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ASPIRAÇÃO ENDOTRAQUEAL EM PACIENTES COM VIA AÉREA ARTIFICIAL SOB VENTILAÇÃO MECÂNICA INVASIVA INTERNADOS EM UTI

ENDOTRACHEAL SUCTION IN PATIENTS HOSPITALIZED IN ICU WITH ARTIFICIAL AIRWAY IN INVASIVE MECHANIC VENTILATION

ASPIRACIÓN ENDOTRAQUEAL EM PACIENTES CON VÍA AÉREA ARTIFICIAL BAJO VENTILACIÓN MECÁNICA INVASORA INTERNADOS EN UCI

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RESUMO

Objetivo: Identificar e analisar as intervenções e o manejo da enfermagem na aspiração endotraqueal em pacientes adultos com via aérea artificial em ventilação mecânica, internados em unidade de terapia intensiva. **Método:** Trata-se de uma revisão integrativa de literatura, com abordagem quantitativa, realizada nas bases de dados Literatura Latino-Americana e do Caribe em Ciências da Saúde e PubMed, por meio dos seguintes descritores: "enfermagem *and* sucção *and* unidades de terapia intensiva" e "*nursing and suction and intensive care units*", entre os anos de 2012 e 2017. **Resultados:** A busca nas bases de dados resultou em 108 artigos; após a aplicação dos critérios de inclusão e exclusão e a análise de conteúdo, nove artigos foram selecionados. Identificaram-se como intervenção 16 cuidados de enfermagem referentes à prevenção de infecções, colonização bacteriana, alterações hemodinâmicas e respiratórias e monitorização do paciente durante e após o procedimento de aspiração da cânula endotraqueal. **Conclusão:** As intervenções encontradas são relevantes para a prática clínica de enfermagem na aspiração endotraqueal, porém há a necessidade de avaliação, por meio do exame físico do paciente antes do procedimento, a fim de facilitar a escolha da técnica ideal e assegurar a tomada de decisão do enfermeiro para a execução do procedimento.
Descritores: Enfermagem; Sucção; Unidades de terapia intensiva

ABSTRACT

Objective: To identify and to analyze nursing interventions and management in endotracheal suction in adult patients with artificial airway in mechanical ventilation, hospitalized in an intensive care unit. **Method:** It is an integrative literature review , with quantitative approach, carried out in the Latin American and Caribbean Literature databases in Health Sciences and PubMed , through the following descriptors: "*enfermagem* and *sucção* and *unidades de terapia intensiva*", and "nursing and suction and intensive care units", between 2012 and 2017. **Results:** The research in the databases resulted in 108 articles; after applying the inclusion and exclusion criteria and the content analysis, nine articles were selected. They identified as intervention 16 nursing cares related to infection prevention, bacterial colonization, hemodynamic, breathing disorders and the monitoring patient during and after endotracheal cannula aspiration procedure. **Conclusion:** The interventions found are relevant for the nursing clinical practice in endotracheal suction; however, it should be made a patient evaluation through physical exam, before the procedure, in order to facilitate the choice of the ideal technique and to assure the nurse's decisions.
Descriptors: Nursing; Suction; Intensive care units.

RESUMEN

Objetivo: Identificar y analizar las interversiones y el manejo de los enfermeros en la aspiración endotraqueal en los pacientes adultos con vía aérea artificial en ventilación mecánica, internados en unidad de terapia intensiva. **Método:** Se trata de una revisión integrante de literatura, con abordaje de cuantificación, la cual se realizo con bases de datos en Literatura Latino-Americana y del Caribe en Ciencias de la Salud y PubMed, por medio de los siguientes descriptores:"enfermería *and* succión *and* unidades de terapia intensiva" y "nursing and suction and intensive care units", entre 2012 y 2017. **Resultados:** La búsqueda en las bases de datos resultó en 108 artículos; después de la aplicación de los criterios de inclusión y exclusión y el análisis del contenido, nueve artículos fueron elegidos. Se identificó como intervención 16 cuidados de la enfermería, los cuales se refieren a la prevención de infección, colonización bacteriana, cambios hemodinámicos y respiratorios y monitoramiento del paciente durante y después del procedimiento de aspiración de la cánula endotraqueal. **Conclusión:** Las intervención que fueron encuentradas son relevantes para la práctica clínica de enfermería en la aspiración endotraqueal, todavía hay la necesidad de evaluación, por medio de examen físico del paciente antes del procedimiento, con la finalidad de hacer fácil elegir la técnica ideal y dejar una seguridad mayor para el enfermero ejecutar el procedimiento.
Descriptores: Enfermería; Succión; Unidades de cuidados intensivos.

