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ORIGINAL

Nursing process applied to a preschooler with spinal muscular atrophy and chronic respiratory failure

Proceso de enfermería aplicado a preescolar con atrofia muscular espinal e insuficiencia respiratoria crónica

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ABSTRACT

Introduction: chronic respiratory failure involves changes in the respiratory system, preventing its normal functioning. Inadequate gas exchange leading to the onset of compensatory mechanisms characterized by a sustained decrease in arterial oxygen pressure.

Objective: manage the nursing care process for a pediatric patient with spinal muscular atrophy and chronic respiratory failure.

Method: a qualitative, descriptive single case study was carried out. Data were collected through the use of observation, physical examination, documented review and interview techniques and the information was organized using the Assessment Guide according to Marjory Gordon's 11 functional health patterns.

Results: the 4 altered patterns were identified and 8 nursing diagnoses were formulated (taxonomy II of NANDA I) prioritizing three: deterioration of spontaneous ventilation, ineffective cleaning of the airways and risk of deterioration of skin integrity. Subsequently, the objectives were set and care plans were created (NOC and NIC taxonomy) to then execute a large percentage of said nursing care and finally the NOC indicators were evaluated, differentiating both final and baseline scores. At the end, change scores of +1, +3, +2 were obtained.

Conclusions: the nursing care process applied in the preschool was the basis for identifying the present problems and risks, as well as planning the necessary interventions and activities, executing them and evaluating them, in this way it was possible to adequately manage the care. pediatric.

Keywords: Nursing Care Process; Respiratory Failure; Pediatric Intensive Care Units.

RESUMEN

Introducción: la insuficiencia respiratoria crónica implica cambios en el sistema respiratorio impidiendo su funcionamiento normal. Intercambio gaseoso inadecuado que conduce al inicio de mecanismos compensatorios caracterizados por una disminución sostenida de la presión arterial de oxígeno.

Objetivo: gestionar el proceso de atención de enfermería a un paciente pediátrico con atrofia muscular espinal e insuficiencia respiratoria crónica.

Método: se realizó un estudio cualitativo, descriptivo de caso único. Se recolectaron los datos a través del uso de las técnicas de observación, examen físico, revisión documentada y entrevista y se organizó la información usando la Guía de valoración según los 11 patrones funcionales de la salud de Marjory Gordon.

Resultados: se identificaron los 4 patrones alterados y se formularon 8 diagnósticos de enfermería (taxonomía II de NANDA I) priorizando tres: deterioro de la ventilación espontánea, limpieza ineficaz de las vías aéreas y riesgo de deterioro de la integridad cutánea. Posteriormente se plantearon los objetivos y se crearon los planes de cuidado (taxonomía NOC y NIC) para después ejecutar en gran porcentaje dichos cuidados enfermeros y finalmente se evaluaron los indicadores NOC diferenciando tanto puntuación final como la basal. Al término se obtuvieron unas puntuaciones de cambio de +1, +3, +2.

Conclusiones: el proceso de atención de enfermería aplicado en el preescolar fue la base para identificar los problemas presentes y los riesgos, así como la planificación de las intervenciones y actividades necesarias, ejecutarlas y evaluar, de esta forma se logró gestionar de forma adecuada la atención pediátrica.

Palabras clave: Proceso de Atención de Enfermería; Insuficiencia Respiratoria; Unidades de Cuidado Intensivo Pediátrico.

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INTRODUCTION

In the Americas, more than half a million deaths among men and women are caused by chronic respiratory diseases, corresponding to a rate of 36 deaths per 100 000 inhabitants, with higher mortality rates among men (42 and 31 deaths per 100 000 inhabitants in men and women, respectively).[1]

The development of CRF is gradual and not necessarily reversible (exacerbations are common). Its origin is related to obstructive bronchial diseases, chronic interstitial lung diseases, neoplasms of the respiratory system in all stages, cardiovascular diseases, chest deformities, morbid obesity, and diseases of the nervous and muscular systems, such as spinal muscular atrophy, considered one of the most common neuromuscular diseases in newborns with hypotonia, affecting 1 in every 6 000 to 10 000 births and whose severity ranges from perinatal apnea to prolonged mechanical ventilation due to muscle weakness.[2]

Within CRF, two main groups can be distinguished: those with hypercapnic CRF, i.e., with alveolar hypoventilation, as occurs in diseases affecting respiratory control, neuromuscular diseases, or diseases of the chest wall, and another large group in which the lung structure, airway caliber, or pulmonary circulation is affected.[3]

