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ORIGINAL ARTICLE

VENTILATOR-ASSOCIATED PNEUMONIA: PERCEPTION OF THE NURSING STAFF

PNEUMONIA ASSOCIADA À VENTILAÇÃO MECÂNICA: PERCEPÇÃO DOS PROFISSIONAIS DE ENFERMAGEM

LA NEUMONÍA ASOCIADA A LA VENTILACIÓN MECÁNICA: PERCEPCIÓN DE LOS PROFESIONALES DE ENFERMERÍA

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ABSTRACT

Objective: to know the opinion of the nursing staff about the safety of the patient under mechanical ventilation aiming at the prevention of VAP. ***Method:*** a qualitative, descriptive and exploratory study performed at a private hospital of small size. It was an intentional sample with seven nursing professionals and the data collection occurred through semistructured interviews and audio-recorded, using the thematic analysis. ***Results:*** a thematic map was elaborated, composed by the theme "Risk of ventilator-associated pneumonia: perception of Nursing professionals", which includes the subtheme "Prevention of ventilator-associated pneumonia: What do nursing professionals do?" ***Conclusion:*** participants recognized the risk of VAP and reported implementing protocol measures for prevention. However, they did not mention notifying adverse event, knowing the indicators or participating in educational strategies, central factors for the management of risks and the strengthening of patient safety. ***Descriptors*:** Pneumonia; Artificial Respiration; Critical Care; Intensive Care Units; Nursing; Patient's Safety.

RESUMO

Objetivo*:** apreender a percepção dos profissionais de Enfermagem sobre a segurança do paciente sob ventilação mecânica com vistas à prevenção da PAV. ***Método*:** trata-se de um estudo qualitativo, descritivo e exploratório realizado em um hospital privado de pequeno porte. Compôs-se de uma amostra intencional com sete profissionais de Enfermagem e efetuou-se a coleta de dados por meio de entrevistas semiestruturadas e gravadas. Utilizou-se a análise temática dos dados. ***Resultados*:** elaborou-se um mapa temático composto pelo tema "Risco de pneumonia associada à ventilação mecânica: percepção dos profissionais de Enfermagem", que congrega o subtema "Prevenção da pneumonia associada à ventilação mecânica: O que fazem os profissionais de Enfermagem?". ***Conclusão: concluiu-se que os participantes reconheceram os riscos de PAV e referiram implementar medidas protocolares para a prevenção. Aponta-se, contudo, que não mencionaram a notificação do evento adverso, o conhecimento dos indicadores ou a participação em estratégias educacionais, fatores fundamentais para o gerenciamento dos riscos e o fortalecimento da segurança do paciente. ***Descritores:*** Pneumonia; Respiração Artificial; Cuidados Críticos; Unidades de Terapia Intensiva; Enfermagem; Segurança do Paciente.

RESUMEN

Objetivo: conocer la percepción de los profesionales de enfermería acerca de la seguridad del paciente bajo ventilación mecánica con miras a la prevención de la PAV. ***Método:*** un estudio cualitativo, descriptivo y exploratorio realizado en un hospital privado de pequeño porte. Compuesto de una muestra intencional con siete profesionales de enfermería y utilizándose, para la recopilación de datos, entrevistas semiestructuradas y grabadas. Se utilizó el análisis temático de los datos. ***Resultados:*** se elaboró un mapa temático compuesto por el tema "Riesgo de neumonía asociada a ventilador: percepción de los profesionales de enfermería", que contine el subtema "Prevención de la neumonía asociada a ventilador: ¿Qué hacen los profesionales de enfermería?" ***Conclusión:*** se concluye que los participantes reconocen el riesgo de PAV e informaron la implementación de medidas protocolares para la prevención. Se señala, sin embargo, que no se menciona la notificación de los eventos adversos, el conocimiento de los indicadores o participación en estrategias educativas, factores fundamentales para la gestión de riesgos y el fortalecimiento de la seguridad del paciente. ***Descriptores*:** Neumonía; Respiración Artificial; Cuidados Críticos; Unidades de Cuidados Intensivos; Enfermería; Seguridad del Paciente.

