco de classe 2, ou seja, moderado.

Palavras-chave: Risco. Riscos ocupacionais. Gestão de riscos.

RESUMEN: Objetivo: Analizar los riesgos no clínicos de un centro de material y esterilización (CME). **Método:** Se trata de un estudio observacional, analítico y longitudinal, realizado entre marzo y noviembre de 2017 en el CME de un hospital regional del interior de Piauí. La colecta de datos se realizó en turnos distintos, utilizando un formulario. El análisis fue realizado de acuerdo con la clasificación del grado de severidad y probabilidad del riesgo. **Resultados:** Los riesgos ergonómicos están parcialmente en conformidad. Los riesgos de quemaduras, descargas eléctricas e incendio se mostraron preocupantes, pues tienen cuestiones en no conformidad. Cuanto a los riesgos biológicos, existe falta de entrenamiento/capacitación de los profesionales acerca de la contaminación por equipos cortopunzantes. Los riesgos más encontrados fueron los de clase 1 y los menos encontrados, los de clase 3. **Conclusión:** Hubo mayor registro de factores para riesgo de clase 2, o sea, moderado.

Palabras clave: Riesgo. Riesgos laborales. Gestión de riesgos.

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INTRODUCTION

The work in the health sector, although needed for human development due to its inherent characteristic to the care of the neighbor, has potential harmful to the health of workers, since the exposure of these to the most diverse risks from labor is a problem of not only the scientific community[1].

The risks to which health professionals are exposed in a hospital environment can be classified into clinical and non-clinical. In the latter case, those originated by procedures and practices of activities related to the maintenance of the physical structure and the assistance support[2]. The non-clinical risks that affect workers of health institutions are derived from physical, chemical, biological and ergonomic factors, which represent elements capable of harming productivity, the quality of the care provided and the health of professionals themselves[3].

In the Material and Sterilization Center (MSC), the main problems relate to the non-clinical risks to which workers are exposed. This is considered to be a complex environment, both for its dynamics of operation and for the activities performed in which professionals work routinely exposed to organic fluids, heat and chemicals used in the cleaning, disinfection and sterilization processes[4]. Such working conditions may put health professionals at risk and interfere with the quality of care provided to the patient by the sector.

The MSC environment is considered to be one of the sectors where there are more non-clinical accidents within a hospital because of the handling of articles and products that must be carefully processed. This is corroborated by the number of notifications in the hospital *locus* of the survey, which is 30% higher than in other areas of the institution.

Therefore, careful analysis of these risks must be carried out, so that strategies can be drawn up to prevent and extinguish possible fragilities and/or failures in the service, in order to mitigate them at acceptable levels and implement preventive and corrective actions. In this context, it is the responsibility of health facilities to promote adequate management so that they can continuously identify, analyze, evaluate and monitor such failures and/or weaknesses. It is therefore necessary to prepare studies on this subject.

The relevance of this study is due to the fact that new knowledge on the subject will allow a re-evaluation of the work processes and the functioning of the MSC in general, in order to reduce non-clinical risks, improving the quality of work process and of patient care.

OBJECTIVE

To analyze the non-clinical risks of a MSC in a hospital in the countryside of Piauí.

METHOD

This is an observational, analytical and longitudinal study, through which we sought to analyze non-clinical risks in a MSC, as it is in the practice of working in the daily routine of the field of this research.

The study was conducted in the period from March to November 2017, in a regional hospital in the coutryside of Piauí, located about 310 kilometers from the capital Teresina. This facility was chosen due to its being a reference unit for the whole macro-region, attending to clinical and surgical conditions of patients from 52 surrounding municipalities, besides functioning as a school hospital.

The MSC is classified as type II and presents a physical structure divided into dirty and clean areas, which process hospital articles for use in general, gynecological and orthopedic surgeries, in addition to the routine use of ventilatory assistance. Its team consists of one day-care nurse and four Nursing technicians, working on 12/36-hour shifts, for both categories.

Data collection was carried out during the month of October 2017, in the morning (9a.m. to 12p.m.) and afternoon (2a.m. to 6p.m.), on previously established days, according to convenience for the reception of the researchers in the sector. Three observations were made (observation 1: afternoon shift; observation 2: afternoon shift; and observation 3: morning shift), and the intervals between these were two days from the first to the second one and from six days from the second to the third one. This number was chosen because it is an odd number, since it could reduce the chances of collecting repetitive data and thus improve their reliability.

