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Clinical evolution of nursing outcome indicators in patients with ineffective breathing pattern

Evolução clínica dos indicadores de resultados de enfermagem em pacientes com padrão respiratório ineficaz

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ABSTRACT

The aim of this study was to evaluate the clinical evolution of nursing outcome indicators in patients with Ineffective Breathing Pattern, through the Nursing Outcomes Classification. This is a prospective longitudinal study carried out in a university hospital, with 25 patients with lung diseases who were followed-up with for three days or until hospital discharge. The nursing outcome indicators Respiratory Status, Fatigue Level and Anxiety Level were assessed using propaedeutic techniques of respiratory assessment and a five-point Likert scale, according to the Nursing Outcomes Classification. When the averages of all indicators were grouped, there was a significant improvement in the mean (p<0.001), in the comparison between the first and last assessment, with emphasis on Coughing (p=0.017) and Verbalized anxiety (p=0.013). Dyspnea showed a statistically significant improvement (p=0.017) in the daily assessment. It was observed that the Nursing Outcomes Classification makes it possible to measure the clinical evolution of patients' results, as well as the degree of impairment of the respiratory pattern.

Descriptors: Nursing Diagnosis; Respiratory System; Outcome Assessment, Health Care.

RESUMO

O objetivo deste estudo foi avaliar a evolução clínica dos indicadores de resultados de enfermagem em pacientes com Padrão Respiratório Ineficaz, através da *Nursing Outcomes Classification*. Trata-se de estudo longitudinal prospectivo realizado em hospital universitário, com 25 pacientes com doenças pulmonares, que foram acompanhados durante um período de três dias ou até alta hospitalar. Os indicadores dos resultados de enfermagem Estado Respiratório, Nível de Fadiga e Nível de Ansiedade foram avaliados utilizando técnicas propedêuticas de avaliação respiratória e escala Likert de cinco pontos, conforme a *Nursing Outcomes Classification*. Quando agrupadas as médias de todos os indicadores, observou-se evolução de melhora significativa na média (p<0,001), na comparação entre a primeira e última avaliação, destacando-se Tosse (p=0,017) e Ansiedade verbalizada (p=0,013). A Dispneia obteve melhora estatisticamente significativa (p=0,017) na avaliação diária. Observou-se que a *Nursing Outcomes Classification* possibilita mensurar a evolução clínica dos resultados dos pacientes, bem como o grau de comprometimento do padrão respiratório.

Descritores: Diagnóstico de Enfermagem; Sistema Respiratório; Avaliação de Resultados em Cuidados de Saúde.

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INTRODUCTION

Respiratory diseases represent the second cause of morbidity, thus being an important public health problem. Chronic Obstructive Pulmonary Disease (COPD) and respiratory infections will be among the top five causes of death in 2030, mainly due to the continuous exposure to risk factors, with pollution and smoking standing out, in addition to the aging of the world population[1,2]. This ends up raising hospitalization costs and causing prolonged hospitalizations[1,2].

The most common signs and symptoms related to respiratory diseases include dyspnea, cough, sputum, hemoptysis, chest pain and hoarseness. Physical examination also shows cyanosis, clubbing, changes in the rib cage, breathing pattern, expandability, thoracic vocal fremitus and auscultation sounds. As for laboratory tests, the most frequent findings are changes in arterial blood gases and hematocrit. These are the clinical indicators of nursing diagnoses (NDs) related to the respiratory system, to which environmental or physiological factors may be associated[3,4].

In these clinical conditions, the Ineffective Breathing Pattern ND is likely to occur, this ND having been identified as prevalent in adult and elderly populations[5,6]. Respiratory diagnoses are a priority as they directly affect tissue oxygenation. These are health problems that require direct care, through permanent assessment and quick and resolving nursing interventions[7]. The identification of the state of the ND, before and after the implementation of interventions, is essential, since it favors the definition of nursing goals with a focus on the outcomes.

The Nursing Outcomes Classification (NOC) comprises the patient's states, behaviors, reactions and feelings, before and after nursing interventions. Each nursing outcome (NO) has a title, numeric code, definition and clinical indicators that are measured by five-point Likert scales, which make it possible to monitor the improvement, worsening or stagnation of patient's condition during a care period[8].