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INTRODUCTION

Healthcare-associated infections (HAI) constitute the most common adverse event in care provision in the world, affecting 7% of patients in developed countries and 10% in developing countries,[1] with urinary tract infection, surgical site infection, bloodstream infection and pneumonia as the most frequent types.[2]

Particularly regarding the scenario of Intensive Care Units (ICUS), in high-income countries, at least one HAI affects approximately 30% of the patients. In low- and middle-income countries, the frequency is two through three times greater,[1] highlighting the ventilator-associated pneumonia (VAP) as the most frequent infection in these units, with an incidence between 9 and 27% of the intubated patients and mortality rates reaching up to 60%.[3]

The VAP is defined as an infection that starts from 48 to 72 hours after endotracheal intubation and the establishment of invasive mechanical ventilation, and has, as causative agent, a microorganism that was not present or incubated[3] and whose occurrence usually results from aspiration of secretions of the upper airways, gastrointestinal reflux and inoculation of exogenous contaminated material.[4]

The risk factors for its development can be modifiable or non-modifiable[5]. The non-modifiable risk factors are the patient's age and health condition. The modifiable risk factors are prolonged mechanical ventilation, subsequent tracheal intubations, nasogastric probing, immobilization, supine position, use of antimicrobial agents,[4] use of antacids, sedation, inadequate hand hygiene by health professionals and the ill-treatment of asepsis during intubation, airway aspiration and handling of the respirator.[3]

To intervene in the modifiable risk factors for the prevention of VAP,[4-5] some measures can be adopted, such as washing of hands, maintenance of high decubitus between 30° and 45°, daily adequacy of sedation level and test of spontaneous breathing, oral hygiene with antiseptics, judicious use of neuromuscular blockers, care with the ventilator circuit, metered dose inhalers and nebulizers, care to avoid unscheduled extubation and reintubation, monitoring of the cuff pressure, preferential use of tracheal intubation and maintenance of the enteral probe in gastric or pyloric position.[4]

In this sense, institutions where there is the systematic evaluation of indicators related to VAP shows reduction of its incidence, after implementing preventive measures, which confirms that it is a preventable adverse event.[4]

Paradoxically, there is inadequate adherence to measures for the prevention of VAP[6-7]; therefore, there are some deficiencies in the mechanically ventilated patient's care, which makes him/her vulnerable to situations of risk for this infection.[6]

The nurse is the professional directly involved in patient care and healthcare management. Many of the measures for the prevention of VAP are part of nursing care in the ICU[8]. Investigating nursing professionals' perception about the safety of the patient under mechanical ventilation, aiming at the prevention of VAP, can contribute to subsidize educational actions for the development and implementation of prevention programs of this serious adverse event.

OBJECTIVE

- To know the perception of nursing professionals about the safety of the patient under mechanical ventilation aiming at the prevention of VAP.

METHOD

This is a qualitative, descriptive and exploratory research developed in the ICU of a small-sized private hospital, located in a municipality in the southern region of the State of Minas Gerais.

To select participants, the intentional sample was used, composed by nursing professionals who work in the ICU of the institution scenario of the study, obeying the following eligibility criteria: being a technical-/higher-level nursing professional and working in the ICU for at least six months.

Ten nursing professionals were organized; however, there were three refusals, totaling, therefore, seven participants, being two nurses and the others, nursing technicians.

Data collection occurred in February and March 2018, in the study institution, through semi-structured and audio-recorded interviews. A structured interview was used, contemplating a questionnaire on sociodemographic and guiding questions: "Talk about the patient's risk to develop ventilator-associated pneumonia in the ICU where you work" and "What has been done, in relation to the safety of these patients, in the day-to-day, for its prevention?".

To assess the understanding of the guiding questions, a pilot test was carried out with two nursing professionals who had already worked in the ICU; however, at the time of

data collection, they were working in another sector, excluding these interviews from the process of data analysis.

Data organization and analysis occurred through the thematic analysis. Inductive and sementic approaches were used, traveling six steps: familiarization with the data, comprising the transcriptions of the interviews and repeated readings; the generation of initial codes, which consisted of identifying the most basic segments of the data corresponding to the research interests; the search by topics, which consisted of classifying the codes identified in possible themes, comparing them to fragments of statements; a review of topics, considering coherence, internal homogeneity and external heterogeneity; definition and organization of themes, through the evaluation of specificities and issues addressed by each one and the completion of the survey report.[9]

The study was submitted to the evaluation of the Research Ethics Committee of the Federal University of Alfenas, obtaining the approval by the Opinion 2.429.001 and CAAE 80842617.0.0000.5142.

