BIOSAFETY MEASURES AS A DETERMINING FACTOR IN THE QUALITY OF PATIENT CARE IN THE INTENSIVE CARE UNIT

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ABSTRACT

Biosafety is an issue of great relevance for the health of the staff, the patient and the community; in recent years, health authorities have emphasized its compliance, since this guarantees quality patient care. The objective of the study was to analyze biosafety measures as a determining factor in the quality of patient care in the intensive care unit. A review of documentary databases such as Scielo, Dialnet, Medline, Lilac and Google Scholar was carried out. Most of the studies show that biosafety measures ensure that both the staff and the patient reduce the risk of acquiring a health care-associated infection, thus guaranteeing the quality of care in the intensive care unit. Among the conclusions it can be highlighted that the knowledge, attitude and adherence of the healthcare personnel to biosafety measures such as: hand washing, correct use of personal protective equipment, are fundamental aspects in healthcare institutions that reduce the risk of the patient and the personnel of acquiring healthcare-associated infections.

Key words: quality of care, biosafety measures, determining factors, patient, intensive care unit.

INTRODUCTION

Hospital environments constitute a reservoir and a source of infection for the patients admitted, as well as for the personnel working there; therefore, they should be safe places and governed by the biosafety regulations of the institutions (Lopez-Cerero, 2013). According to the World Health Organization (WHO) *"biosafety are those principles, techniques and practices applied in order to avoid unintentional exposure to pathogens and toxins or their accidental release."* (Aguilar, Gonzalez and Morchon, 2015) It is important to note that biosafety emerged as a discipline in the 1970s as an operational response to the potential risks of biological agents, modified by molecular engineering (Galdos, Basulto, Quesada, 2018). The CDC in 1987 developed a set of standards called universal precautions, which establish as a basic principle that: *"health care workers should consider the possibility that all blood, organic fluids, secretions, excretions, except sweat, may contain transmissible infectious agents, which may contain pathogenic viruses"*. (Renteria-Valencia; Renteria-Valencia, J ; Aya-Alzate; Granada (2013)

In relation to this issue, WHO calls on governments and health care leaders to adopt the five measures designed to better protect health care workers. The pandemic has also highlighted the extent to which the protection of health care workers is the key to guaranteeing the functioning of the health care system and society (Acosta-Gans SI. 2011), for this reason hospital managers should take into account the biosafety standards proposed by the CDC of the United States that state: "that these constitute a set of guidelines that seek to reduce occupational risks for health care workers while promoting a safe environment for patients and users of the hospital system, reducing the possibility of developing infections associated with health care". (Nunez, DV. 2017)

This study addresses biosafety measures and their relationship with the quality of patient care in the intensive care unit (ICU), which is considered an area where highly complex care is provided to critically ill patients, who need intensive supervision and surveillance, as this is a hospital area where the risk of developing healthcare-associated infections and occupational accidents due to the need to use live methods and quick and effective decision making is high. (Unahalekhaka A. 2013)

Between January 2003 and December 2008 the International Nosocomial Infection Control Consortium, conducted a surveillance study of HAIs in 173 ICUs located in Latin America, Asia, Africa and Europe; the research included that the rate of central venous catheter-associated infections was almost three times higher than that recorded in ICUs in the United States. The infection rate of mechanical ventilation-associated pneumonias (VAP) was higher 13.6% versus 3.3 per 1000 ventilator/days of cases of 155,358 hospitalized patients. (Nunez, DV. 2017)

On the other hand, it is important that health personnel know and apply the biosafety standards and protocols of the institution in which they work, since when providing care in the different areas they are exposed to a variety of microorganisms, due to the direct and indirect contact they have with the patient and their environment. In this sense, biosafety should be understood as the behavioral standards aimed at achieving attitudes and behaviors that reduce the risk of staff, patients and families of acquiring infections associated with health care due to poor quality of care. (Condor Dorre, Garay AC. (2019)