The most common symptom of CRF is dyspnea as a result of the respiratory effort the patient makes to correct the presence of hypoxemia. Respiratory rate and tidal volume are proportional to ventilation; therefore, to increase ventilation, the respiratory rate is increased, and accessory muscles are used. Differentiating dyspnea from CRF can be difficult, depending on the underlying disease.[4]

Pulmonary vasoconstriction also leads to pulmonary arterial hypertension, triggering long-term chronic lung disease. Cyanosis is a characteristic secondary clinical feature and is usually a late manifestation; in the cardiovascular system, the most common change is tachycardia to increase cardiac output. Cerebral hypoxia may cause neuropsychiatric disturbances such as agitation, anxiety, and tremors. Finally, since sustained hypoxemia can lead to dysfunction in any organ, renal and hepatic disturbances are other manifestations that may be found in these patients.

The treatment of CRF aims to prevent tissue hypoxemia and complications related to adaptive mechanisms. It also attempts to correct hypercapnia. Respiratory rehabilitation is indicated in all stages of severity for patients with CRF who have symptoms and limitations in activities of daily living. This includes comprehensive respiratory physiotherapy, where the management of bronchial secretions through drainage techniques, knowledge of relaxation techniques, and respiratory re-education are essential.

On the other hand, prolonged mechanical ventilation (MV) is frequently used in critical care units to treat CRF. To maintain this modality, some patients often require the placement of a tracheostomy tube. The management of the device must be organized around a specialized respiratory care center with experience in patient selection, as well as in the initiation and monitoring of treatment.[5]

In this space, nursing professionals play a key role in the nursing process, making it necessary for them to become familiar with the patient's symptoms and have a thorough knowledge of the interventions to be taken into account for better and more effective care during patient management.[6]

The pediatric intensive care nurse aims to identify and resolve the problems of children and their families and to meet their needs during their stay in the critical care unit through multidisciplinary work with other health professionals involved in their care. The specialist nurse also formulates a care plan and carries out interventions and activities to resolve the problems identified and reduce the risk of complications in pediatric patients.[7]

General objective

Manage the nursing care process for a pediatric patient with spinal muscular atrophy and chronic respiratory failure.

Specific objectives

Assess clinical manifestations in pediatric patients with chronic respiratory failure.

Determine risk factors for complications in chronic respiratory failure. Describe the role of nursing in the care of patients with chronic respiratory failure. Formulate a nursing care plan for patients with chronic respiratory failure using the NANDA, NIC, and NOC taxonomies.

METHOD

Study design

A qualitative, descriptive, single clinical case study was conducted using the nursing care process (NCP) as the method.

Subject of study

The pediatric patient, a 2-year-old preschooler, was admitted to the institution on 06/17/2023 with a tracheostomy connected to a portable mechanical ventilator (receiving home mechanical ventilation). Parents report that in the previous days, the patient presented with rhinorrhea, semi-liquid stools 2 to 3 times a day, and fever spikes. Auxiliary tests revealed leukopenia, severe neutropenia, PCR at 40, and Pseudomonas aeruginosa in tracheal secretion culture. The patient was treated with antibiotics, but despite the treatment, leukopenia and clinical deterioration persisted, which is why he was transferred from his home to the institution to be admitted to the pediatric intensive care unit.

Scope and period of study

This study was conducted in the Pediatric Intensive Care Unit at Universidad Peruana Unión, Lima. The case study was evaluated over a 12-hour period on November 1, 2023.

Information collection procedure

Source of Information

The reference source used was data collection through interviews with the patient herself.

Another source was the medical history and nursing assessment according to Marjory Gordon's 11 patterns.

A literature review of scientific evidence was also conducted.

Data Collection Technique

The technique used was an interview with the patient, which was the main source of information and extremely useful for obtaining information. Observation of the subject of the study was also essential.

Information Procedure

Information gathering began with a review of the patient's medical history to obtain clinical data such as background information, reasons for consultation, diagnostic test results, medical diagnosis, medical evolution, and the evolution of nursing care. Subsequently, a nursing assessment was carried out through a personal interview, using Marjory Gordon's 11 Functional Patterns, identifying the patient's functional limitations and needs, medical evolution, and the evolution of nursing care. Subsequently, a nursing assessment was performed through a personal interview, using Marjory Gordon's 11 Functional Patterns, identifying the primary nursing diagnoses for developing a specific care plan. The patient's evolution was carefully assessed. According to the date criterion, a comprehensive analysis of the scientific evidence was carried out, limiting the search to information from 2018 to the present. Keywords such as nursing care process, respiratory failure, and pediatric intensive care units were used.