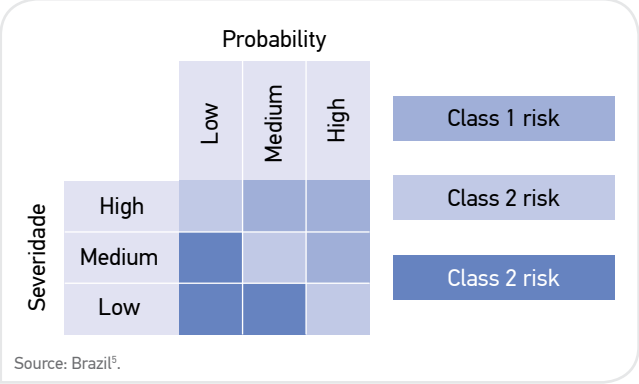
By means of direct non-participant observation, a form-type instrument created by the researchers was used based on the recommendations of the National Agency of Sanitary Surveillance (*Agência Nacional de Vigilância Sanitária* – ANVISA), observing the following variables: environmental risks; machine maintenance; biological hazards; fire hazards; ergonomic hazards; risks of burns and structural and physical risks.

A previous simulation of the data collection at the research site, with the instrument and equipment to circumvent the Hawthorne effect, was performed, as well as to pre-test the instrument, in order to evaluate the reliability, operability and validity of the instrument, observing its relevance to the research and the need to add, replace or remove some topic. It should be emphasized that there were no changes in the instrument after the pre-test. The validity of the instrument was evaluated by three teachers in the area of Perioperative Nursing.

The following equipment were used to evaluate the variables: measuring tape, measured in centimeters, to measure the physical size of the area; Digital Incoterm TDEC100C digital meter to measure the noise level; and 4IN1 Multifunctional Environment Meter to quantify brightness, temperature and humidity parameters. It should be noted that all equipment must be calibrated and certified by the National Institute of Metrology, Quality and Technology (*Instituto Nacional de Metrologia, Qualidade e Tecnologia* – INMETRO). It should be noted that all devices were used according to the manufacturer's instructions.

After data collection, the data related to environmental risks were organized as a table. Next, the non-clinical risk stratification analysis was performed in three classes: class 1, class 2 and class 3, with reference to the severity of the impact and the probability that a given risk has to occur[5], according to the figure below (Figure 1).

It is worth mentioning that probability was stratified into: high (when risk is present and there is an expectation of long-term correction, or when there is no expectation of correction); mild (when the risk is present and there is an expectation of correction in the medium term); and low (when the risk is present and there is expectation of short-term correction). On the other hand, severity followed the criteria: high risk (when it affects the safety of workers and generates permanent damage), medium risk (when it affects the safety of worker and causes the need for clinical intervention), and low risk (when it affects the safety of workers, but causes no damage)[5].



Source: Brazil[5].

Figure 1. Method for assessing and classifying a risk.

RESULTS

Results are divided into two topics: variables of non-clinical risks and classification of non-clinical risks.

Variables of non-clinical risks

The observed non-clinical risks that influenced the safety of the professional, and indirectly the safety of the patient, are: ergonomic hazards, risks of burns and electric shock, fire hazards, biological hazards and water quality (Chart 1).

As for the variable ergonomic risks, the work space was in agreement with the standardization of ANVISA[6]; the quantity and the disposition of the tables and benches, as well as the distance between equipment, were out of the established conformities / standard, generating risk for those who manipulate them (Chart 1).

On the risks of burns and electric shocks, compliance and non-compliance levels were balanced. On the one hand, it was verified the existence of energy stabilizers linked to the machines, equipment connected in the voltage specified by the manufacturers and exclusive outlets for all the machines, which helps to reduce the risks of fire, since all these aspects are directly involved with electrical power and therefore have high potential to produce electric discharges. On the other hand, there were aspects in non-compliance with the recommended, including existence of apparent electrical wires, lack of training of the professionals to handle the machines, distance between machines and quantity of undersized professionals. These items increase the risk of burns and electric shock, since the equipment works at high temperatures.

Regarding the fire hazard variable, only the existence of an Internal Accident Prevention Commission (CIPA) was in line with the recommendation. All other items were in non-compliance, as there are no requirements for fire prevention and control, as well as training against fire with employees, thus hindering the safety of professionals, equipment, stock of MSC materials and, consequently, of patients (Chart 1).