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INTRODUCTION

The Endotracheal Suction (ES) in adult patients in mechanical ventilation (MV) admitted to an Intensive Care Unit (ICU) is performed using aseptic technique with a flexible catheter connected to a vacuum system and introduced to the Artificial Airway (AA) of the patient[1,2], aiming to remove pulmonary secretions from individuals who are unable to cough and to expel their accumulation, maintaining the gas exchange process and improving arterial oxygenation and pulmonary functioning[1].

There are two methods to perform it: Closed System Suction (CSS) and Open System Suction (OSS). While this consists of disconnecting the AA from the patient of the MV, for the introduction of the flexible suction cannula, which is connected to a vacuum system, it is made by means of a device called trachcare, which does not require disconnection from the AA of the MV , since it works simultaneously in the ES[1].

Although it is a necessary procedure for the patient's well-being, it can be subject to complications, such as: tracheal mucosa lesion, pain, discomfort, infection, alteration of hemodynamic parameters and arterial gases, bronchoconstriction, atelectasis, intracranial changes in cerebral blood flow, anxiety, tachycardia and hypertension[3,4]. Its complexity stems from these important risks, making prior assessment of the patient indispensable. In other words, the individual should be evaluated before aspiration by the methods of inspection, pulmonary auscultation, chest percussion and vital signs and oxygen saturation (SpO2), in order to verify the need for aspiration of the Endotracheal Cannula (CET)[5] and its periodicity.

The nurse, in this context, should be provided with a scientific basis on the theory and practice of ES to perform it[3], as it is a routine activity for the critical patient, in order to minimize complications associated with MV. According to COFEN Opinion no.5557 / 2017, serious patients, submitted to orotracheal intubation in the ICU, should have their airways privately aspirated by the nurse practitioner, according to the Nursing Professional Exercise Law[6], due to the need for a thorough assessment of the clinical picture of these and technical capacity for emergency management in necessary cases[3].

Regarding the procedure, studies[7-9] show that nursing is not aware of some stages of the ES technique and it is often not based on scientific evidence to perform this care, which can cause harm and involution of the patient in their treatment[10,11]. In order to justify this assertion, authors have shown in their studies that nurses are still insecure in the theory and practice of the procedure[10,12], besides some professionals perform it without even knowing the steps for its execution[7-9] making it a risk to the patient, which should be evaluated adequately and promptly, if there is any intercurrence in the aspiration process[10,12]. In addition, results of experimental studies involving intensive care nurses[13-15] state that a patient's evaluation of the patient prior to ES allows the ideal choice of technique and the best approach to be taken at the time of aspiration, minimizing risks and complications to the patient in MV[16,17].

In light of these evidences, the idea was to group scientific studies that would contribute to the direction of the nursing practice techniques in the ES of the patient in the MV admitted to the ICU, in order to reduce complications. Thus, the answers to the main questions about ES were sought, by means of the following guiding question: what are the nursing interventions in the management of the ES of the adult patient in critical state with AAV in MV, hospitalized in ICU?

Although it is a procedure commonly performed by these professionals and its complexity, ES is still a subject rarely addressed in nursing protocols in ICU care[8], and there is no consensus on the ideal technique by nurses who perform this procedure[5]. This fact is related by the lack of training on updating the management of the ES of patients in MV[8,9]. Thus, the relevance of an integrative literature review on the competencies needed by nurses in the management of EFT is justified by the need to highlight specific and current care for this procedure, in order to provide subsidies for the development of safe care to the critical patient in clinical practice.

Thus, this study aims to identify and to analyze the interventions and management of nursing in endotracheal aspiration in adult patients with artificial airway in mechanical ventilation, hospitalized in an intensive care unit.