Data processing

The data were examined and organized based on the nursing approach. The patient was assessed based on Marjory Gordon's 11 functional patterns, and a prioritization network was created using the nursing methodology to select the primary diagnosis according to the NANDA I taxonomy. Next, after selecting the primary nursing diagnosis, the expected outcome criteria (NOC), nursing interventions (NIC), and respective activities were established.

A critical analysis of the scientific evidence included in this study was performed to obtain the primary NOC of the nursing diagnosis and the primary collaboration problem and thus develop the care plan based on the NIC taxonomy.

Finally, the planned nursing interventions and/or activities were carried out. Then, these activities were evaluated to verify the interventions' scope according to the patient's individualized care plan.

RESULTS

General Information

Patient C. M. S. J., male, 2 years old, weighing 10,3 kg.

Days of nursing care: 135 days

Medical diagnosis: spinal muscular atrophy and chronic respiratory failure on prolonged mechanical ventilation (MV), tracheostomy and gastrostomy.

Date of assessment: 11/01/2023

Reason for admission

The pediatric patient, a 2-year-old preschooler, was admitted to the institution on 06/17/2023 with a tracheostomy connected to a portable mechanical ventilator (receiving home mechanical ventilation). Parents report that in the previous days, the patient presented with rhinorrhea, semi-liquid stools 2 to 3 times a day, and fever spikes. Auxiliary tests revealed leukopenia, severe neutropenia, CRP at 40, and Pseudomonas aeruginosa in tracheal secretion culture. The patient was treated with antibiotics, but despite the treatment, leukopenia and clinical deterioration persisted, which is why he was transferred from his home to the institution and subsequently admitted to the pediatric intensive care unit.

Assessment according to Functional Health Patterns

Functional Pattern I: Perception - Health Control

Preschool patient with a tracheostomy tube diagnosed with spinal muscular atrophy and chronic respiratory failure on prolonged mechanical ventilation. He was born by scheduled cesarean section, with a history of home MV, tracheostomy tube change (05/06/23), and hospitalized at 4 months and 1 year and 4 months in the pediatric ICU of the San Pablo Clinic. He has no allergies, according to his medical history. Good hygiene. He received Pediasure via gastrostomy and was breastfed. His vaccinations are incomplete. He receives medication intravenously and via gastrostomy.

Functional Pattern III: Metabolic Nutrition

Preschooler with hydrated, moderately pale skin, feverish, diaphoresis during the nights, integrity of the oral mucosa, gastrostomy through which he receives 200 ml of Pediasure every 4 hours (6 feedings) and 150 ml of smoothie (at 2 p.m. and 6 p.m.), soft/depressible abdomen, no edema, tendency to develop erythematous areas due to pressure that subside when position is changed.

Temperature: 38,6°C Weight: 10,300 kg (low P/T) Height: 87 cm BH: +372

Laboratory tests: Hb: 10,4 g/dl, Hct: 31,8 %, Glucose: 121 mg/dl, Serum sodium: 137 mEq/L, Serum potassium: 4 mEq/L,

HCO3: 28,5 mEq/L.

Risk of pressure injuries: high risk (Braden Scale: 9 points).

Functional Pattern IV: Activity - Exercise

Respiratory activity

FR: 28x´, normal chest expansion. O2 saturation: 99 %.

Presents slightly thick secretions in normal quantity. Bronchial secretion culture negative (10/31/2023).

On auscultation, vesicular murmur in both lung fields and bilateral rales.

Receiving oxygen via mechanical ventilation. Tracheostomy patient connected to prolonged mechanical ventilation in PCV mode, ventilatory parameters: FiO2: 0,35, PCV: 15 cmH2O, PEEP: 5 cmH2O, Ti: 0,80s, FR: 28rpm, IE: 1,0:1,6.

Auxiliary tests

Arterial blood gas (ABG) results: pH: 7,39, PaO2: 85 mmHg, PaCO2: 40 mmHg, Pa/FiO2: 384, HCO3: 28,5 mEq/L, Hb: 10,4 g/dl, Hto: 31,8, Plaq: 400,000/mm3.

PCR: 82,5 mg/dl, PCT: 0,45 mg/ml.

Circulatory activity

HR: 115x BP: 133/74 mmHg

Peripheral pulses are palpable, capillary refill time is greater than 2 seconds, and distal extremities are cold.

Presence of invasive lines

Patient with a patent peripheral venous catheter in the left upper limb.

Activity self-care ability

Quadriplegia with muscle atrophy, hypotonia.

Fall Risk Scale assessment: high risk (Humpty Dumpty Scale score: 17 points).

Functional Pattern VI: Perceptual - Cognitive

Preschool, alert, pupils isocoric and photoreactive. ECG: 7 + TQT.

