Revision Article

Intervention and proposed activities for the nursing diagnosis: impaired spontaneous ventilation

Intervenção e atividades propostas para o diagnóstico de enfermagem - ventilação espontânea prejudicada

Intervención y actividades propuestas para el diagnóstico de enfermería: ventilación espontánea perjudicada

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ABSTRACT

This study aimed to investigate the nursing interventions and activities proposed in the literature for the nursing diagnosis of impaired spontaneous ventilation. It was an integrative literature review, on the databanks of MEDLINE and LILACS using the terms: Mechanical Ventilation, Nursing Diagnosis, Intensive Care and Nursing Care. The sample consisted of 15 articles; in eight of them were identified 20 references of care that could be related to activities and interventions of nursing care, applied in patients with mechanical ventilation, as proposed in the Classification of Nursing Interventions. Among those cares, only eight were equivalent to priority interventions. However, in the suggested interventions were activities for, virtually, all cares of this review. This study showed that, despite the importance of care applied to patients on mechanical ventilation, they are not considered as being specific of nursing, and the majority is not present in the literature.

Keywords: Nursing diagnosis; Nursing care; Respiration, artificial; Intensive care

RESUMO

Este estudo teve como objetivo investigar as intervenções e atividades de enfermagem propostas pela literatura para o diagnóstico de enfermagem ventilação espontânea prejudicada. Trata-se de uma revisão integrativa da literatura, nos bancos de dados MEDLINE e LILACS, utilizando os unitermos: Ventilação Mecânica, Diagnóstico de Enfermagem, Cuidados Intensivos e Cuidados de Enfermagem. A amostra foi constituída de 15 artigos, em oito deles foram identificados 20 cuidados que poderiam se relacionar às intervenções e atividades de enfermagem aplicadas ao paciente em ventilação mecânica, propostas na Classificação das Intervenções de Enfermagem. Entre esses cuidados, apenas oito equivaleram-se às intervenções prioritárias. Mas, nas intervenções sugeridas existem atividades para praticamente todos os cuidados desta revisão. Este estudo demonstrou que, apesar da importância dos cuidados aplicados aos pacientes em ventilação mecânica, estes, não são considerados como específicos da enfermagem, e a maioria não está presente na literatura.

Descritores: Diagnóstico de enfermagem; Cuidados de enfermagem; Respiração artificial; Cuidados intensivos

RESUMEN

Este estudio tuvo como objetivo investigar las intervenciones y actividades de enfermería propuestas por la literatura para el diagnóstico de enfermería de ventilación espontánea perjudicada. Se trata de una revisión integradora de la literatura, en los bancos de dados MEDLINE y LILACS, utilizando los unitermos: Ventilación Mecánica, Diagnóstico de Enfermería, Cuidados Intensivos y Cuidados de Enfermería. La muestra fue constituida de 15 artículos, en ocho de ellos fueron identificados 20 cuidados que podrían relacionarse a las intervenciones y actividades de enfermería aplicadas al paciente con ventilación mecánica, propuestas en la Clasificación de las Intervenciones de Enfermería. Entre esos cuidados, apenas ocho fueron equivalentes a intervenciones prioritarias. Sin embargo, en las intervenciones sugeridas existen actividades para prácticamente todos los cuidados de esta revisión. Este estudio demostró que, a pesar de la importancia de los cuidados aplicados a los pacientes en ventilación mecánica, estos no son considerados como específicos de la enfermería, y la mayoría no está presente en la literatura.

Descriptores: Diagnóstico de enfermería; Atención de enfermería; Respiración artificial; Cuidados intensivos

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INTRODUCTION

The nursing process is based on data collection, needs identification, interventions, and results assessment, and consolidates the nursing clinical practice, guiding nurses' work. Nursing diagnoses (ND), once inserted in care, allow a unique language to be used, enable understanding, and facilitate decision making concerning the necessary interventions for each patient, thus improving care provided[1].

At Intensive Care Units (ICUs), most patients are in critical state and need invasive ventilation support, thus requiring nurses to play the essential role of assessing these patients and ensuring the ventilator functioning[2]. Nevertheless, such therapy is not risk-free, and in spite of the several benefits it brings, it can also have downsides if the necessary care is not provided during its utilization[3]. Mechanical Ventilation (MV) is mainly indicated for serious acute respiratory failure (ARF) cases, and its appropriate use requires knowing effects over the lungs mechanics and respiratory function, as well as its impacts on other organs[4].