METHODS

This was an integrative literature review, with a quantitative approach, which enabled the search, critical evaluation and systematization of a given theme[18], thus subsidizing the knowledge of nursing interventions in ES in critical adult patients with AAV in MV.

The review was operationalized in six phases: elaboration of the guiding question and the purpose of the study; establishment of search strategy in databases; selection of studies following inclusion and exclusion criteria; critical reading of the title and summary of selected articles; construction of the evaluation tool and analysis of results; discussion of the results in light of the literature[19].

The articles search was carried out in the Latin American and Caribbean Literature in Health Sciences (LILACS) and PubMed databases, considering articles between 2012 and 2017, through Descriptors in Health Sciences (DECSs) of the Virtual Health Library and the Medical Subject Headings (MeSH), National Library of Medicine. The logical "and" was used to conjugate the different keywords, namely: "nursing and suction and intensive care units" and "nursing and suction and intensive care units". The search was carried out in the months of January and February of 2017.

The selection strategy adopted for the search of articles in the second phase was the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA), considering the four proposed steps: identification, screening, eligibility and inclusion, aiming to contribute to the quality of results in the construction of knowledge[20], according to the objective of this research.

Regarding the inclusion criterion of the articles, their abstract and objectives should correspond to the proposed theme, being referenced in Portuguese, English and Spanish. On the other hand, those of exclusion were: editorials, dissertations, theses, articles with restricted references, articles of literature review and studies that were not in the defined chronological time (2012 to 2017), thus finalizing the third phase.

The reading of the title and abstract of the articles, in the fourth phase, was carried out separately by the researchers. Any disagreement over the inclusion or exclusion of an article has been resolved by the presence of a third party evaluator.

In order to carry out a process of critical evaluation of the studies and presentation of the results in the fifth phase, a data collection instrument was developed by the authors of this research and according to the recommendations of studies oriented towards the elaboration of integrative reviews[18,19]. This instrument was composed of the following variables: authors, year, objective, methodology, results and conclusion. Still in this phase, after the elaboration of this instrument, a critical and detailed analysis was carried out, based on a detailed and interpretative evaluation of the selected studies, which allowed the selection of relevant data for this research and later analysis. At the end of this selection, the data were entered in a spreadsheet in the Microsoft Excel 2010® program, exported and processed by the statistical package *Statistical Package for Social Sciences*® (SPSS), version 21, which allowed the analysis by descriptive statistics.