Pain assessed according to Wong-Baker: 8 points.

Functional Pattern VII: Elimination

Spontaneous urination, urinary flow: 52 cc/m2/h.

Spontaneous pasty stool, 2 to 3 times a day.

PRIORITIZED NURSING DIAGNOSES

Initial diagnosis

Diagnostic label: deterioration of spontaneous ventilation (00033).

Defining characteristic: increased use of accessory muscles, increased respiratory rate, and decreased circulating volume.

Related factor: neuromuscular deterioration, respiratory muscle fatigue.

Diagnostic statement

Impaired spontaneous ventilation related to neuromuscular deterioration and respiratory muscle fatigue evidenced by increased use of accessory muscles, increased respiratory rate, and decreased circulating volume.

Expected results

NOC (0403) Respiratory status: ventilation

Indicators

Respiratory rate.

Use of accessory muscles.

Respiratory rhythm.

Tidal volume.

Nursing interventions

NIC (3300) Management of mechanical ventilation: invasive

Activities

- Select the most appropriate ventilation mode to improve the patient's condition in consultation with other healthcare professionals and make the appropriate changes.
- Routinely check the mechanical ventilation parameters, temperature, and humidification system of the inspired air.

- Avoid factors related to increased oxygen use, such as fever, pain, chills, or nursing actions such as bathing and repositioning, which cause ventilatory support parameters to be exceeded and lead to desaturation. Monitor clinical signs indicating increased ventilatory effort, such as heart rate, respiratory rate, hypertension, and diaphoresis.
- Assess adverse reactions related to mechanical ventilation such as pneumonia, volutrauma, barotrauma, gastric distension, reduced cardiac output, and establish care to prevent them, such as continuous oral care using soft moist gauze, mouthwash, and gentle suction.

Second diagnosis

Diagnostic label: ineffective airway clearance (00031).

Defining characteristic: adventitious breath sounds, excessive sputum, psychomotor agitation.

Related factor: difficulty clearing secretions.

Diagnostic statement: ineffective airway clearance related to difficulty clearing secretions as evidenced by adventitious breath sounds, excessive sputum, psychomotor agitation.

Expected results

NOC (410) Respiratory status: airway patency.

Indicators

Ability to clear secretions.

Pathological breath sounds.

Accumulation of sputum.

Anxiety.

Nursing interventions

NIC (3180) Artificial airway management

Activities

- Place the patient in the semi-Fowler position to facilitate adequate ventilation/perfusion.
- Suction orotracheal secretions.
- Assess the presence of crackles and rales by auscultation in both lung fields.
- Assess secretions and their characteristics: color, consistency, and quantity.
- Perform chest physiotherapy, when necessary, including nebulization.

Third diagnosis

Diagnostic label: risk of skin integrity deterioration (00047).

Risk factor: body mass index below the normal range for age, decreased physical mobility, pressure on bony prominences.

Associated condition: cognitive dysfunction and decreased muscle tone and strength.

Diagnostic statement: risk of skin integrity impairment related to body mass index below normal range for age, decreased physical mobility, pressure on bony prominences associated with cognitive dysfunction and decreased muscle tone and strength.

Expected results

NOC (0204) Consequences of immobility: physiological.

Indicators

Muscle tone.

Muscle strength.

Pressure ulcers.

Nutritional status.

Nursing interventions

NIC (3540) Prevention of pressure ulcers

Activities

- Perform passive range of motion exercises.
- Assess the risk of pressure ulcers in preschoolers using the Braden scale, perform this assessment during each shift, and record the results in the nursing log.
- Use pneumatic mattresses; in addition, use pillows on top of the mattress to raise pressure points.
- Reposition the patient every 2 hours, placing the posture clock in a visible place.
- When changing the preschooler's position, assess the integrity of the skin, especially at pressure points, at least three times a day.
- Apply protective barriers such as creams or hydrocellular dressings to the preschooler and avoid excessive moisture.

Table 1. Intervention management of invasive mechanical ventilation for the diagnosis of spontaneous ventilation deterioration

Intervention: management of mechanical ventilation: invasive		
Date	**Time**	**Activities**
01/11/23	14:00 – 19:00	The most appropriate ventilation mode was selected to improve the patient's condition in consultation with other healthcare professionals, and the appropriate changes were made. Mechanical ventilation parameters, temperature, and the inspired air humidification system were routinely checked. Factors related to increased oxygen use, such as fever, pain, chills, or nursing actions such as bathing and repositioning), which could cause the ventilatory support parameters to be exceeded, leading to desaturation. Clinical manifestations that could indicate increased ventilatory effort, such as heart rate, respiratory rate, hypertension, and diaphoresis, were also monitored. Adverse reactions related to mechanical ventilation, such as pneumonia, volutrauma, barotrauma, gastric distension, and reduced cardiac output, were assessed, and care was established to prevent them, such as continuous oral care using soft moist gauze, mouthwash, and gentle suction.