Regarding the variable biological hazards, only one item of non-compliance was found, which is the lack of training or training of employees against the risk of contamination by sharps. In-compliance items are: use of adequate personal protective equipment (PPE) and existence of a solid waste management plan (SWM) (Chart 1).

Classification of non-clinical risks

In Chart 2, the classification of the non-clinical risks of the receiving and cleaning area can be verified, according to the probability of the error and the severity of the damage. The variables risk of burns and electric shock and fire hazards had mild probability of occurrence and high severity of damage, classified as a class 1 risk. The variable biological hazard had both mild probability and severity; thus, it is classified as a class 2 risk. Environmental risks had mild severity and low probability, classified as a class 3 risk, along with ergonomic hazard, which had low probability and low severity.

Chart 1. Description of compliance and non-compliance of non-clinical risk variables of MSC.

Variables	Compliance	Non-compliance
Ergonomic hazards	- Work space	- Distance between machines - Insufficient tables and work benches - Absence of seats and/or chairs
Risk of burns and electric shocks	- Energy stabilizers connected to the equipment (autoclave and heat sealer) - Equipment (autoclave and heat sealer) plugged at specified manufacture's voltage - Equipment (autoclave and heat sealer) plugged to exclusive sockets	- Exposed wires connected to the electric network - Absence of training for the handling of equipment (autoclave and heat sealer) - Distance between autoclaves and professionals
Fire hazard	- There is CIPA	- Insufficient requirements for fire prevention and control - Absence of training against fire
Biological hazards	- Appropriate PPE - There is SWM	- Absence of training to prevent the risk of accidents with sharps

CIPA: International Accident Prevention Comission; PPE: presonal protective equipment; SWM: solid waste management.

In the area of packaging and sterilization, the risks of burns and electric shock and environmental and biological hazards were of mild probability; high probability was identified in fire hazards; and low probability was verified in ergonomic hazards. According to high severity: risk of fire, burns and electric shock; mild severity: environmental and biological hazards; and low severity: ergonomic hazards. Thus, the following results were obtained: class 1 ergonomic hazards, class 2 environmental and biological hazards, and fire, burn and class 3 electric shock hazards (Chart 3).

In the storage and distribution area, there are no machines or electrical equipment. In this way, the risks of electric shock, burns and fire were discarded. Environmental and ergonomic hazards were of low probability and high severity, being classified as class 2; biological hazards were of low probability and low severity, being classified as class 3 (Chart 4).

Thus, according to Charts 2, 3 and 4, the most common risks were those of class 1, with three risk variables in the reception and cleaning area and three variables in the packaging and sterilization area. The lowest risks were those of class 3, with two risk variables in the reception and cleaning area, one in the area of packaging and sterilization and one in the area of storage and distribution. It is noteworthy that the most serious risks (class 1) were found in two of the three areas of the MSC.

DISCUSSION

Among the factors of ergonomic risks to which Nursing professionals in the MSC are exposed, the adequacy of the tables and benches to carry out the work, the space of work

Chart 2. Classification of risks in the reception and cleaning area of the material and sterilization center.

		Probability		
		Low	Medium	High
Severity	High		- Risk of burns and electric shock - Fire hazard	
	Medium	- Environmental hazards	- Biological hazard	
	Low	- Ergonomic hazards		

: Class risk 1; : Class risk 2; : Class risk 3.

for locomotion of the worker and the distance between the machines stand out. It is known that the labor activity in this sector is demarcated by monotonous and repetitive tasks, in a physical space isolated from the other hospital sectors, demanding great responsibility and attention from the professionals who work in this scenario[7].

After carrying out a study about the ergonomic hazards to which nursing professionals are submitted, it was evidenced that for the professional to develop activities that demand effort in inappropriate conditions, more body mobilizations are required, such as: excessive work rhythm, inadequate posture and various loads. Measures to prevent exposure to ergonomic hazards, if taken in a selective and uncontrolled way, can lead to disequilibrium and development of diseases[8].

Board Resolution (RDC) RDC/ANVISA/2002-307[9], which changed RDC/ANVISA/1988-50, is the legal document that regulates the minimum guidelines to be adopted by health establishments in Brazil regarding the physical and architectural features of the area built. It determines that, regardless of the care complexity, minimum conditions of comfort and ergonomics should be offered to professionals, as well as, through planning in cooperation with engineers, architects and health workers, to create barriers to reduce infections related to health care.