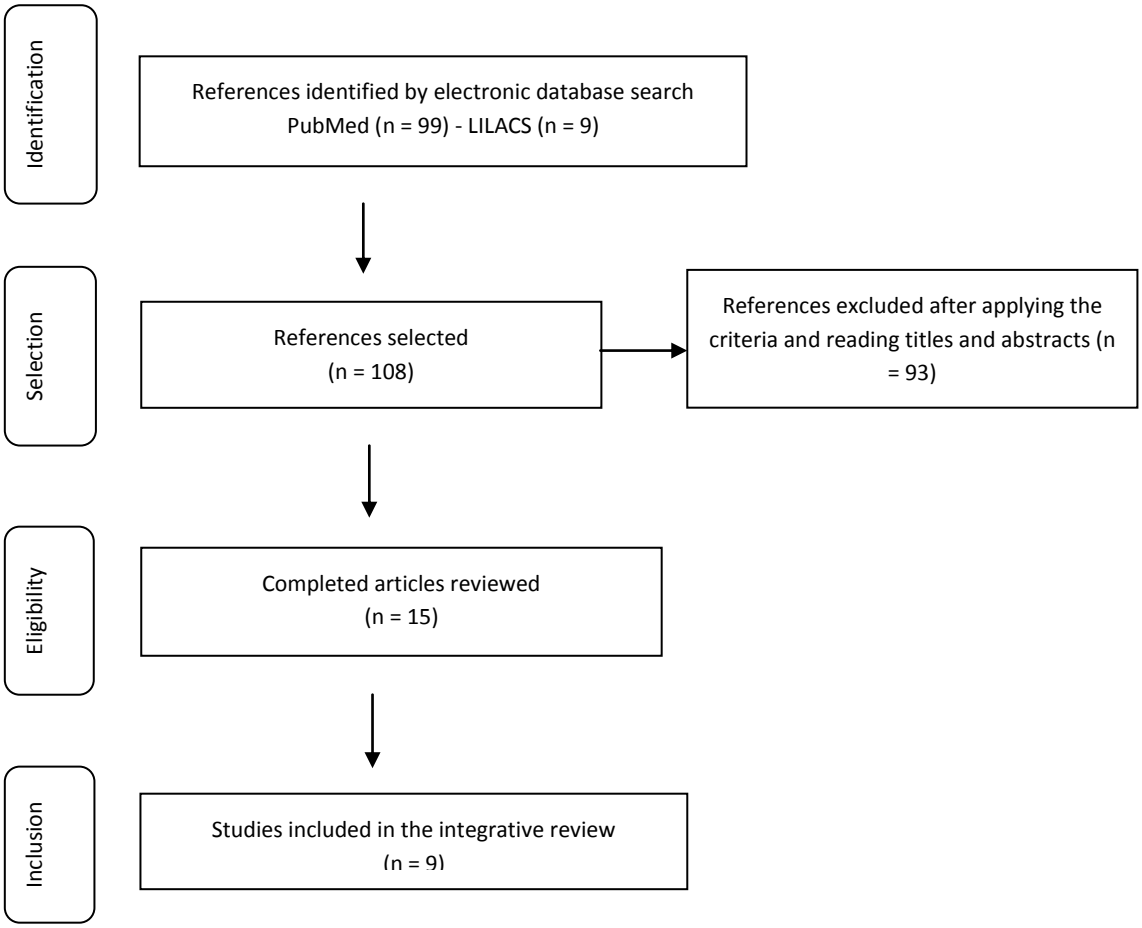
The final results were presented through tables in the sixth phase and discussed in the light of the literature, in a descriptive way, with a view to making viable, through the selected results, the interventions evidenced and compared with others in the literature, in order to answer the guiding question this research.

The ethical aspects related to the integrative review were respected, since the author's precepts and the citations of the authors of the publications that constituted the sample of this revision were duly cited.

RESULTS AND DISCUSSION

A total of 108 articles were identified in the PubMed and LILACS databases. It was verified that, after inclusion of the inclusion/exclusion criteria and the reading of titles and abstracts, 93 articles were not adhered to. From the 15 articles submitted to content analysis for data extraction, according to the research objective, nine were left for inclusion in the review. Figure 1 shows the search strategy of the articles in the databases.

Figure 1 - Search strategy of articles in databases. Curitiba, Paraná, 2017.



Source: Adapted from Moher et al. (2009).

A summary of the results and outcomes of the nine articles included in the review was prepared, aiming to organize and evidence nursing interventions in ES in patients with AAV in MV (Figure 2).

Figure 2 - Description of the articles identified in the searched databases about the nursing practice in the management of ES in patients with AAV in MV. Curitiba, Paraná, 2017.

Article	Authors	Year	Objective	Methodology	Results	Conclusion
I[13]	Yazdannik et al.	2013	To compare the effects on the gas exchange of two different negative suction pressures applied to the ASF with hyperoxygenation and without recruitment maneuvers.	Randomized clinical trial, with evaluation of patients in MV, divided into two groups of ASF by different suction pressures: 100 and 200mmHg.	The analysis of variance of the study showed no difference between the two levels of pressure (p = 0.315).	Suction pressure of 200mmHg in ASF did not present detrimental effects on patients' cardiorespiratory function.
II[14]	Yousef et al.	2014	To compare the effect of two levels of negative pressure on the ASA of the	Randomized clinical trial, involving adult patients in MV, and requiring ASA, divided	Hyperoxygenation is required before, during, and after the procedure.	The ASA suction by negative pressure of 200mmHg was