The ND proposed by the *North American Nursing Diagnosis Association (*NANDA) for MV patients is impaired spontaneous ventilation, defined as "decreasing energy levels, resulting in a state in which a person is unable to maintain adequate breathing to support life". Such diagnosis defining characteristics are: increased restlessness, apprehension, decreased cooperation, dyspnea, increased heart rate, increased pCO2, decreased pO2, decreased SaO2, increased metabolic rates, increased used of accessory muscles, and decreased tidal volume. Related factors include respiratory muscles exhaustion, and metabolic factors[5].

Nursing interventions refer to any care given based on nurses' judgment and clinical knowledge allied to a scientifically based action, performed in benefit of patients, and in response to a nursing diagnosis. The Nursing Interventions Classification (NIC) contains interventions and activities performed by nurses, in an organized and structured format. Each nursing diagnosis is related to several interventions, which are divided into "priority", "suggested", and "additional optional" Priority interventions are related to the diagnosis cause and have activities or interventions that are more likely to solve the problem[6].

Nursing care given to MV patients requires technical and interpersonal competence. Nurses need to perceive alterations to patients' health state, interpret them, and correctly intervene, utilizing the nursing process[2]. Therefore, it is essential that care is organized, aiming to maintain technical rigor so as to control the care being given, preventing complications, decreasing costs, and improving quality. Consequently, it is relevant that a bibliographic review is performed, so as to investigate nursing care given to patients with an impaired spontaneous ventilation ND, and observe its applicability in clinical practice.

OBJECTIVE

To investigate nursing activities and interventions as proposed by the literature for the impaired spontaneous ventilation nursing diagnosis.

METHODOLOGY

The present is an integrative literature review, with regard to nursing care given to patients under mechanical ventilation, emphasizing interventions and activities proposed for the nursing diagnosis "impaired spontaneous ventilation".

Articles on the subject were searched in March 2009, through MEDLINE and LILACS databases. Inclusion criteria for the selection were: articles approaching nursing care for mechanical ventilation patients; articles published in English and Portuguese; articles published between 2004 and 2009. Articles excluded did not focus on nursing care given to MV patients.

During the articles search, Boolean connectors and the following controlled descriptors were used: Mechanical Ventilation, Nursing Diagnoses, Intensive Care, Nursing Care, and their respective translations in Portuguese.

Uniterms such as mechanical ventilation, nursing care, and intensive care were searched for in the MEDLINE database, resulting in 75 articles, and 3 other articles were selected from LILACS. When the uniterms mechanical ventilation and nursing diagnosis were used, no articles were selected from MEDLINE, and only one was selected from LILACS. Using the same uniterms and a non-specified time range (due to the lack of material found), the same article was found in LILACS, and other 16 articles were found in the MEDLINE database.

The second step was to read the abstracts presented by the bibliographic material obtained, aiming to explore and verify if they were interesting for the present research. Most of the articles (84 %) out of 95 were not related to this study objective and were excluded.

The final sample included 15 articles that were submitted to a selective reading process, aiming to select material that truly corroborated with the present research objectives, an analytical reading, so as to organized information found in the articles, and finally, a more complex interpretative reading, aiming to correlate what authors affirmed with the theme in question[7].

Information obtained was listed and organized, and relevant aspects were identified and categorized for final

analysis, aiming to correlate the material obtained and the reflections triggered by this study objective.

RESULTS

Out of the 15 selected studies, four were descriptive (prospective or retrospective studies), two were observational descriptive, two were almost experimental, two were experimental, one was a transversal study, one was a clinical research study, two were literature reviews, and one was a case study. Out of these, 8 studies mentioned 20 care practices that could be related to the nursing interventions and activities applied to mechanical ventilation patients, according to the Nursing Interventions Classification.

Among such care practices, only eight were equivalent to activities considered priority nursing interventions for the impaired spontaneous ventilation ND, according to the NIC. Considering that the interventions "new-born cardiopulmonary resuscitation" and "ventilation assistance" do not fit the present study objectives, three other nursing interventions were selected: mechanical ventilation, artificial airway control, and respiratory monitoring, according to Chart 1.

Data from Chart 2 present the same care practices, regarding not only priority interventions, but also suggested interventions and their correspondent activities.

When analyzing 85 nursing activities related to priority interventions from the NIC, 64 activities could be applied to mechanical ventilation patients with an impaired spontaneous ventilation ND. Out of the 20 care practices found by this review, eight have corresponding priority nursing interventions.

Chart 1 – Care for mechanical ventilation patients as identified through the bibliographic review in relation to the priority nursing interventions.