Biosafety is one of the health care processes whose compliance allows guaranteeing an adequate quality of care, being thus the set of preventive and/or corrective measures aimed at protecting health personnel, patients, visitors and the environment from exposure to potentially infectious agents or those considered to be biohazardous. This refers to the principles, techniques and practices applied in order to avoid unintentional exposure to biohazard agents and toxins, or their accidental release (Pan American Health Organization, 2013). In this sense, Mitchell refers that *"In the Americas in 2007, some 7.6 million occupational accidents were identified per year. Which means an average of 20,825 per day, of which 11,343 were fatal (46.2% in Latin America and the Caribbean and 53.8% of North America), according to PAHO/WHO estimates."* (Sanchez, 2019)

By virtue of the above, the importance of this article is established, for which the following questions were posed: What biosafety measures do health personnel use in patient care in the intensive care unit? Are biosafety measures a determining factor in the quality of patient care in the intensive care unit?

METHODOLOGY

A literature review is performed in the following databases Dialnet, MEDLINE, LILAC and Google Scholar, combining the descriptors quality of care, biosafety measures, determinants, patient, intensive care unit published in the Spanish language, in the period between 2010 and 2021.

DEVELOPMENT AND DISCUSSION

BIOSAFETY MEASURES AND QUALITY OF CARE

The definition of quality has evolved throughout history, and approaching it from this perspective implies referring to its five stages: the first, which spanned from the industrial revolution to 1930 with a focus on inspection. The second stage, which lasted until 1949, focused on control,

and during this period the International Organization for Standardization (ISO) was created (1946). The third stage (1950-1979) saw the development of statistical quality control and the cause-effect model, while the fourth (1980s) was characterized by the conception of quality as a competitive opportunity, with an administrative orientation and approach. From the 1990s to the present is considered the fifth stage, whose perspective is total quality, given by its global organizational vision, which has as its center the perception by the customer (Aguirre-Gas, 2008). Along the same lines, the International Organization for Standardization (ISO) defines quality in the ISO 9000 standard "as the degree to which a set of inherent characteristics meets requirements." (Santana L, 2020)

From this perspective, the ISO system in health institutions is useful to certify the structure and organization and indicates that they are able to provide quality care. (Vera and Ramon, 2021) In this context, in the health sector there are more than 23472 standards in the family of ISO norms, some of them stand out for being used in health services, resulting in a higher quality service and more satisfied collaborators with their work. (Navarro, 2020).

We can say that quality is identified by patients in the health system in two ways: perceived quality, which is directly related to service satisfaction, and technical quality, which is represented by the effectiveness, safety and usefulness of each of the activities carried out to prevent, protect and promote the health of the beneficiaries (Sanchez, Rodriguez, Romero and Serrano, 2003). It can be pointed out that the beneficiaries of compliance with biosafety measures are the health personnel and patients, it is for this reason that the personnel have the commitment to apply biosafety measures, since in this way the risks generated in daily activities and the quality of care provided are prevented. (Navarro-Meza and Gonzalez-Baltazar, 2016)

In attention to this idea Perez and collaborators conducted a study whose objective was to know the level of knowledge and compliance with biosafety measures in nursing personnel and their influence on accidents with biological risk; where a questionnaire was applied to 70 nurses, giving as results that the average working age was 18 years, with relation level of knowledge 86% received information on biosafety and the application of the measures was 60%, in addition 67% suffered at least one accident with biological risk. The authors conclude that the staff has a good level of knowledge about biosafety, which was expected that there would be greater application of these, but, although the staff had work experience still presented a risk accident in the staff. (Guglioelimino et al., 2019)

On the other hand, the authors Gonzalez, Lopez in the article Safety in critical patient care make reference to the fact that the quality of care in recent years has reached a high place in the health system as one of the key dimensions of quality. That monitoring, measuring and improving the quality of patient care in the intensive care unit represents a challenge for intensive care units. We can say that the intensive care unit is an area where, health interventions that involve high risk for the patient are performed, it is required that the use of biosafety measures are consciously intervention that can reduce the risks and thus optimize care in critical patients and improve the safety culture in the ICU. (Gonzalez and Lopez, 2017)

Therefore, by using the protocols as clinical guidelines in the institutions, all the personnel work in a unified manner, resulting in a decrease in risk, better management of both human and financial resources, since they all work in a unified manner, thus achieving quality patient care.