A recent literature review identified 21 articles that addressed the NOC under different approaches: translation and cultural adaptation of NOs and their indicators (4.77%); applicability in clinical practice (33.33%); and validation of its elements (63.90%)[9]. Among the studies that addressed the applicability of NOC in clinical practice, only one used NOs to assess patients with Ineffective Breathing Pattern, and the study sample consisted only of children with congenital heart disease[9]. As respiratory problems are related to the occurrence of different NDs[10,11], research on the clinical evolution of NO indicators related to the Ineffective Breathing Pattern of adult patients with lung diseases, becomes relevant.

Thus, this study was conceived as an effort to close the gaps found in the literature involving nursing classifications, more specifically on the Ineffective Breathing Pattern ND. It will enable a standardized clinical assessment approach, focused on the outcomes of patients with respiratory problems, and will contribute to innovate the clinical reasoning during the implementation of the nursing process (NP). In addition, it is believed that the construction of evidence from the use of the NOC fosters the accurate assessment of patient's health status and helps to verify the effectiveness of the interventions performed, thus impacting in time of hospitalization and consequently in hospital costs.

In this sense, the study seeks to answer the question: Are the NO indicators of the NOC shown to be sensitive to changes in the clinical status of patients with ineffective breathing pattern? Accordingly, the objective of this study was to evaluate the clinical evolution of NO indicators in patients with Ineffective Breathing Pattern, through the NOC.

METHODS

This is a prospective longitudinal study carried out with patients with respiratory diseases admitted to clinical units of a university hospital in southern Brazil. This institution is accredited by the Joint Commission International and provides high-complexity treatment in more than 60 specialties to its own and referred patients. There is a computerized NP, used as a working method, which adopts the terminology of NANDA International (NANDA–I)[12] for the ND stage and the Nursing Interventions Classification[13] for the prescribed care.

The sample calculation considered the outcome of improvement of the NO indicators and considered a difference of 0.5 in the score of the NOC indicator scales, with a power of 90% and an alpha error of 1%, and a standard deviation between the scores of 0.7, obtaining a minimum of 17 patients, plus 20% of possible losses during the follow-up. Thus, the sample consisted of 25 patients selected for convenience, through an active search in inpatient units. Adult patients of both sexes were included, admitted within the last 48 hours, with Ineffective Breathing Pattern ND recorded in medical records; and medical diagnosis of respiratory disease. Patients were excluded if they had, at the recruitment stage, unstable hemodynamic status or other pathologies (renal or motor) that could confuse the specific clinical picture of respiratory diseases, as well as those who presented limitations that would make communication and interaction with researchers impossible.

The variables selected to assess the clinical evolution of patients were extracted from three NOs of the NOC: Respiratory Status (0415), Fatigue Level (0007) and Anxiety Level (1211)[8]. These outcomes were selected by nurse researchers linked to the research project, with experience in caring for patients with respiratory disorders and using the NOC. Thus, considering the title and definition,

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patients selected were those who had a recommendation for assessing the scoped diagnosis[8]. It is worth noting the NOC recommendation to choose outcomes and indicators that are relevant to the care context in which they will be applied[8].

The following indicators were selected to assess the NO Respiratory Status (0415): Respiratory Rate (041501), Auscultated Breath Sounds (041504) and Oxygen Saturation (041508), and were operationally defined according to a scale ranging from Severe Deviation from normal range to No deviation from normal range. The indicators Fever (041530), Coughing (041531) and Cyanosis (041513), in turn, were assessed according to the Severe to None scale. The indicators Dyspnea at rest (041514), Dyspnea with mild exertion (041515), Diaphoresis (041518), Accessory muscle use (041510) and Chest retraction (041511) were operationalized under a single indicator, in order to reduce the subjectivity of clinical assessment. This indicator, called *Dyspnea*, is considered to represent a respiratory difficulty resulting from increased muscular work which, as a response of the central nervous system to physical stress, can cause diaphoresis and could be one of the first signs of a respiratory dysfunction in progress[7].