			endotracheal tube of patients hospitalized in ICU.	into two groups with different suction pressures: 100 and 200mmHg.		applicable, with a low risk of complications.
III[15]	Abbasinia et al.	2014	To compare the effects of ES by invasive and minimally invasive technique in ICU patients.	Randomized clinical trial involving 74 patients, divided into two groups: invasive AET (n = 37) and minimally invasive ES (n = 37).	There was a significant difference in SpO2 and heart rate after ASA within each group (p <0.05), but the variables did not result in a difference between the two groups (p> 0.05).	The number of ES in the invasive aspiration group was lower and, consequently, lower risk of infection due to exposure to the procedure.
IV[16]	Irajpour et al.	2014	To evaluate the effect of invasive and minimally invasive ES methods on the cardiovascular parameters of patients admitted to the ICU.	Randomized clinical trial in patients submitted to MV with aspiration needs, divided into two groups: invasive ES and minimally invasive ES.	Patients presented respiratory rate change and SpO2 drop shortly after ES, but there was no significant difference between groups (p> 0.05). Furthermore, it was found that the amount of ES to maintain the permeable orotracheal tube was higher in the minimally invasive aspiration group (p <0.05).	It was evidenced the need for patient monitoring during ES, due to alteration in the cardiovascular parameters.
V[9]	Hamishehkar et al.	2014	To evaluate the adhesion of the prevention package of Mechanical Ventilation-Associated Pneumonia (VAP).	Observational study, conducted at ten ICUs in Iran, with training before and after the VAP prevention package.	The patients presented changes in heart rate and blood pressure soon after the ES in both groups (p <0.05).	It was recommended the expansion of continuing education and supervision of procedures.
VI[11]	Bakhtiari et al.	2015	To evaluate the effect of a program of upper respiratory airway care on the incidence of VAP.	Randomized clinical trial, performed in adult patients submitted to MV and hospitalized in ICU, divided into two groups: intervention and control.	The study variables (buccal and subglottic aspirations, head elevation at 45° and cuff pressure of 25cm H2O) were significant in the prevention of VAP in the intervention group (p <0.05).	The intervention group resulted in a lower infection rate compared to the control group that did not use the usual techniques.
VII[12]	Leddye Wilkinson	2015	To analyze the practice of suctioning and the use of saline in AET in patients with AAV, performed by nurses and physiotherapists.	Evaluative research, through a questionnaire, on the knowledge and practice of aspiration and the use of saline, applied to two groups: nurses and physiotherapists.	Both groups noted adverse effects on the patient after administration of saline (discomfort, falling saturation, and increased heart rate).	The use of saline in ES is not recommended, and professional training is suggested for this procedure.
VIII[10]	Nesami-Bagheri et al.	2015	To evaluate the quality of the implementation of preventive measures of VAP in the ICUs of university hospitals.	This cross-sectional study was carried out with nursing professionals who work directly with patients on MV, in three university ICUs.	There was a need for training for all the professionals involved, regarding preventive measures of VAP.	The knowledge acquired in preventive measures generated promotion of quality and safety in the practice of care.

IX[17]	Dastdadeh et al.	2016	To compare the effects of ES by ASF and ASA, considering the agitation and pain of patients in MV admitted to the ICU.	Randomized clinical trial with patients, divided into two groups: ASF and ASA.	The patients showed an increase in pain and agitation in each of the groups (p <0.001), but there was no significant difference between them (p> 0.05).	There was no difference between the groups regarding pain level and agitation.

Source: The authors (2017).

The PubMed database presented the highest number of articles. On the other hand, the low number of productions in the LILACS database highlights the scarcity of Brazilian publications on the subject in nursing, regarding the ES techniques, according to the frequencies presented in Table 1.

Table 1 - Frequency and percentage of the distribution of the articles, according to the databases. Curitiba, Paraná, 2017.

DATABASE	Quantity (n)	Percentage (%)
LILACS	2	13,3
PubMed	13	86,7
Total	15	100,0

Source: The authors (2017).

Regarding the journals of the studies listed, 100% are international, and submitted contributions of nursing publications for ES, according to the objective of this research. Table 2 presents the selected journals and the respective number of articles used in this review.

Table 2 - Frequency and percentage of articles, according to the selected journal. Curitiba, Paraná, 2017.