Table 2. Baseline and final scores for respiratory status outcome indicators: ventilation

Indicators	Baseline score	Final score
Respiratory rate	3	5
Use of accessory muscles	3	4
Respiratory rhythm	3	4
Tidal volume	3	4

Table 3. Performance of airway suctioning for the diagnosis of ineffective airway clearance

Intervention: management of mechanical ventilation: invasive		
Date	**Time**	**Activities**
01/11/23	7:00 - 19:00	The semi-Fowler position was established to facilitate adequate ventilation/perfusion. Orotracheal secretions were aspirated. The presence of crackles and rales was assessed by auscultation in both lung fields. Secretions and their characteristics were assessed: color, consistency, and quantity. Chest physiotherapy was performed when necessary, including nebulization.

Table 4 shows the baseline and final scores for the NOC outcome indicators Respiratory status: airway patency of the nursing diagnosis Ineffective airway clearance, the mode of the scores before nursing interventions and activities (baseline score) was 1 (severely compromised) and after them the mode of the scores (final score) was 4 (mildly compromised). The change score was +3.

Table 4. Baseline and final scores for respiratory status outcome indicators: airway patency

Indicators	Baseline score	Final score
Ability to eliminate secretions	1	4
Pathological breathing sounds	1	4
Accumulation of sputum	1	4
Anxiety	3	5

Table 2 shows that the baseline and final scores for the NOC outcome indicators respiratory status: ventilation of the nursing diagnosis impaired spontaneous ventilation; the mode of the scores before nursing interventions and activities (baseline score) was 3 (moderately compromised) and after them, the mode of the scores (final score) was 4 (slightly compromised). The change score was +1

Table 5. Implementación de una intervención para la prevención de úlceras por presión en el diagnóstico de movilidad física reducida

Intervention: prevention of pressure ulcers		
Date	**Time**	**Activities**
01/11/23	7:00 - 19:00	Passive range of motion exercises were performed. In preschool, the risk of developing pressure ulcers was assessed using the Braden scale, which was performed during each shift and recorded in the nursing log. A pneumatic mattress was used, along with pillows on top of the mattress to raise pressure points. The patient's position was changed every 2 hours, placing the postural clock in a visible place. When changing the preschooler's position, the integrity of the skin was assessed, especially at pressure points, at least three times a day. Protective barriers such as creams or hydrocellular dressings were applied to the preschooler, and excessive moisture was avoided.

It can be seen in table 6 that the baseline and final score for the NOC outcome indicators Immobility consequences: physiological of the nursing diagnosis Immobility consequences: physiological, the mode of the scores before performing the nursing interventions and activities (baseline score) was 1 (severely compromised) and after them the mode of the scores (final score) was 3 (moderately compromised). The change score was +2.

Table 6. Baseline and final scores for outcome indicators Consequences of immobility: physiological

Indicators	Baseline score	Final score
Muscle tone	1	3
Muscle strength	1	3
Pressure ulcers	0	0
Nutritional status	2	4

During the assessment, data was collected through observation, physical examination, documented review (based on medical history as the primary source), and interviews (conducted with the mother as a secondary source). The work was based on Marjory Gordon's Assessment Guide according to the 11 functional health patterns to organize the information.

During the diagnosis, once the significant data had been identified and the analysis completed using a scientific basis, the four altered patterns were identified, and eight nursing diagnoses (NANDA I taxonomy II) were formulated, prioritizing three: Impaired spontaneous ventilation, ineffective airway clearance, and risk of impaired skin integrity.

Subsequently, during the planning stage, objectives were set, and care plans (NOC and NIC taxonomy) were created, choosing the nursing outcomes and indicators to be evaluated for baseline and final scores. The central conflict was the subjectivity involved in determining these scores.

During the implementation stage, many nursing interventions and activities were carried out without difficulty. Finally, the NOC indicators were evaluated during the evaluation stage, differentiating between the final and baseline scores. Ultimately, change scores of +1, +3, and +2 were obtained. This stage developed changes and feedback during the care provided to the pediatric patient.