Biosafety measures should be implemented strictly in all hospital areas to reduce the risk of nosocomial infections that according to studies by Diaz, Neciosup-Puican, Fernandez et al (2016) are an important cause of morbidity exceeding 50% worldwide, being the intensive care area a critical point due to the health condition with which the patient is admitted, where sticking to the established biosafety protocols not only protects the health personnel but also directly impacts the patient. (Diaz Velez et al., 2016)

According to the results raised above we can say, that biosafety measures have an impact on the quality of care received by patients in the intensive care unit, if the staff does not correctly apply biosafety measures it will negatively affect the patient.

USE OF PERSONAL PROTECTIVE EQUIPMENT

The personal protective equipment (PPE) is an apparel that functions as a barrier to ensure safety when performing procedures, and thus prevent health workers from becoming infected or spreading microorganisms in the hospital among them we have (goggles, screens, gowns, gloves, hat, masks, shoe covers). Therein lies the importance that the staff in their daily work use PPE; to reduce the risk of transmitting microbes to patients during direct care, especially when they come into contact with blood or other body fluids or if they are exposed to diseases whose transmission mechanisms are by airborne, droplets or common vehicle. (Medlineplus, 2021)

As evidenced by Guglielmino and collaborators in the project to improve adherence to the use of PPE, which they carried out at the Foianini Clinic, whose objective was to achieve that 80% of

the personnel adhere to the correct use of PPE, in the realization of this they used the technique of direct and indirect observation, and gave as a result that the training of personnel favored adherence to the placement and removal of PPE. (Guglielmino et al., 2019)

In order to determine the association between working conditions and access to PPE in health personnel, Raraz and collaborators in Lima-Peru, applied a survey to 271 health professionals, obtaining as results that personnel under 26 years of age received incomplete PPE more frequently than workers between 56 and 64 years of age, workers with temporary contracts received masks less frequently, compared to those with permanent contracts. In addition, in relation to the time of delivery of PPE to health personnel, 53.9% reported that they received their PPE for each work shift. The authors concluded that only half of the health personnel reported having received personal protective equipment for each work shift. (Raraz et al., 2021)

Similarly, Phan and collaborators, conducted a study whose objective was to characterize the use of PPE and the practices of PPE removal by health personnel in the acute care hospital, where they made 162 observations inside the patients' rooms in order to describe the practices carried out, giving as results that the most observed errors were: removing gloves incorrectly, and when removing the gown they did it improperly, for example (pulling it from the front, not removing it from the shoulder outwards); in addition, the healthcare personnel did not perform hand hygiene during the procedure of removing PPE. From the observations made to the personnel during PPE removal, the authors concluded that the most common error was that the personnel did not follow the PPE removal sequence; they also consider that given the complexity involved in this process and the deficiencies in the removal practices, it is necessary to adopt a new approach in education and training (Phan et al., 2021).