The NO Fatigue Level (0007) was assessed using the Severe to No deviation scale by the indicators Muscle Pain (000711) and Joint Pain (000712), focusing on the presence of chest pain, considering that changes in breathing pattern and pain may increase the level of respiratory muscle fatigue[14].

Finally, the NO Anxiety Level (1211) was assessed according to the Verbalized Anxiety (121117) and Sleep disturbance (121129) indicators, also using the Severe to None scale.

All of these indicators were inserted in a data collection instrument structured in two parts: the first with sociodemographic data and history of the current health problem, and the second aimed at assessing the clinical evolution of NO indicators. A conceptual and operational definition describing the assessment procedure was constructed for each indicator. In addition, the instrument contained the day of the assessment, the magnitude of the operational definition stratified in five points in the form of a Likert scale according to the NOC, where "1" corresponds to the worst and "5" to the best score. The last column was intended for registration in case of "not applicable". At the end of the instrument, there was space for recording observations.

The instrument was developed using Sphinx Software® and was tested in a pilot study to standardize data collection. Patients assessed during the pilot were not included in the sample. The survey was carried out using tablets and the information was automatically transferred to a database. Data collection was carried out from August 2016 to February 2017, by a pair of nursing students who were part of a research group on nursing classifications. They received a total of 16 hours of training, conducted by the researchers, to standardize collection and minimize measurement bias.

Data collection was carried out after confirmation of the ND and medical diagnosis through the reading of the medical record. It started within 48 hours after admission of the patient and was followed by assessments carried out with periods of 24 h between them. After obtaining informed consent and signing the Informed Consent Form (ICF), the instrument was filled out based on interviews with the patient, and the application of propaedeutic techniques for physical examination of the respiratory system. Additionally, the nursing care prescribed for this ND was collected from the electronic nursing prescription system. The patients continued to be assessed daily, for a period of three days or until hospital discharge, to observe the variation in the indicator scores.

Data analysis was performed using the IBM Statistical Package for the Social Sciences (SPSS) version 21 for Windows. Continuous variables were described as mean and standard deviation or median and interquartile ranges. Categorical variables were described as absolute numbers and relative frequencies. The paired t-test was used to compare the indicator scores on the first and last day of assessment. To compare the daily averages of the indicators, the Generalized Estimating Equations (GEE) model was used. The Bonferroni post hoc test was used to indicate the difference between days. A two-tailed $p < 0.05$ was considered statistically significant.

The study was approved by the Institutional Research Ethics Committee, under opinion no. 110601. The participants signed an informed consent in two copies. The provisions of Resolution no. 466/2012 of the National Health Council were met.

RESULTS

The study involved 25 patients with respiratory diseases and a total of 95 clinical assessments. Of these patients, 20 (80%) were assessed during the maximum period of four days of follow-up.

The sample consisted predominantly of female patients (n=6, 64%), white (n=21, 84%) and with a mean age of 64 years (standard deviation of 7.4). Only four (16%) patients reported previous smoking. COPD was the most prevalent respiratory disease (n=15, 60%), followed by bronchopneumonia (n=5, 20%). Dyspnea (n=7, 28%) and airway infection (n=4, 16%) were the most frequent reasons for hospitalization. Regarding the associated comorbidity, 13 patients (52%) had cardiovascular diseases.

Table 1 compares the first and last NO indicator assessments for patients with Ineffective Breathing Pattern. Highlighting Coughing (p=0.017) and Verbalized Anxiety (p=0.013), there was evolution of a significant improvement

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in mean (p<0.001) when the means of all the assessed indicators were grouped.

Table 2 shows the daily mean of scores of the NO indicator assessed in patients with Ineffective Breathing Pattern. There was a significant improvement in the Dyspnea indicator (p=0.017), which showed a significant increase in the mean from the third to the fourth assessment. There was also a significant improvement from the 1st to the 3rd and 4th days, the latter two not differing from each other.

Table 3 shows the nursing care prescribed by nurses for the patients involved in the study, according to the day of assessment of NO indicators. The most frequent care on every assessment day was "Communicate signs of pain" (40%), followed by "Implement oxygen therapy – breathing tube" (32%).