DISCUSSION

Spontaneous ventilation impairment is defined as the inability of the patient to initiate and/or maintain independent breathing that allows them to live. It also responds to the depression of energy reserves, causing difficulty in breathing adequately and surviving. It is also the patient's difficulty breathing without external assistance, leading to serious consequences requiring immediate medical attention and specialized nursing care.[8]

According to Gouveia E et al.[9] impaired spontaneous ventilation is the inability to tolerate an attempt at spontaneous breathing that shows signs of respiratory distress (respiratory rate greater than 35 breaths per minute, arterial oxyhemoglobin saturation less than 90 %, use of accessory respiratory muscles, or paradoxical thoracoabdominal ventilation), tachycardia (heart rate > 140 beats per minute), hemodynamic instability (systolic blood pressure < 90 mmHg or 20 % above baseline levels), or altered mental status (drowsiness, coma, and anxiety).

According to Herdman T et al.[8], the symptoms recorded for the diagnosis of deteriorating spontaneous ventilation are Dyspnea, decreased oxygen saturation, decreased partial pressure of oxygen, increased partial pressure of carbon dioxide, increased metabolic rate, decreased circulating volume, use of accessory respiratory muscles, tachycardia, increased respiratory rate, increasing agitation and apprehension, and reduced cooperation. In the case of the patient under study, the defining characteristics present were increased use of accessory muscles, increased respiratory rate, and decreased circulating volume.

When there are diseases in the respiratory center, the body cannot meet the ventilatory demand, so ventilatory support through mechanical ventilation is necessary as part of the nursing care process. One of the causes of prolonged mechanical ventilation in

pediatric patients is neuromuscular dysfunction. Multiple pathologies can affect oxygen supply, and in response to this hypoxemia, the use of ventilatory support is almost inevitable in most patients.[10]

Adverse reactions related to mechanical ventilation, such as pneumonia, polytrauma, barotrauma, gastric distension, and reduced cardiac output, are considered, and care is established to prevent them, such as continuous oral care using soft, moist gauze, mouthwash, and gentle suction. Mechanical ventilation can cause multiple adverse events, which nursing professionals must be aware of to take the appropriate precautions to prevent.[11]

Dantas JR et al.[12] define ineffective airway clearance as narrowing or resistance of the airways to the passage of oxygen and elimination of carbon dioxide due to the inability to remove secretions.

Patients with ineffective airway clearance present with shallow breathing, tachypnea, and asymmetric chest movement. There is also a decrease in airflow in regions of fluid consolidation; abnormal bronchial breath sounds such as crackles and rales may also be heard on inspiration, expiration, or both in response to fluid accumulation, thick secretions, and airway spasm or obstruction.[13]

Likewise, ineffective airway clearance is related to multiple factors such as dehydration, excessive mucus, exposure to harmful substances, fear of pain, mucus plugs, and retention of secretions.[8] Inflammatory and infectious processes are pathophysiological conditions that disrupt the innate defense mechanisms in the respiratory tract; in both cases, an intense anti-inflammatory response develops, accumulating products of bacterial destruction, including actin filaments and neutrophil DNA, as well as remnants derived from cell apoptosis and microorganisms. Together, these promote a purulent appearance and perpetuate harmful changes in the composition of the mucus (increased viscosity and thickness), contributing to more incredible difficulty in expectoration.[14]

Artificial airway management was considered in nursing interventions. Patients with non-permeable airways may require sedation, endotracheal intubation, and mechanical ventilation to clear the airways.[12] In turn, activities to resolve the problem of ineffective airway clearance were performed by placing the patient in a semi-Fowler position, which significantly facilitates concordance in the distribution of ventilation and pulmonary perfusion. It is an effective measure to minimize aspiration of gastric contents into the respiratory tract (broncho-aspiration) and is, therefore, a preventive measure for patients who tolerate the position. In addition, orotracheal secretions were aspirated.[15]

Chest physiotherapy was performed, including nebulization. This allows the fluidification of secretions, improving gas exchange in patients on mechanical ventilation due to acute or chronic conditions. Nebulizers convert solutions into aerosols of a size suitable for inhalation into the airway.

Physical mobility impairment is the limitation of movement of one or more body parts, affecting a person's ability to perform activities independently. It is a significant problem that represents a risk factor that negatively influences patients' quality of life, leading to specific adverse effects, such as pressure ulcers.[17]

Spinal muscular atrophy is one of the most common diseases of the nervous and muscular systems, the severity of which ranges from perinatal apnea to prolonged mechanical ventilation due to muscle weakness, thus also causing a deterioration in physical mobility.[2] The care plan considered the consequences of immobility as the primary outcome, and pressure ulcer prevention was considered in nursing interventions. Activities to reduce the risk of skin integrity deterioration were carried out by performing passive range of motion exercises. These are performed externally, with the presence of an assistant or a device, without necessarily requiring the patient's muscles to contribute to the movement.[18]