The study participants had to sign Informed Consent Form of their participation, and for the guarantee of anonymity, each participant was identified with the codes “N”, for nurses, and “NT”, for nursing technicians, followed by an Arabic numeral.

RESULTS

The sociodemographic characterization, showed the predominance of female participants (71.43%), belonging to the age group between 30 and 40 years (71.43%), married or in a stable union (57.15%), nursing technicians (71.43%), with professional practice between five and ten years (57.15%). Moreover, in the ICU, professional practice of less than five years (57.15%), working in the night shift (42.85%) and only in the institution scenario of the study (85.71%).

The analysis of the interviews originated the theme “Risk of ventilator-associated pneumonia: nursing professionals’ perception”, including the subtheme “Prevention of ventilator-associated pneumonia: What do nursing professionals do?” which are represented in the thematic map that can be seen in figure 1.

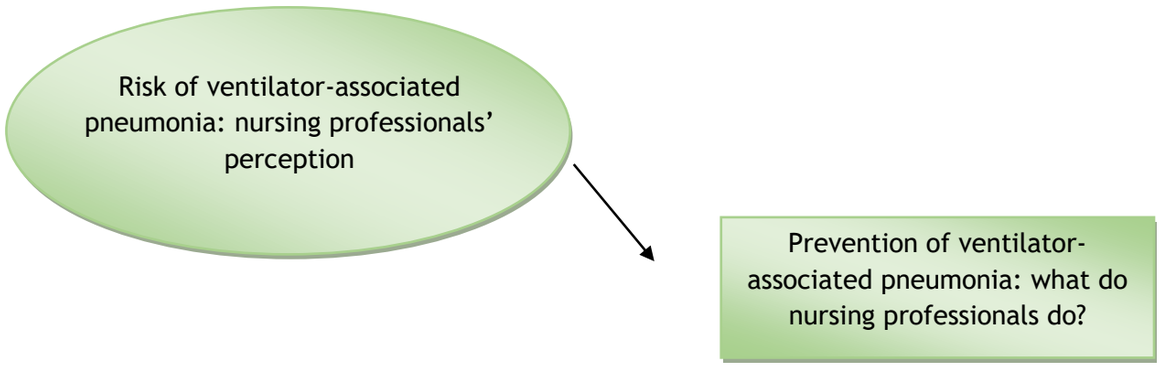

Figure 1. Thematic map.

Nursing professionals’ perception about the risk of VAP to which the patient may be exposed in the ICU influences and directs the implementation of preventive measures focused on reducing those risks.

DISCUSSION

In the theme “Risk of ventilator-associated pneumonia: nursing professionals’ perception”, VAP is recognized as a risk present in the ICU scenario:

> *Inside the ICU, patients are much more likely to have pneumonia, you're already intubated, and the risk is much greater. (N2)*

> *After being intubated, there may happen pneumonia due to mechanical ventilation. (NT3)*

Patients hospitalized in the ICU’s, and especially those with mechanical ventilation, are particularly susceptible to developing pneumonia, since they present reduced defenses of the organism, a high risk of introduction of contaminated material in the airways and exposure to an environment with greater presence of aggressive microorganisms.[4]

The mechanical ventilation is an intervention of extreme relevance to critical patients. However, the insertion of the endotracheal tube violates the natural mechanisms of defense of the organism.[10] It

also facilitates the microbial colonization of the airways and aspiration of contaminated secretions, due to reduced cough reflex and increased possibility of retention of secretions in the subglottic space.[4]

Nursing professionals participating in this study highlighted the time of intubation and mechanical ventilation as risk factors relevant to the development of VAP:

> *The time, the time of intubation. (NT1)*
>
> *I think that time of ventilation, the time using the tube. (N1)*

In this sense, the literature describes the association between the duration of mechanical ventilation and the development of VAP[11-2], and the relationship between the duration of mechanical ventilation and mortality of the patient.[13]

The estimates of the risk of VAP are 3% per day during the first five days of ventilation and 2% in the remaining days.[4] The microorganisms causing VAP may differ according to the duration of mechanical ventilation. The early onset of VAP often relates to pathogens sensitive to antibiotics, whereas the late one, i.e., which starts after the fourth day of ventilation, has as major causative agents multiresistant bacteria.[10]

In this perspective, perhaps because this risk of developing VAP is the most commonly recognized, the nursing staff readily identifies it in the ICU environment where they carry out their activities.