Authors	Care	Priority Nursing Interventions
Tolentino-DelosReyes AF, Ruppert SD, Shiao SY[8]	Keep bed headrest on a 30°to 45° degree elevation (not impeded by pressure ulcers; decubitus can be changed every 2 hours)	-
	Continuously drain subglottic secretion	-
	Do not change the ventilator circuit	-
	Wash hands before and after contact with patients	-
	Education	-
	Perform oral hygiene	Artificial airway control
	Verify residual volume in the nasogastric tube	
Cason CL, Tyner T, Saunders S, Broome L[14]	Drain oropharyngeal secretions (above the cuff) before removing or re-positioning endotracheal tube	Artificial airway control
	Drain oropharynx	Artificial airway control
Birkett KM, Southerland KA, Leslie GD[17]	Prevent unplanned extubation	Artificial airway control
	Monitor sedation	-
	Assess early weaning	-
	Use physical and medication contention when necessary	-
Lindgren VA, Ames NJ[19]	Nutritional support	-
	Sleep promotion	-
	Anxiety monitoring	Respiratory Monitoring
Camargo MF, Andrade APA, Cardoso FPF, Melo MHO[20]	Intracuff pressure monitoring	Artificial airway control
Nepomuceno RM, Silva LD[21]	Ventilation alarms identification and management	Respiratory Monitoring and mechanical ventilation
Abbott CA, Dremsa T, Stewart DW, Mark DM, Swift CC[22]	Remove condensation from the circuit	Mechanical ventilation
	Gloves usage	-

Chart 2 – Care for mechanical ventilation patients as identified through literature review in relation to nursing interventions and activities according to the NIC

Care	Nursing Interventions	Activities
Keep bed headrest on a 30°to 45° degree elevation (not impeded by pressure ulcers; decubitus can be changed every 2 hours)	Airway control	Position patient so as to maximize respiratory potential.
	Precautions against aspiration	Position decubitus at 90° degrees or more when possible
	Positioning	Change position in order to ease dyspnea (for ex.: semi-fowler) when appropriate
	Positioning	Elevate bed headrest when appropriate
	Positioning	Change position so as to facilitate the ventilation/perfusion combination ("healthy lung down") when appropriate
Continuously drain subglottic secretion	-	-
Do not change the ventilator circuit	Infection control	Change equipment for patient care according to the institution protocol
Wash hands before and after contact with patients	Infection control	Wash hands before each care activity provided to patients, and do the same afterwards.
	Infection control	Use antimicrobial soap to wash hands, when appropriate
Education	Infection control	Teach healthcare workers how to wash hands
Perform oral hygiene	Artificial airway control	Offer oral hygiene care and oropharyngeal draining, when appropriate
	Acid-alkaline control	Offer frequent oral hygiene
	Oral health maintenance	Establish oral health routine
	Oral health maintenance	Facilitate teeth brushing and flossing at regular intervals
Verify residual volume in the nasogastric tube	Precaution against aspiration	Check nasogastric tube or gastrotomy for residuals before feeding
	Precaution against aspiration	Avoid feeding if a lot of residuals are found
Drain oropharyngeal secretions (above the cuff) before removing or re-positioning endotracheal tube	Artificial airway control	Drain oropharynx secretions and those found in the upper part of the tube cuff before deflating it
Drain oropharynx	Acid-alkaline control	Keep airway de-obstructed
	Acid-alkaline control: respiratory alkalosis	Keep airways open
	Airway control	Perform endotracheal draining, when appropriate
	Artificial airway control	Offer oral hygiene care and oropharyngeal draining, when appropriate
	Artificial airway control	Keep aseptic techniques when draining and offer care to the tracheostomy.
	Airway draining	Use sterilized and disposable equipment for each tracheal draining procedure
	Airway draining	Determine if mouth/trachea need draining
	Airway draining	Auscultate respiratory sounds before and after draining
Prevent unplanned extubation	Artificial airway control	Establish measures to prevent spontaneous extubation: attach the artificial airway with tape/bandage; administer sedation and curarization, when appropriate; use immobilizers for arms, if appropriate
	Airway control	Observe references in centimeters, marking the endotracheal tube height so as to monitor possible dislocation
	Artificial airway control	Minimize elevation and traction on the artificial airway, locking the ventilation circuit to overhead supports, using gyratory and flexible bases and supports for the circuit, and immobilizing the tube during turns, draining, disconnection from, and reconnection to the ventilator.
Monitor sedation	-	-

Continued...