In conjunction with the above, compliance with biosafety protocols and standards on the correct use of PPE allows avoiding negative conditions that affect health personnel in the performance of their work. In this sense, Guerrero and collaborators carried out a study at the Sullana Hospital, whose objective was to determine the relationship between the level of knowledge and attitudes of the personnel working in the ICU on biosafety barriers, using a sample of 20 participants to whom a questionnaire was applied to determine the level of knowledge and a checklist to describe attitudes: the use of gloves and hand washing; more than 50% reached an adequate attitude, the authors conclude that there is a significantly moderate correlation in nursing personnel between the level of knowledge and attitudes about biosafety barriers. (Urbina, 2021)

In the year 2020, a controlled study was conducted where with the objective of evaluating the method for putting on and taking off personal protective equipment has less risk of contamination for workers. The results show low to very low evidence that the use of full body personal protective equipment provides better protection, but they are more expensive and removal is more difficult, which can lead to greater contamination. Personnel who receive spoken instructions when removing gloves, gowns and performing glove disinfection procedures reduce contamination and increase compliance (Ijaz et al., n/d).

HAND WASHING

It is a safety technique that, when used, reduces microorganisms on the hands of the person and thus prevents their propagation. People's skin contains a microflora with resident and transitory microorganisms such as streptococci, influenza, klebsiella, staphylococci, pseudomonas, echerichia coli, among others. Here lies the importance of hand washing, which should not be considered an exaggerated practice because infectious agents are transferred through them. Hand washing is a practice that has been promoted worldwide and is closely related to the culture of personal self-care, but as a result of the COVID-19 pandemic, this measure was intensified in the world population, becoming a strategy for prevention and self-care. (Firme and Veron, 2017)

In relation to this topic, the author Bernal refers that the World Health Organization (WHO) has highlighted that: *"hand washing is one of the most efficient and effective measures for the control of infections derived from care, however, professionals have not sufficiently recognized the value of the procedure"*. (Annia, 2011)

In the same line, Miranda and collaborators in the article Semmelweis and his scientific contribution: Medicine: hand washing saves lives; where they refer to the importance of the contribution of Dr. Ignaz Semmelweis to medicine in the 19th century where he demonstrated through studies, the influence of hand hygiene in reducing morbidity and mortality in postpartum women associated with infectious complications. Many studies and publications worldwide confirm its impact on the quality of care provided by professionals (Miranda et al., 2008). With reference to this issue Elizalde Jose in his article *"saving lives: hand washing"* states that there is a certain degree of stubbornness and intransigence in the staff because he thinks that overlooking it does not bring unfavorable consequences for both him and the patient. (Gonzalez, 2019)

In this sense, Flores et al. carried out a study in the ICU of the Edgardo Martinis Hospital whose objective was to determine the effectiveness of a training intervention for nursing personnel

in the compliance of hand washing norms in a sample of 25 nurses, using a questionnaire and a checklist as instruments, where the results showed that 44% have been working for 16 to 20 years and that they are qualified as mature adults since they are between 41 and 50 years of age. Regarding the knowledge of the personnel about compliance with the standards, before the intervention, only 52% reported that they had knowledge and after the training intervention this percentage increased to 96%. The author concluded that including a training intervention as part of an educational program contributes to increasing staff knowledge. (Florez Barrios, 2016)

Similarly, Santana et al. conducted a study whose objective was to identify the perceptions and knowledge of healthcare professionals in the intensive care unit, correlating them with the figures for adherence to hand hygiene reported in observational studies of 187 professionals. They combined a quantitative methodology using a survey technique and direct observation of a sample, obtaining as a result that 91.4% had received prior training on hand hygiene, 84.1% consider hand washing to be more effective than hand rubbing with alcohol-based solution against microorganisms. 86.1% of professionals have the perception that they perform hand hygiene correctly, to a greater extent than when compared with the adherence rates obtained through direct observations which resulted that 62.6%, the authors concluded that despite the fact that, healthcare personnel have previous training on hand hygiene knowledge is incomplete, and they have a perception that does not conform to reality. (Santana Lopez, 2018)

The COVID-19 pandemic brought with it an imbalance between the needs of the patient and the effective availability of healthcare resources, coupled with this, the staff had to face the reality of a somewhat deficient knowledge of biosecurity measures, so one of the strategies was the educational intervention for healthcare professionals.