The colonization of the oropharynx is also described as another risk factor for infection mentioned by study participants:

> *If the patient stays with an inadequate oral hygiene, it can lead to the bacterial growth and cause pneumonia. (NT2)*
>
> *That saliva keeps acumulating and, sometimes, even smells bad. If it is smelly, there is some risk, right? (NT5)*

The oral cavity contains a high burden of microorganisms, which may lead to the development of plaque and, consequently, increase the risk of infection.[14]

Some conditions that may influence oral microbiota are age, clinical and nutritional status of the patient, smoking, alcoholism, the permanence time in the hospital, the use of antibiotics or corticosteroids and the effectiveness of oral hygiene.[4]

The colonization of the oral cavity, allied to the clinical situation of the patient, favors the migration of microorganisms to the lungs, through aspiration, thus predisposing them to the development of pneumonia.[4]

The participants also emphasized the undue aspiration of the endotracheal tube and airways as a risk factor for VAP, once it can cause complications, such as injuries and traumas. It may also be ineffective in the removal of secretions,[15] which, when accumulated, besides obstructing the orotracheal tube, constitute a conducive environment for microbial proliferation:

> *The undue aspiration can cause an infection. (NT2)*
>
> *Sometimes, after aspiring, a very, very thick secretion tumbles out, but only from the ventilator insertion site, but, around its base, it remains. (NT3)*

The study institution, for aspiration of secretions from the respiratory tract of mechanically ventilated patients, uses the closed suction system, referred to by nursing professionals as a measure to protect the patient from the occurrence of VAP, minimizing the possibility of contamination while performing the procedure, as stated below:

> *Here, in our institution, we don't have this problem [non-execution of aseptic technique in the aspiration procedure] because we use the closed suction system, so the risk of contamination on the suction side is much smaller. (N2)*
>
> *Regarding aspiration, here, we use the closed system, which is safer. (NT4)*

The aspiration of secretions is considered an important measure for reducing VAP. However, studies report that there is no significant difference between the use of open or closed system of aspiration and the incidence of this adverse event,[16-8] so that the closed system of aspiration, in isolation, does not assign a protective effect.

Some benefits of the closed system are the maintenance of positive pressure in the airways, reduced periods of hypoxia resulting from its depressurization while disconnecting the ventilator, reduced environmental dissemination of microorganisms and consequent reduced exposure of health professionals to biological agents while performing the procedure.[4]

In relation to the equipment, such as aspirator of secretions, humidifier and ventilator, their inadequate use and care represent a risk for the patient, identified in the speeches of the study participants:

> *The risk is the mishandling of ventilation, the handling of the machine, the asepsis of the machine itself between one patient and another. (NT4)*
>
> *The circuit that I say, in this case, the filter, the aspirator [...] If you stay long there, it will also grow bacteria, with this, the patient, while breathing, can inhalate this bacterial growth [...] it is normal, while*

> *aspirating the patient, to have that cough, squeezing the trachea, which ends up bleeding, and that blood can sometimes be on that circuit and that blood is also a means of contamination and bacterial growth. (NT3)*

Such equipment can contribute to the entrance of microorganisms in the patient's airways, in case of nebulization, inhalations or tracheal aspiration with contaminated material. Moreover, the accumulation of condensed water or dirt also represent a growth medium and, consequently, favor the occurrence of infection.[4]

The use of probes and enteral diet, although essential for nutritional support in critically ill patients, also constitute a risk factor[19], being pointed out in the interviews. The probe presence favors the colonization of the oropharynx, and the administration of enteral nutrition interferes in gastric pH, which can lead to microbial colonization, increasing the possibility of gastroesophageal reflux and aspiration.[19]