In addition to measurement scales, other mandatory measures must be applied to prevent PU. In this case, pneumatic mattresses, along with pillows on top of the mattress, were used to raise pressure points and eliminate friction between surfaces and bony prominences. The patient's position was also changed every two hours, placing the postural clock in a visible place; the integrity of the skin was assessed, especially at pressure points, at least three times a day, and protective barriers such as creams or hydrocellular dressings were applied to prevent excessive moisture. The nursing staff applied all these actions and care, and the success in preventing pressure ulcers in the patient depended on this.[19]

Likewise, the risk factors for this diagnosis are External or environmental factors (irritating chemicals, bodily excretions or secretions, mechanical factors such as pressure, shearing and restraint, radiation, humidity, hypothermia or hyperthermia, and extreme age) and internal or individual factors (altered nutritional status, physical immobilization, metabolic alterations, sensory alterations, developmental factors, bony prominences, medications, changes in skin elasticity, psychogenic factors, immunological factors, and altered circulation).[20]

CONCLUSIONS

In this study, each stage of the nursing care process (NCP) was carried out in pediatric patients with tracheostomy diagnosed with chronic respiratory failure and spinal muscular atrophy. Applying this process to preschool patients was the basis for identifying existing problems and risks, formulating nursing diagnoses, and prioritizing them. It also allowed for planning necessary interventions and activities, their execution, and the evaluation of results and indicators, obtaining change scores of +1, +3, and +2. The nursing process was successfully managed in the pediatric patient, allowing for adequate health care and contributing to his recovery in the short, medium, and long term. Therefore, using the NANDA, NIC, and NOC taxonomies is essential. They should be used in all healthcare institutions, representing the standardized nursing language.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

AUTHORSHIP CONTRIBUTION

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BIBLIOGRAPHIC REFERENCES

1. Organización panamericana de la salud-OPS. (2021). La Carga de las Enfermedades Respiratorias Crónicas, 2000-2019. https://www.paho.org/es/enlace/carga-enfermedades-respiratorias-cronicas

2. Giménez G, Prado F, Bersano C, Kakisu H, Herrero MV, Manresa AL et al . Recomendaciones para el manejo respiratorio de los pacientes con atrofia muscular espinal. Arch. Pediatr. Urug. . 2021 Jun [citado 2024 Ago 20] ; 92(1): e401. http://www.scielo.edu.uy/scielo.php?script=sci_arttext&pid=S1688-12492021000101401&lng=es.

3. Patel, B. Insuficiencia ventilatoria—Cuidados críticos. Manual MSD versión para profesionales. Manual MSD . 2022 [citado 2024 Ago 20] https://www.msdmanuals.com/es/professional/cuidados-cr%C3%ADticos/insuficiencia-respiratoria-y-ventilaci%C3%B3n-mec%C3%A1nica/insuficiencia-ventilatoria

4. Salvador M A, Martínez-Verdasco A, Carpio C, Agustín F. Insuficiencia respiratoria crónica. Medicine - Programa de Formación Médica Continuada Acreditado. Dialnet. 2018 [citado 2024 Ago 20] 12(66). https://dialnet.unirioja.es/servlet/articulo?codigo=6713104

5. Bernal-Sprekelsen M, Avilés-Jurado F X, Álvarez Escudero J, Aldecoa Álvarez-Santuyano C. Documento de consenso de la Sociedad Española de Medicina Intensiva, Crítica, y Unidades Coronarias (SEMICYUC), la Sociedad Española de Otorrinolaringología y Cirugía de Cabeza y Cuello (SEORL-CCC) y la Sociedad Española de Anestesiología y Reanimación (SEDAR) sobre la traqueotomía en pacientes con COVID-19. Acta Otorrinolaringologica Espanola. Dialnet. 2020. 44(8), https://dialnet.unirioja.es/servlet/articulo?codigo=7733073

6. De Arco-Canoles OC, Suarez-Calle ZK. Rol de los profesionales de enfermería en el sistema de salud colombiano. Univ. Salud . 2018 [citado 2024 Aug 20] ; 20(2): 171-182. http://www.scielo.org.co/scielo.php?script=sci_arttext&pid=S0124-71072018000200171&lng=en.