ADHERENCE TO BIOSAFETY MEASURES

Biosafety measures represent the basic behaviors that should be adopted by health personnel, whose purpose is to reduce or eliminate risks to workers, the community and the environment, and are considered a vital element of the quality assurance system, aimed at achieving attitudes and behaviors. (Ruiz et al., n/d)

The application of biosafety measures during the performance of daily activities should be a responsibility of the healthcare personnel who are the major beneficiaries, since in this way they prevent occupational accidents of biological type and diseases related to health care. (Unahalekhaka A. (2013)

According to Apolaya and his collaborator in their article *"Evidence on biosafety in the health care process"*, they refer to the problem of biosafety processes where they state that *"non-compliance due to ignorance or omission of biosafety processes conditions health personnel to be in the correct management of the risk of exposure to various microbial agents"*. (Galan-Rodas, 2012)

In union with the above Sinchi and collaborators conducted in the intensive care unit of the Hospital Clinica San Fernando a study whose objective was to determine the factors that influence compliance with biosafety standards by health professionals and relatives in the above mentioned area, 15 health professionals and 9 relatives of patients participated, where they concluded that among the factors that influenced the application of biosafety barriers were: lack of knowledge of the function of each of these resources, incorrect handling of biosafety standards and the absence of monitoring of the correct handling of the same, these results indicate to managers the need to schedule training in biosafety. (Ruiz de Somocurcio, 2017)

Therefore, it is necessary to understand that compliance with biosafety measures by the staff is essential, this is stated by Intrigo and collaborators in the study conducted to nursing staff at the Luis Vernaza Hospital in Guayaquil, with the objective of evidencing non-compliance with biosafety measures in the intensive care unit, for the realization of the same they used the technique of direct observation to the activities carried out by the staff and as instruments the checklist sheet. The results obtained evidenced the need for training to be for all ICU nursing staff and not only for the graduates, since despite the fact that in the ICUs there were biosafety protocols 47% of the staff sometimes used them. (Intriago, 2017)

Similarly Maria Falconi conducted a study in the ICU of the Hospital Nacional Docente de Madre Nino San Bartolome in Lima ,Peru,(2010), with the objective of determining the level of knowledge and attitudes of the nursing professional on the application of biosecurity measures ,where she alludes *"that the nursing staff is the one most exposed to biological risks in the ICU since it is responsible for the comprehensive care of the critical patient, which provides direct assistance involving direct contact on a permanent basis through care."* (M Falconi 2010). In order to carry out this quantitative, descriptive study, the authors applied the interview technique and a questionnaire to a population of 30 nurses. They concluded that the results are incongruent since they do not show a relationship between the low average level of knowledge about biosafety measures and favorable attitudes towards their application (Irribarren MF, 2010).

Palomino, Albino, (2017) conducted a study in the hospital of Contingency Hermilio Valdizan Medrano of Huànuco with the objective of establishing the correlation between the level of knowledge and practice of biosecurity measures of the ICU nursing professional a total of 12 nurses participated. To obtain data they used the knowledge questionnaire and the observation guide to evaluate the practices of biosafety measures, the authors considered dimensions such as biological risks, hand washing, use of PPE, and management of hospital waste. The data were analyzed with Kendall's Chi-square and Tau tests, where it was evidenced that there is correlation between all variables, where they conclude that the level of knowledge about biosecurity measures is high, then the practices are also good. (Nacion, 2018)

HOSPITAL SOLID WASTE MANAGEMENT

The WHO defines health care waste as *"all forms of waste generated by health care facilities"* and these become a wide spectrum of materials, therefore, the first thing that hospital managers should do is to reduce health care waste and separate it properly from its source of origin. Hospital solid wastes are classified as: common, hazardous and special, and the degree of hazardousness depends on the type of exposure they have had to pathogenic agents. (DSH Manual)