> *Probe is a risk of pneumonia, because it can lead to aspiration pneumonia. (NT2)*
>
> *[...] the patients, mostly, are with enteral diet, the risk of pulmonary aspiration is too large. (N2)*

Nursing professionals perceived several risk factors for VAP in the institution. Most of these risk factors correspond to what the pertinent literature presents and to the recommendations of the National Health Surveillance Agency (ANVISA), regarding prevention of VAP.[4]In contrast, in this study, there was low incidence of adverse events in the ICU:

> *Generally, the patient is already in serious condition, with pneumonia, but the risks, we prevent them from happening. (NT3)*
>
> *Most of the time, it happens at home, while providing the diet and the person aspired at home, arriving here with this condition. (NT2)*
>
> *It hardly ever occurs, if there is any [case], I'm not remembering. (NT5)*

In this sense, VAP rates vary according to the institution reality, patients' characteristics and diagnostic resources employed[4] Therefore, the local reality and patients' clinical profile may have influenced the perception of occurrence of this important adverse event.

Although reporting a low incidence, the nursing professionals of this study did not mention any objective data or indicators of VAP in the institution, hampering the identification of the magnitude of the problem in the studied institution. The surveillance of VAP, sharing of indicators and their comparison with adherence to recommended preventive measures stand out as important allies in the quest for quality and safe care in ICUs.[4]

The subtheme "Prevention of ventilator-associated pneumonia: what do nursing professionals do?" presents the measures professionals reported performing for preventing this adverse event.

In general, they seek, for the prevention of VAP, reducing the transmission of pathogens to the patient, the colonization of reservoirs, and the inoculation of microorganisms in the airways.[20]

The appropriate airway aspiration was the predominant preventive measure in the professionals' discourse:

> *Then, in our routine, adequate suction, always using sterile gloves, keeping the suction probe in closed system and aspirating only when necessary, [...] auscultating the patient. (N1)*
>
> *Aspirate properly, [...] before aspirating, also make sure that you have a sterile glove. (NTE2)*
>
> *We have to be very attentive on the suction side. (N2)*
>
> *Use the fully sterile technique in the aspiration [...] and more frequently, when necessary; some patients have more secretion, so, obviously, you have to aspirate more often during the night shift; some have less secretion, so it just hurts and does not have this need. (TE3)*

The focus on the aspiration of the airways as a measure for the prevention of VAP may occur due to the fact that the maintenance of airway permeability constitute an important concern in relation to nursing care to the patient on mechanical ventilation[21]. In addition, since the technique directly relates to the removal of secretions, it becomes part of the routine nursing care to these patients.

As shown in the speeches, nurses and nursing technicians reported performing the aspiration technique. However, due to its complexity, Resolution 0557/2017, which regulates the activity of the nursing team in the airway aspiration procedure, provides that critical patients should have the procedure performed by nurses.[22] It indicates the need for the institution to implement efforts to suit this legal device, once the knowledge and the evaluation of clinical and ventilatory conditions affect the safety of the patient undergoing the procedure.[23]

The speeches showed other preventive measures that are in line with the risks perceived and reported by the participants: oral hygiene; maintenance of equipment care;

care while moving and positioning the patient aiming at preventing aspiration.

> *Oral hygiene is very important; we make it three times a day, in all patients. (NT2)*
>
> *I believe that oral hygiene, we use the antiseptic, and it's helpful to eliminate those bacteria from the mouth. (NT5)*
>
> *The materials assembly, having the safety it was assembled and that everything is sterile. (N1)*
>
> *In relation to the cuff, whether it is in the proper size. (NT2)*
>
> *Being with an inflated cuff. (NT5)*
>
> *Always keeping the head elevated; at bath time, suspend the diet to prevent the risk aspirating while moving the patient. (NT2)*
>
> *The elevated head is very important [...]; during the infusion of the diet, the patient must be sit because the risk of pulmonary aspiration is huge. (N2)*

When applying the afore mentioned strategies in conjunction with other measures, they are able to contribute to the prevention.