DISCUSSION

This study investigated the clinical evolution of NO indicators in patients with Ineffective Breathing Pattern, aiming to deepen the use of NOC in the real clinical environment. This was a pioneering study that tested the

Table 1. Comparison between the first and last assessment of NO indicators for patients with Ineffective Breathing Pattern. Porto Alegre, RS, 2017.

Variable	First Assessment	Last Assessment	Difference (CI 95%)	p
NO indicators*	3.92±0.09	4.18±0.07	0.26 (0.15 to 0.37)	<0.001
Respiratory rate (041501)	4.48±0.15	4.76±0.09	0.28 (-0.09 to 0.65)	0.129
Auscultated breath sounds (041504)	3.16±0.24	3.28±0.25	0.12 (-0.30 to 0.54)	0.559
Oxygen saturation (041508)	4.32±0.18	4.56±0.10	0.24 (-0.10 to 0.58)	0.161
Fever (041530)	4.88±0.12	5.00±0.00	0.12 (-0.13 to 0.37)	0.327
Coughing (041531)	2.84±0.22	3.20±0.19	0.36 (0.07 to 0.65)	0.017
Cyanosis (041513)	3.68±0.12	3.68±0.14	0.00 (-0.12 to 0.12)	1.000
Dyspnea	3.32±0.25	3.44±0.25	0.12 (-0.15 to 0.39)	0.376
Thoracic pain	4.64±0.20	4.76±0.14	0.12 (-0.26 to 0.50)	0.524
Verbalized anxiety (121117)	3.72± 0.30	4.44±0.25	0.72 (0.17 to 1.27)	0.013
Sleep disturbance (121129)	4.12±0.27	4.64±0.20	0.52 (-0.05 to 1.09)	0.073

Student's t-test for paired samples. Numbers expressed as mean±standard deviation.
*Indicators of NOs followed by codes suggested by the taxonomy NOC.

Table 2. Daily means of NO indicators for patients with Ineffective Breathing Pattern. Porto Alegre, RS, 2017.

NO Indicator*	1st D	2nd D	3rd D	4th D	p
Respiratory rate (041501)	4.48±0,15	4,56±0,14	4,44±0,18	4,80±0,09	0,321
Auscultated breath sounds (041504)	3.16±0.24	3.16±0.24	3.24±0.24	3.40±0.27	0.668
Oxygen saturation (041508)	4.32±0.18	4.44±0.13	4.64±0.10	4.55±0.11	0.293
Fever (041530)	4.88±0.12	4.92±0.05	4.92±0.08	5.00±0.00	0.333
Coughing (041531)	2.84±0.22	3.20±0.23	3.24±0.21	3.25±0.19	0.069
Cyanosis (041513)	3.68±0.12	3.56±0.15	3.68±0.14	3.70±0.14	0.721
Dyspnea	3.32±0.25[ab]	3.48±0.26[ab]	3.32±0.24[a]	3.60±0.28[b]	0.017
Thoracic pain	4.64±0.20	4.72±0.19	4.72±0.16	4.85±0.11	0.462
Verbalized anxiety (121117)	3.72±0.30	4.08±0.29	4.00±0.32	4.30±0.29	0.234
Sleep disturbance (121129)	4.12±0.27	4.44±0.19	4.44±0.20	4.55±0.24	0.476

Generalized Estimating Equations (GEE) model; Numbers expressed as mean ± standard deviation.
[a,b]Same letters mean no differences according to Bonferroni test at 5% significance.
*NO indicators followed by codes suggested by the NOC taxonomy.

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clinical applicability of these NOs and indicators in adult patients with lung diseases, assessing the evolution of the patient's condition according to the NOC.

Respiratory diseases make up five of the 30 most common causes of death, with COPD being the third and respiratory tract infection the fourth cause. Altogether, more than a billion people suffer from acute or chronic respiratory conditions[15]. It is noteworthy that in this study, corroborating the literature[16,17], COPD was the prevalent diagnosis in patients, followed by bronchopneumonia. In addition, dyspnea symptoms were among the most frequent reasons for the hospitalization of the sample patients, corroborating data from a study that analyzed the associations between discriminators of the Manchester Screening System and NDs in adult patients classified with clinical priority, with Ineffective Breathing Pattern also being the most prevalent[18].