In relation to the management of hospital solid waste, the authors Carranzas, et al. (2018) conducted a study in the Hospital Clinica San Francisco with the objective of determining the management that the nursing staff gives to hospital solid waste and the incidence that they have on the staff, the sample consisted of 127 nursing staff, In order to collect the data, a questionnaire was applied, obtaining as results that 67% had not received training on the protocols for handling hospital waste, 47% had had an accident due to inadequate handling of waste, 78% correctly applied biosafety and hospital waste management procedures. Despite the fact that the personnel did not receive training, they perform the procedure adequately, but there is a deficiency in the monitoring of the protocols in order to evaluate the established protocols. (Gomez et al., 2020)

In this sense Barragan and collaborators (2019) with the objective of analyzing the knowledge of nursing staff on the management and segregation of waste in intensive care units in the San Jose de Cucuta Clinic, for the realization of this they applied a questionnaire to a population of 39 nursing staff where the results indicated that the staff has adequate knowledge for the management and segregation of hospital solid waste. (Barragan Tarazona et al., 2022)

In 2021, the authors Saavedra et al. conducted a systematic review of 15 scientific articles with the objective of understanding the characteristics of the final disposal of solid hospital waste in

order to contribute to the quality of life of the population, the authors conclude that a good disposal of solid hospital waste brings benefits to users, They also point out that most health personnel and managers of health services are unaware of the importance of a good final disposal of hospital solid waste, a condition that becomes a risk factor for the personnel, and that health institutions should provide training to health personnel on this subject. (Ciencia Latina, n/d)

In the same order Solorzano and collaborators in the study they conducted in the critical areas of the IEE hospital of Guayaquil evidenced that the inadequate management of hospital waste produces negative consequences to the personnel as for the environment so they recommend applying biosecurity measures and internal and external controls in the processes and procedures to correctly eliminate hospital waste generated from patient care in order to avoid infectious diseases in the personnel. (Vera Solorzano et al., 2015)

Health care activities protect, restore health therefore save lives, for WHO the waste generated by these activities, approximately 85% are non-hazardous common waste, the remaining 15% are considered hazardous materials that can be infectious, toxic, radioactive, but what happens to the waste generated. For the WHO reasons such as: lack of awareness of the dangers that sanitary waste can cause to health, poor waste management training, the absence of waste management and disposal systems and the lack of regulation in some countries on this matter, are grounds that managers should take to implement training plans with the aim of preventing infections for both patients and/or staff and the community.(WHO, 2018)

CONCLUSIONS

It is important that the head of the intensive care unit ensures that the staff complies with the protocols and the management of biosafety standards within the ICU, in this way it can mitigate the occurrence of health-associated infections, and thus will improve the quality of clinical practice. Likewise, it will allow establishing guidelines that help to systematize processes and minimize inadequate variations in the actions of healthcare personnel, when they fail to comply with protocols and standards.

In order to guarantee quality patient care, there must be an integration of factors such as: professional excellence, efficient use of resources, risk reduction, patient satisfaction, and the authorities of the institution have the responsibility to maintain permanent education and training programs through information, communication and education strategies.

Providing quality care to patients should be a priority action for the health personnel involved; therefore, biosafety measures should be rigorously and strictly implemented by all health personnel. The practice of biosafety measures and the success of these measures requires requirements such as: knowledge, skills and attitudes where adherence to them has positive consequences for the patient and the health professionals, since in this way an infection associated with health care is avoided.

Within the institutions there should be a person responsible for biosafety; in Panama, this responsibility falls on the biosafety committee, which is in charge of training and qualifying all the personnel who work in or enter the hospital, as well as monitoring compliance with the regulations in force; since biosafety is carried out jointly, the personnel should comply with the regulations, the authorities should ensure that they are complied with, and the administration should be a facilitating entity to ensure that they are complied with.

When there is evidence of noncompliance with the protocols and biosafety standards by the health personnel, the heads of the executing units should apply administrative sanctions that are included in the administrative regulations, with the objective of generating behavioral changes in the collaborator.

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