Chart 3. Classification of risks in the packaging and sterilization area of the material and sterilization center.

		Probability		
		Low	Medium	High
Severity	High		- Risk of burns and electric shock	- Fire hazard
	Medium		- Environmental hazards - Biological hazard	
	Low	- Ergonomic hazards		

: Class risk 1; : Class risk 2; : Class risk 3.

Chart 4. Classification of risks in the storage and distribution area of the material and sterilization center.

		Probability		
		Low	Medium	High
Severity	High	- Environmental hazards - Ergonomic hazards		
	Medium			
	Low	- Biological hazard		

: Class risk 1; : Class risk 2; : Class risk 3.

Non-conformities have been verified regarding the risks of burns and electric shocks, which, when associated with improper use of electrical equipment, may cause electric shock. According to a study[10], there is no employee training for the correct handling of electrical equipment; however, it is known that professionals must be trained and qualified to handle the equipment, as well as to know the instructions for use (IFU) and the specifications provided by the manufacturers, such as voltages and distances that employees must keep from them[10]. In addition to these observations, it is worth noting that it is important to use stabilizers in all equipment that use high voltages and high energy consumption, thus helping to reduce the risks of short circuits and explosions in the electrical network[10,11].

In the MSC studied, there are several fire hazard factors that do not comply with the recommended. The only item found to be in compliance is the existence of the CIPA, which is an important accident prevention tool, available to employees, since it should be composed of representatives of the company and employees[12].

Even with the presence of CIPA, there are no other measures for fire prevention and control, nor training with employees. This indicates the need to promote and reinforce safe work practices, provide risk-free environments, control materials and equipment against the possibility of a fire, clearly signal emergency exits, and train health professionals to use firefighting equipment[13].

When considering biological hazard, MSC workers are exposed to organic secretions when washing and handling contaminated articles, which are a source of transmission of microorganisms to professionals when preparing an article that will be sterilized and handling an already sterilized item[14]. The results found regarding biological hazards were reasonably satisfactory when it comes to workers' safety, since they use PPE established by the Ministry of Health (MoH).

According to the results of this study[4], there is no training for employees regarding the risk of contamination with sharps in the MSC, which increases the risk of contamination. Using safe practices, having knowledgeable professionals and developing conscious self-care leads to greater visibility

of work at the MSC, which encourages health promotion, occupational safety, prevention and health care[4,15].

A study that analyzed occupational hazards showed that the most prevalent risks were those of low degree of damage and observed that the least prevalent ones are the high-damage risks. In a way, this result relieves the workers of health institutions, once that, despite the existence of many risks, those that are less harmful to health professionals are prevalent[16]. The important thing is that several questions are raised from this study, since the amount of risks found in the MSC shows the number of deficiencies related to the work process in hospital units. The lack of investment by managers is also evidenced, although workers in this sector seek to minimize risks by making use of alternatives considered as a sort of "improvisation". The reduction or extinction of these risks depends on administrative aspects and the proper use of financial and material resources.

The results of this study show problems that should be explored in order to come up with solutions to reduce the non-clinical risks in the MSC and even the hospital unit as a whole, since some of the risks of this sector can also be identified in other hospital sectors, although this general analysis has not been done yet. Actions taken to reduce or extinguish these risks embedded in the work environment can contribute to the better health condition of the professionals and, consequently, the improvement of the health care delivery of patients. In this way, valuing the quality of life of professionals, as well as strengthening their connections with permanent and continuous education, is imperative in ensuring the health of those involved.

CONCLUSION

There was a greater number of records for class 2 risk factors, that is, medium risk, but it is worth noting that a set of measures for the reduction of class 1 risks is necessary, since these present a high degree of health compromise and cause more severe damage. The low incidence of class 3 risks does not imply that these should be forgotten because, in the course of the work processes, they can also affect the safety of the worker, causing damage to their health.

Among the non-clinical risks identified, the risks of burns, fire and electric shocks by machines were the most representative ones. Professionals should be critical in surveying occupational hazards to which they are exposed, emphasizing the risk of harm with greater severity and greater probability of occurring. As a limitation, it should be emphasized that the study was conducted in only one MSC, thus not representing the regional reality.

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