The NOs Respiratory Status, Fatigue Level and Anxiety Level, and their respective indicators, were assessed four consecutive days during patient hospitalization. When assessing these clinical indicators in accordance with NOC recommendations, the evolution of all the addressed NOs can be observed (p<0.001), highlighting Cough and Verbalized Anxiety. However, of all the indicators, only Dyspnea showed a statistically significant improvement when considering the evolution of the four assessments. It is important to highlight that the NOC considers the maintenance of an already adequate status to be positive[8], which is the case of the indicators under study, since many patients had good initial scores.

In the assessment of the Coughing indicator, considering the four days of assessment, there was a progressive improvement, with a mean that showed a magnitude of two in the initial assessment, representing cough with purulent secretion, and that migrated to position three of the Likert scale, defined as cough with mucous secretion. Although there is no significant difference in the four days

of assessment, considering the change in magnitude there is an important clinical improvement. When comparing the first and last days, there is a statistically significant improvement. Likewise, the Verbalized anxiety indicator showed a significant improvement when comparing the first and fourth days of assessment, changing the mean magnitude of three, Anxiety of moderate intensity, to a magnitude of four, Anxiety of weak intensity.

The Ineffective Breathing Pattern ND is defined in Taxonomy II of NANDA–I[12] as "inspiration and/or expiration that does not provide adequate ventilation", with Dyspnea being one of the defining characteristics of this ND. In this study, dyspnea (n=7, 28%) was the most frequent reason for hospitalization. Dyspnea was also the indicator that showed the best evolution in the assessments (p=0.017). The Anxiety indicator also showed significant improvement when comparing the first and the last assessment. It is noteworthy that Anxiety is a related factor of the ND in question. Cough, however, is not a symptom included in this ND according to the NANDA–I classification, but its inclusion in the taxonomy has already been suggested[3]. Thus, dyspnea, cough and anxiety are elements taken into account in the clinical reasoning that supports the decision-making on the Ineffective Breathing Pattern ND in this population. In this sense, the findings of this study demonstrated the importance of an accurate assessment of the respiratory pattern, indicating the evolution of the patient according to the NOC, favoring the implementation of NP and standardized language systems in clinical practice.

Regarding the nursing prescription, it was observed that "Communicate signs of pain" (40%), and "Implement oxygen therapy – breathing tube" (32%) were the most frequent. Chest pain is considered common in patients with respiratory problems[11]. Assessments of pain intensity that are performed and recorded systematically contribute to effective management in the cessation of the painful phenomenon[19]. It is believed that the fact that pain is part of the control of

Table 3. Nursing care prescribed according to the assessment day. Porto Alegre, RS, 2017.

Nursing prescription	1st D	2nd D	3rd D	4th D
Communicate signs of pain	10 (40)	12 (48)	13 (52)	12 (48)
Implement oxygen therapy – breathing tube	8 (32)	8 (32)	7 (28)	5 (25)
Communicate changes in ventilatory pattern	4 (16)	5 (20)	5 (20)	5 (25)
Keep headboard elevated	3 (12)	3 (12)	2 (8)	2 (10)
Implement oxygen therapy – CPAP	3 (12)	2 (8)	2 (8)	1 (5)
Implement oxygen therapy – Venturi Mask	1 (4)	3 (12)	2 (8)	-
Stimulate sputum	1 (4)	1 (4)	1 (4)	1 (5)
Implement oxygen therapy – nasal catheter	1 (4)	1 (4)	1 (4)	1 (5)

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vital signs, was decisive for this indicator to remain stable during hospitalization, with a magnitude above four points on the Likert scale in the four days of assessment.

Oxygen therapy is a treatment modality recommended for patients with hypoxia resulting from respiratory problems. Despite being essential to life, oxygen, like any medication, when administered improperly, can be toxic and cause clinical damage. Good practices in care with oxygen therapy are important; humidification is important when applying therapies involving the use of catheters or breathing tubes, for example, since dryness or bleeding of the nasal mucosa may occur[20]. This may have positively influenced the improvement of the outcomes of the patients, mainly with regard to dyspnea.