Oral hygiene helps reducing the microbial load of the oral cavity, which can be sucked in and reach the lower airways. The care with the equipment intends to reduce contamination and, consequently, the introduction of microorganisms in the patient's airway; the verification of the cuff pressure focuses on preventing microaspirations arising from the presence of subglottic secretions between the tube and the trachea and, finally, the bed positioning should be elevated to 30 to 45º. Although it does not present a direct impact in the reduction of VAP, it is recommended because it is a simple and effective measure for preventing aspiration in patients who use enteral nutrition, and can be a measure associated with the improvement of their ventilatory condition.[4]

Furthermore, considering health professionals' hands as the tool they use to perform the care,[24] their hygiene is referred to as the measure of greater effectiveness in the prevention of infections, considering that this procedure prevents cross-transmission of microorganisms.[25]

The participants reports indicate this procedure as a strategy for the prevention of VAP, as illustrated in these speeches:

Being careful with hands to move the patient; washing, using alcohol. (NT3)

The asepsis of the hands before moving both the machine as the patient. (NT4)

Despite its simplicity and effectiveness for preventing infections, few professionals mentioned this procedure when questioned about the care routinely performed for preventing VAP.

Thus, there emerge questions about the adherence to the procedure, or if professionals indeed recognize it as a measure capable of preventing VAP, or just as a routine associated with healthcare provision.

The participants' speeches do not contemplate other measures recommended for the prevention of VAP, such as care to avoid unscheduled extubation, the adequacy of the level of sedation, preferential use of noninvasive mechanical ventilation and rigorous use of neuromuscular blockers. Possibly, because nursing professionals are not directly responsible for decision-making and implementation of these actions.

Nevertheless, there is need for sharing decisions related to critical patients and the prevention of VAP among the multidisciplinary team, in order to promote the convergence of efforts to achieve the best clinical results.

The statements do not address the participation in trainings on the topic, but it does not infer that the institution does not offer them. In their work processes, professionals may not value the educational strategies and practices for strengthening patient safety[26] as a means to produce an effective impact on reduction of VAP rates[4] but, rather, as an initiative aiming at achieving organizational goals.

The study shows that nursing professionals perceive the risk of VAP in the ICU and report implementing many preventive measures in line with scientific evidence.

Knowing the pathophysiology, diagnostic criteria, risk factors and the best scientific evidence for the prevention is of fundamental importance for patient safety in the ICU's.[8] It constitutes a necessary condition for nursing professionals, mainly nurses, while members of the multidisciplinary team, to pursue a proactive role in the prevention of HAI, especially VAP, overcoming the implementation of procedural and technical actions, since this professional, the nurse, is responsible for the nursing care to the serious patient with risk of life.[27]

In this perspective, nurses are vital elements for the prevention of VAP, not only because many preventive measures are part of the nursing care in the ICU,[8] but also by their important role in the identification of risks to which patients are exposed, regarding opportunities and barriers for safety, in stimulating the notification of adverse events[26] and in the elaboration of protocols,

staff education and evaluation of care quality.[8]

This study presents limitations. During its development, there were dilemmas regarding the refusal of some professionals to participate in the interview, the embarrassment with the recording and, still, certain resistance in addressing the issue, even after receiving instructions about the objectives and ethical aspects of the study. They could also be afraid of providing some information that could be considered incorrect or inadequate during the interview. These factors, allied to the fact that interviews occurred during the working hours, may have interfered the extension and the naturalness of the responses.

Nonetheless, the study can contribute to reflections on the theme, possibly assisting the establishment of strategies for education of professionals involved in the prevention of VAP. It can also provide subsidies for the implementation of preventive measures in the studied institution or in similar scenarios.

CONCLUSION

The study allowed recognizing nursing professionals' perception about the risks of VAP.

The time of intubation and mechanical ventilation, microaspirations from the colonization of the oropharynx, inadequate aspiration of the airways and the orotracheal tube, the use of probes for nutritional support and improper care with equipment stand out as factors capable of compromising the safety of mechanically ventilated patients. From this perception, preventive measures are performed, with the aspiration of the airways as prevalent in the professionals' statements.

While recognizing the risk of VAP and relating to the implementation of preventive actions, the study participants did not mention the notification of adverse event, the sharing of indicators or participation in educational strategies, which constitute actions relevant to the management of risks and the strengthening of the quality and safety of patient in the ICU.

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