Journal	Quantity (n)	Percentage (%)
Anesthesiology and Pain Medicine	1	11,1
Canadian Journal of Respiratory Therapy	1	11,1
Iranian Journal of Nursing and Midwifery Research	4	44,5
Journal of Caring Sciences	1	11,1
Journal of Clinical and Diagnostic Research	1	11,1
Journal of Research in Pharmacy Practice	1	11,1
Total	9	100,0

Source: The authors (2017).

After a detailed analysis of the nine articles which were presented in Figure 2, it was observed that the nursing interventions are directly related to the minimization of complications related to hemodynamic, respiratory and blood gas changes, suction pressure, saline instillation, hyper-oxygenation, microbial colonization, invasive and minimally invasive aspiration, prevention of MV-associated infection, amount of aspirated secretion, experience and professional knowledge in ES in patients with AAV in MV. Thus, it was possible to evidence 16 nursing interventions in the ES, highlighted and presented by frequency of citation in each study in Table 3.

Table 3 - Nursing interventions identified in the selected studies on management in ES in patients with AAV in MV and frequency of citation. Curitiba, Paraná, 2017.

Nursing intervention	Frequency (n= 16)	
	Absolute (f)	Relative (%)
Oral suction	1	6,3
ES pressure up to 200 mmHg in a closed system	1	6,3
ES pressure up to 200 mmHg in an open system	1	6,3
Invasive aspiration of the endotracheal tube	2	12,6
Minimally invasive aspiration of the endotracheal tube	2	12,6
Subglottic aspiration	1	6,3
Hyper-oxygenation before and after ASF	1	6,3
Hyper-oxygenation before and after ASA	1	6,3
Instillation of saline in AAV	1	6,3
Hand washing before aspiration of CET	2	12,6
Keeping hospital headrest elevated by 30°	1	6,3
Keeping hospital headrest raised by 45°	2	12,6
Maintaining cuff pressure at 25cm from H_2O	2	12,6
Monitoring heart and respiratory rates, SpO_2 and patient blood pressure during and after invasive aspiration of the orotracheal tube	1	6,3
Performing oral hygiene with clorexedine gluconate	2	12,6
Performing suction in sterile technique	1	6,3

Source: the authors (2017).

With a careful analysis of the selected articles, considering nursing care in ES in patients with AAV in invasive MV, observing them, when comparing aspiration techniques in research and with the usual, the results were more recent in groups (p> 0.05)[11,14-16], which reinforces the need to use mathematical techniques in ES, supported by experimental studies[9,10,12], to ensure safety and the procedure to perform a critical task in ICU.

As for the subglottic aspiration in the VAS prevention package[11], the results (p < 0.05) showed that the technique was lower in risk of VAP in the intervention group (reduction of secretion between the *cuff* of the orotracheal tube and the tracheal mucosa, minimizing bacterial colonization) compared to the control group, which does not use the prevention package. This is the result of the literature review[21], which is more controversial than the aspiration of an early sub-global and, consequently, hospital costs.

In relation to hyper-oxygenation and after the ES procedure by open and closed systems[13,14], studies show that this technique contributes in reducing the chance of hypoxia during aspiration, minimizing the complications of the procedure. A randomized clinical trial[22] evidenced a hyper-oxygenation with the classification of Inspired Oxygen Fraction (FiO_2) in 50% of patients in treatment with hypoxemia during an ES in adults and stable in MV, especially those ones ventilated with value of Final Positive Expiratory Pressure (PEEP) reduced.

With regard to pressure aspiration of up to 200 mmHg through open and closed systems[13,14], the authors pointed out that this choice helped to minimize the accumulation of pulmonary and residual secretions in AAV. This pressure value don't have deleterious effects on the cardiorespiratory functions of individuals in MV, but it was observed that recurrent hemodynamic changes in aspiration returned to their basal rates, in a shorter time in the ASF group. On the other hand, in a randomized comparative analysis between two types of tracheal aspiration system (open and closed) in newborns[23], no significant statistical differences between groups were evidenced. However, these authors stated that in patients with more severe pulmonary diseases, such as those with diaphragmatic hernia who have persistent pulmonary hypertension, the use of the closed system may be more beneficial.