It should be noted that in the study institution, care related to vital signs and pulse oximetry is recommended for all hospitalized patients, with the exception of special cases. In addition, Table 3 shows that the frequency of nursing prescription decreases as the mean of patient's outcomes improves (Table 2). It is believed that the improvement of several indicators has also contributed to the evolution of the Verbalized anxiety indicator, a human response to coping/tolerating stress in hospitalized patients[21]. Although the interventions were not sufficient for all patients to reach the ideal score of five, the clinical evolution of the NO indicators in patients with Ineffective Breathing Pattern was satisfactory, and none of the indicators assessed showed clinical worsening, when comparing the first and last assessments (Table 1). This indicates the patients' progression in terms of nursing outcomes. The nurse's clinical reasoning makes it possible to determine assertive interventions as the breathing pattern stabilizes or improves.

A study limitation was the monitoring of patients only at the hospital. A follow-up that includes the outpatient setting or the patient's home after discharge could deepen the outcomes and, through the implementation of other interventions, could allow patients to achieve a score of five on the Likert scales. The small sample studied can be also pointed out as a study limitation, as well as not having assessed other associations of these indicators with the use of antibiotics or other medications/treatments. For these reasons, the generalization of these findings should be done with caution.

The findings of this study indicated the possibility of using the NO indicators of the NOC for the clinical assessment of patients hospitalized with the Ineffective Breathing Pattern ND. In addition, the NOC can favor the early identification of the degree in which the health of each patient is compromised, and enable the implementation of care to achieve the desired outcomes. It also favors the clinical reasoning by determining changes in patient's health status as a result of nursing interventions, at intervals defined according to clinical judgment and nursing prescription[8,9].

CONCLUSION

When the means of all the assessed indicators were grouped, there was a significant improvement in the mean (p<0.001), when comparing the first and last assessment, with emphasis on Coughing (p=0.017) and Verbalized Anxiety (p=0.013). Dyspnea showed a statistically significant improvement (p=0.017) in the daily assessment. In this sense, the NOC makes it possible to measure the clinical evolution of patient outcomes, as well as the degree of impairment of the respiratory pattern.

These findings allowed for the conclusion that the NOC, by means of its NO, indicators and Likert scales, was sensitive to the clinical evolution of the patients, making it possible to demonstrate the degree of impairment of health status, represented in this study by the respiratory pattern. The prescribed nursing care possibly contributed to this improvement, in addition to the treatment offered by other health professionals such as doctors and physiotherapists, extrapolating the use of these measures even to verify the effects of the outcomes of multi-professional interventions.

The adequacy of the indicators for assessing the studied population was confirmed. However, it is suggested keeping these indicators monitored after hospital discharge, in addition to other indicators that assess knowledge and health behaviors related to the control of respiratory diseases, which can corroborate the analysis of these clinical indicators. This research focused clinical patients, but these indicators can be tested with other populations and in other environments to verify the range of assessments.

Nursing has investigated best clinical practices and innovative tools to support the care plan. Thus, the findings of this study bring contributions to research, teaching and clinical practice. The use of the indicators assessed in this research can support other studies, along with building knowledge about the theme. In teaching, this investigation can contribute to the use of these indicators in theoretical and practical courses on the care of patients with respiratory diseases, since they are fundamental tools to estimate the goals of nursing care. In clinical practice, it can foster the drafting of protocols that favor care planning, which can reduce complications arising from the disease as well as increase the monitoring of clinical indicators. It is believed that this data set can assist in hospital management, corroborating the best care practices. This is relevant, because at the bedside nurses can initiate, adjust or suspend interventions, according to the worsening, stabilization or improvement of the patient under their care, supported by evidence-based practice.

This research is a pioneer in using the NOC in the assessment of hospitalized adult patients with respiratory diseases. It is understood that the NOC allows for a standardized and individualized assessment, since it

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assesses the degree of commitment of each indicator separately, allowing to carry out the planning of assistance according to each characteristic presented. Based on these findings, the applicability of the NOC may be viable in the NP of health institutions, improving the safety of diagnostic assessments, as well as the effectiveness of care after nursing interventions.

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