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Assess early weaning	Weaning from the mechanical ventilation	Alternate attempts of weaning from the mechanical ventilation with enough rest and sleep periods
	Weaning from the mechanical ventilation	Consult other healthcare professionals in order to select a weaning method
	Weaning from the mechanical ventilation	Assist patients to distinguish spontaneous and mechanical breathing
	Acid-alkaline Control	Respiratory pattern monitoring
Use physical and medication contention when necessary	-	-
Nutritional support	Protection against infections	Promote adequate nutritional ingestion
	Liquid control	Monitor nutritional state
Sleep promotion	Acid-alkaline control: respiratory acidosis	Promote appropriate resting periods, when necessary
Anxiety monitoring	Respiratory monitoring	Monitoring increase of restlessness, anxiety and shortness of breath
	Anxiety reduction	Explain procedures, including sensations patients might experience during the procedure
	Anxiety reduction	Help patients identify anxiety preceptor situations
	Calming techniques	Guide patients as to methods to reduce anxiety, when appropriate
	Oxygen therapy	Monitor patients' anxiety related to the oxygen therapy need
Intracuff pressure monitoring	Artificial airway control	Maintain the endotracheal/tracheostomy tube cuff inflation at 15 to 20 mmHg during mechanical ventilation and after feeding
Ventilation alarms identification and management	Mechanical ventilation and respiratory monitoring	Monitor the mechanical ventilator parameter readings, observing inspiration pressure increase and tidal volume reduction, when appropriate
	Acid/alkaline control: respiratory alkalosis	Monitor imminent respiratory failure indexes (PaO_2 decrease, respiratory muscles exhaustion, SvO_2/SvO_2 decrease)
	Acid/alkaline control: respiratory alkalosis	Monitor ventilator parameters (for ex.: frequency, modality)
Remove condensation from the circuit	Mechanical ventilation	Remove condensation from reservoirs, when appropriate
Gloves usage	Infection control	Establish standard precaution
	Infection control	Use gloves according to standard precaution demands

DISCUSSION

Nursing care given to mechanical ventilation patients is intensive, long, and complex, besides including several guiding axes for the nursing practice. Among them are: vital signs control, cardiovascular monitoring, gas exchange and respiratory monitoring, as well as constant surveillance[3]. Optimal gas exchange, maintaining the airway open, absence of trauma or infections, appropriate mobility, appropriate communication methods, successful stress-facing measures incorporation, and absence of complications should be in care planning for such patients[2].

In this study, care given to mechanically ventilated patients was identified. When relating it to the priority nursing interventions for the impaired spontaneous ventilation ND presented by the NIC, it is possible to list: offer oral hygiene care and oropharynx draining; drain the oropharynx and the upper area of the tube cuff prior to deflating it; keep the endotracheal/tracheostomy tube cuff at 15 to 20 mmHg during mechanical ventilation during and after feeding; establish measures so as to prevent spontaneous extubation (attach the artificial airway with tape/bandage, administer sedation and curarization when appropriate, use arm immobilizers when appropriate); monitor anxiety; monitor the ventilator parameters in a regular basis; remove condensation from the reservoirs, when appropriate[6].

Oral hygiene is a basic nursing care practice; however, it is often badly executed. Although the Centers for Disease Control and Prevention (CDC) does not recommend specific strategies to perform such activity,

studies verify that the usage of chlorhexidine during oral hygiene is associated to the reduction of respiratory infection rates[8-9]. Teeth brushing is also suggested, so as to diminish plaque formation[9-13].

Ventilator-associated pneumonia (VAP) is one of the complications brought by the ventilation support, and is one of the main causes of death due to hospital infections. Among factors that trigger infections is the oropharyngeal colonization, which can be minimized through preventive care[13]. According to the CDC, 63% of ICU patients have their mouths colonized by VAP-related pathogens[14].

In this context, it is important to consider oral hygiene more than just an activity to provide comfort to patients, and as an important one among critical state patients[11]. Besides providing comfort, oral care reduces thirst, preserves the oropharyngeal mucosa integrity, and helps prevent infections[13].

An important VAP risk factor is oropharyngeal secretion micro-draining, considering that about 100-150 ml of secretion can accumulate in 24 hours. Hence, it is relevant to drain oropharyngeal secretions (above the cuff) before removing or repositioning the endotracheal tube (ETT)[14]. Such care practice is recommended by CDC, as well as continuously removing subglottic secretion[2,10,15]. Using tubes with dorsal lumen above the cuff, enabling the continuous subglottic secretion draining, diminishes VAP chances in 45%-50%, for it prevents micro or macro-draining of pathogen fluids[15]. However, using the ETT is not common for the Brazilian clinical practice, once it is an expensive material.