Regarding oral aspiration technique[11], oral hygiene with cloned gluconate, headrest elevation from 30° to 45°, hygiene of hands before aspiration, control of cuff pressure in 25 cm of H_2O, aspiration in technique sterile and suction frequency, the studies[9-11] analyzed emphasized that they are essential in nurses' care practices during ES, in order to minimize the risk of VAP and bacterial colonization in the airways of patients with AAV. These techniques can promote quality and safety in patient care with invasive ventilatory assistance in the ICU[24], and most of the

aforementioned care has scientific evidence regarding its use[21,24,25].

Regarding the instillation of saline solution in the patient's AAV at the time of ES[12], the understanding of the nurses and physiotherapists about this technique was discussed, and a lack of knowledge about the risk, benefit and indication was verified, a fact that generated the evaluation regarding the need for the training of these professionals and the need to implement the routine evaluation before the procedure, since it was not linked to a daily practice. Other studies have pointed out[8,26] that the knowledge deficit of this technique by health professionals can cause complications in patients with severe ES, such as: hypoxemia, hemodynamic instability and infections, besides respiratory discomfort of the individual; thus, instillation of saline solution is not indicated routinely.

Furthermore, the outcome of a systematic review[27] showed that the instillation of saline solution in volume of 5ml is effective in reducing the occurrence of VAP, when it is compared to the non-instillation. There is, therefore, a need for clinical evaluation and a careful physical examination by the nurse in his indication in the ES. This evaluation may occur through the nursing process, which, through the nurses diagnoses, may evidence the risks and the prevention of complications secondary to nursing practice[28].

Finally, when analyzing the effects of minimally invasive and invasive aspirations on ES, the selected studies[15,16] presented significance between the groups ($p < 0.05$), with a greater efficacy prevailing in those who used invasive aspiration in the following criteria: minimization of tracheal secretion, greater permeability of AAV, less manipulation of the trachea and periodicity of aspiration. The authors reported that the periodicity of invasive aspiration was lower, obtaining less manipulation of the trachea and, consequently, lower risk of VAP. However, the increase in heart rate and blood pressure parameters in these patients was higher, compared to the minimally invasive aspiration group. Since this increase, even to a small degree, can cause adverse events in cardiac patients, nurses should monitor cardiovascular parameters during and after invasive ETT. The authors also recommended additional studies to compare the physiological effects on invasive and minimally invasive ES.

It was verified that from the interventions found through the analysis of the selected studies and the presented considerations, compared to other studies in the literature, it can be affirmed that there is important and current evidence on the technique and the nursing management in the ES. The chosen articles present the effectiveness of the techniques performed by the nurses in the experimental groups and the risk of aspiration failure and complications to the patient, if not performed by means of techniques based on scientific evidence.

To do so, it is necessary the elaboration, by the nursing team, of assistance protocols and training of professionals throughout the ES process, through an updated literature. The articles included in this review affirm that continuing education must comply with a continuous and effective surveillance among nursing teams, in order to contribute to the expansion of knowledge, and this, made effective in the clinical practice of all involved.

In light of the above, it is important to promote scientific research on this subject, to innovate the techniques highlighted in the literature researched and necessary in the daily application in the practice of the professionals directly involved in this procedure.

CONCLUSION

Through this research, it was possible to present an integrative review of nursing interventions in care and management of ES in patients with AAV in MV. In this context, it is necessary to evaluate the patient before, during and after the procedure, through physical examination and monitoring, so that he can select the best technique, making it possible to make care decisions in the ES with safety. The technical-scientific update and the participation of nurses in the planning of critical patient care are essential, and the techniques presented are compatible with other experimental and quantitative studies available in the literature.

During the analysis of the articles, the limitation of experimental nursing studies was observed, dealing with the innovation of care in the ES, mainly of national references on the subject. It is important to highlight the importance of the development of research on nursing interventions in ES and critical patient care with AAV in MV, which allows the choice of the ideal technique for this procedure, based on scientific evidence, making care safe. Thus, the patient is not exposed to risk, aiming at the

quality of his care and minimizing secondary complications in the ES.

This review should be a great incentive for future research on the elaboration of experimental studies involving nursing interventions in the ES, since the results of the care analyzed and discussed reinforce the quality and safety in this procedure.

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