7. Álvarez Guerrero M, Guamán Méndez SA, Quiñonez Cuero JV. Cuidados de Enfermería en pacientes con ventilación mecánica invasiva en la Unidad de Cuidados Intensivos Pediátricos. RevistaHCAM. 2019 [citado 2024 Aug 20] ; 18(1), 96-110.. https://revistahcam.iess.gob.ec/index.php/cambios/article/download/392/285?inline=1

8. Herdman T, Kamitsuru S, Lopes C. Diagnósticos enfermeros. Definiciones y clasificación 2021-2023. Dialnet. 2021 [citado 2024 Aug 20] ; 18(1), 96-110.. https://dialnet.unirioja.es/servlet/libro?codigo=839983

9. Gouveia E, de Medeiros Araújo JN, Barbosa da Silva A, Barbosa de Sousa Alves DL. Concept Analysis of the Nursing Diagnosis of Impaired Spontaneous Ventilation in Critical Patients. Dialnet. 2023 [citado 2024 Aug 20] ; 23(3). https://dialnet.unirioja.es/servlet/articulo?codigo=9198968

10. Dezube R. Intercambio de oxígeno y dióxido de carbono—Trastornos del pulmón y las vías respiratorias. Manual MSD versión para público general. Manual MSD. 2023 [citado 2024 Aug 20]. https://www.msdmanuals.com/es/hogar/trastornos-del-pulm%C3%B3n-y-las-v%C3%ADas-respiratorias/biolog%C3%ADa-de-los-pulmones-y-de-las-v%C3%ADas-respiratorias/intercambio-de-ox%C3%ADgeno-y-di%C3%B3xido-de-carbono

11. Butcher H, Bulechek G, Dochterman J, Wagner, C. Clasificación de Intervenciones de Enfermería (NIC).. 2018 . https://www.academia.edu/37376104/CLASIFICACION_DE_INTERVENCIONES_DE_ENFERMERIA_NIC

12. Dantas JR, Almeida AT, Matias KC, Fernandes MI. Accuracy of the nursing diagnosis of ineffective airway clearance

in intensive care unit patients. Rev Bras de Enf. 2023. https://www.scielo.br/j/reben/a/RXZkhDfKFk6N4xFQ7TphKMg/abstract/?format=html&lang=en

13. Chapoñan J. Proceso de atención de enfermería aplicado en paciente con Insuficiencia Respiratoria – Neumonía.. 2019. https://repositorio.uss.edu.pe/bitstream/handle/20.500.12802/6311/Chapo%C3%B1an%20Lopez%20Jhonatan%20Josue.pdf?sequence=1&isAllowed=y

14. Cortes-Telles A, Che-Morales JL, Ortiz-Farías DL. (2019). Estrategias actuales en el manejo de las secreciones traqueobronquiales.. 2019 [citado 2024 Aug 20]. 78(3), https://www.scielo.org.mx/scielo.php?script=sci_arttext&pid=S0028-37462019000300313

15. Balcázar M, Salazar W, Ramos D. Validación de una guía de cuidados de Enfermería para la prevención de neumonía en pacientes en estado crítico con ventilación mecánica en la UCI de un hospital nacional. Univ Peru Cayet Hered. 2018 [citado 2024 Aug 20]. https://repositorio.upch.edu.pe/handle/20.500.12866/6549

16. Íñiguez F. Terapia inhalatoria en pacientes que reciben Ventilación mecánica. Researchgate. 2018. 13(4). https://www.researchgate.net/publication/328529265_Terapia_inhalatoria_en_pacientes_que_reciben_ventilacion_mecanica

17. Gómez Cruz GL. Deterioro de la movilidad física y su influencia en el autocuidado del adulto mayor en el Centro de Educación Integral Melvin Jones, La Libertad-Santa Elena, 2020—2021.. 2021 [citado 2024 Aug 20]. https://repositorio.upse.edu.ec/handle/46000/6043

18. Espina MC, Sarmiento MV, Pereira H. ¿Influye la fiebre en la saturación de oxígeno de los niños? Un estudio observacional de centro único a 2800 msnm. Researchgate.. 2022 [citado 2024 Aug 20]. https://www.researchgate.net/publication/366295949_Influye_la_fiebre_en_la_saturacion_de_oxigeno_de_los_ninos_Un_estudio_observacional_de_centro_unico_a_2800_msnm

19. Rodríguez Díaz JL, Cobos Echeverría DF, Romero Salas PJ, Parcon Bitanga M. Análisis cuantitativo, uso de Escala Braden por enfermería en el servicio de Medicina Interna del Hospital Santo Domingo. Enfermería actual en Costa Rica. Rev UCR. 2020. https://revistas.ucr.ac.cr/index.php/enfermeria/article/view/38725

20. Arantón-Areosa L, Rumbo-Prieto JM. Concepto de deterioro de la integridad cutánea y tisular como diagnóstico enfermero. Dialnet. 2023. https://dialnet.unirioja.es/servlet/articulo?codigo=8975829