It is known that intensive care patients with invasive ventilation support do not have defensive mechanisms to clear the airway, such as cough – that occurs when the glottis closes – due to the ETT; there is also a higher secretion production by the organism[13].

Among prolonged endotracheal intubation risks are injuries to the larynx and trachea, caused by necrosis resulting from excessive cuff insufflation[3]. It is known that pressure between 20 and 30 mmHg impairs capillary circulation towards the trachea mucosa[13]. However, a discrepancy is found among authors regarding the cuff pressure to be used[3,6,10,12]. The NIC recommendation is to maintain pressure between 15 and 20 mmHg. Another study reinforces that pressure below 20 cm of H2O, equivalent to 27 mmHg, is associated to a higher pneumonia risk[10]. Nonetheless, the II Brazilian Agreement for Mechanical Ventilation recommends that pressure is maintained below 25 mmHg in the cuff, and that it is verified every 12 hours[3]. It is known that an appropriate cuff pressure control also diminishes subglottic secretion aspiration by the lungs[10,12]. Consequently, intra cuff pressure should be appropriate not only during patients' meals, but also when invasive ventilation support is necessary; this is an essential nursing care practice.

The ventilator circuit can present pathogen micro-organisms when condensation accumulates in its interior. Upon such situation, it is important to remove the accumulated water and prevent that it drains towards the patient. Studies verify that changing the circuit in a regular basis does not reduce VAP, therefore, it should be changed only when visibly dirty[3,10,12]. According to the NIC, "ventilator circuits should be changed every 24 hours, when appropriate"[6].

The need for MV generates anxiety among patients and families involved in the process. This is due to the fact patients have to go through aggressive and unknown conducts at times, which requires attention from the nursing team regarding patients' anxiety levels, communication channels, and stimulating participative care whenever possible. Such patients also have to be constantly supervised, so that signs such as hypoventilation, or inadequate ventilation mobility can be identified through restlessness, depression, or anxiety manifestations[16].

Generally, unplanned extubation occurs due to inappropriate ETT attachment, decubitus changes, and psychomotor agitation. Such event has been treated as an adverse factor, once it puts patients' lives at risk[17]. Aiming to prevent accidental extubation, two professionals are recommended when carrying out some nursing care activities, among them, changing positions and attaching the ETT[3]. Self-extubation is more frequent during nursing procedures and it is known that the fewer patients relate to the nursing team, the less frequent extubation is[17].

Sedation used for MV patients aims to comfort, diminish anxiety, and improve synchronization with the ventilator, thus preventing unplanned extubation[18]. Among actions nurses can take is an assessment to check if patients need sedation, and suggest it to the medical team, when it is beneficial.

Ventilation therapy is guided by parameters individually set for each patient[13]. Such therapy evolution is directly related to the respiratory pattern and appropriate oxygenation. Ventilator alarms are important for they indicate problems occurring with the device, which is supporting someone's life[16]. Hence, understanding how to identify ventilator alarms is a priority for nurses, so as to appropriately maintain such therapy, as well as improve care quality.

Among non-contemplated care activities in the NIC priority interventions is the headrest position. One of the four CDC recommendations is to maintain invasive MV patients' headrest at 30°-45°. This position diminishes gastric flow and lung aspiration, preventing VAP, which are important risk factors related to intensive care patients' mortality[10,15].

It is important to highlight that, based on clinical experience, nursing activities related to mechanical ventilation weaning is not part of the nursing team scope

in most ICUs. Nevertheless, when based on clinical care protocols, it is extremely pertinent, mainly when performed inter-disciplinary, by a multi-professional team.

CONCLUSION

It was possible to observe through the present study that most nursing interventions and activities proposed for the impaired spontaneous ventilation Nursing Diagnosis is not present in the literature. However, almost all nursing care activities identified in this review have a NIC equivalent nursing activity. In spite of how important care activities provided to mechanically ventilated patients are, many of them are not considered priority interventions, sometimes, they are not even considered nursing-specific. Hence, nurses' experience and knowledge are essential to identify patients' needs and plan care.

Consequently, it is necessary to amplify knowledge and clinical applicability of nursing care practices provided to mechanically ventilated patients, providing subsidies for an individualized care plan, the implementation of appropriate interventions, team training and qualification.

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