# NURSING OUTCOMES FOR INEFFECTIVE BREATHING PATTERNS AND IMPAIRED SPONTANEOUS VENTILATION IN INTENSIVE CARE

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#### **ABSTRACT**

This study aimed to validate the results of Nursing selected from the link NANDA-I-NOC (Nursing Outcomes Classification – NANDA – International) for diagnosis Ineffective Breathing Pattern and Impaired Spontaneous Ventilation in adult intensive care unit. This is a content validation study conducted in a university hospital in southern Brazil, with 15 expert nurses with clinical experience and knowledge of the ratings. The instruments contained five-point Likert scales to rate the importance of each outcome (1st step) and indicator (Step 2) for the diagnoses studied. We calculated weighted averages for each outcome / indicator, considering: 1 = 0.2 = 0.25, 3 = 0.50, 4 = 0.75 and 5 = 1. The outcomes suggested by the NOC with averages above 0.8 were considered validated, as well as the indicators. The results Respiratory State – airway permeability (Ineffective Breathing Patterns) and 11 indicators, and Response to mechanical ventilation: adult (Impaired Spontaneous Ventilation) with 26 indicators were validated.

Descriptors: Nursing. Nursing process. Nursing diagnosis. Classification. Outcome assessment (health care).

#### **RESUMO**

Este estudo objetivou validar os resultados de enfermagem selecionados a partir da ligação NOC-NANDA-I (Nursing Outcomes Classification — North American Nursing Diagnosis Association — International) para os diagnósticos Padrão Respiratório Ineficaz e Ventilação Espontânea Prejudicada em unidade de terapia intensiva. Estudo de validação de conteúdo, realizado em hospital universitário brasileiro, com 15 enfermeiros com experiência clínica e conhecimento das classificações. Os instrumentos continham escalas Likert de cinco pontos para atribuição do julgamento quanto à importância de cada resultado (1ª etapa) e indicador (2ª etapa) aos diagnósticos. Calcularam-se as médias ponderadas considerando: 1= 0; 2 = 0,25; 3 = 0,50; 4 = 0,75 e 5 = 1. Os Resultados sugeridos pela NOC com médias superiores a 0,8 foram considerados validados, assim como os indicadores. Validaram-se os resultados Estado Respiratório – permeabilidade das vias aéreas (Padrão Respiratório Ineficaz) e 11 indicadores, e Resposta à ventilação mecânica: adulto (Ventilação Espontânea Prejudicada), com 26 indicadores.

**Descritores:** Enfermagem. Processos de enfermagem. Diagnóstico de enfermagem. Classificação. Avaliação de resultados (cuidados de saúde).

Título: Resultados de enfermagem para padrão respiratório ineficaz e ventilação espontânea prejudicada em terapia intensiva.

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## RESUMEN

Este estudio tuvo como objetivo validar los resultados de enfermería seleccionados en el enlace de NOC-NANDA-I (Nursing Outcomes Classification — NANDA -International) para los diagnósticos Estándar Respiratorio Ineficaz y Ventilación Espontanea con Discapacidad en la unidad de cuidados intensivos para adultos. Este es un estudio de validación de contenido realizado en un hospital universitario en el sur de Brasil, con 15 enfermeros expertos con experiencia clínica y el conocimiento de las votaciones. Los instrumentos contenían escalas Likert de cinco puntos para el premio de juicio en cuanto a la importancia de cada resultado (Paso 1) y el indicador (Paso 2) de los diagnósticos estudiados. Se calcularon promedios ponderados para cada resultado / indicadores, teniendo en cuenta: 1 = 0, 2 = 0.25, 3 = 0.50, 0.75 y 4 = 5 = 1. Los resultados sugieren la Nursing Outcomes Classification con promedios por encima de 0.8 se considera validado, así como indicadores. Validado el resultado Respiratorio Estado – permeabilidad vía aérea (Estándar Respiratorio Ineficaz) y 11 indicadores, y la Respuesta a la ventilación mecánica: Adulto (Ventilación Espontánea con Discapacidad) con 26 indicadores.

**Descriptores:** Enfermería. Procesos de enfermería. Diagnóstico de enfermería. Clasificación. Evaluación de resultado (atención de salud).

**Título:** Resultados de enfermería para estándar respiratorio ineficaz y ventilación espontánea con discapacidad en cuidados intensivos.

## INTRODUCTION

Nursing is essentially a caring profession, and this care that today inspires nurses and researchers to assess the effectiveness of each one of their actions <sup>(1)</sup>. At a time when Nursing produces an increasing amount of knowledge, the practice of evaluating nursing interventions at the patients, family members or the community is consistent with this trend.

Just like caring is in our nature, the Nursing Process is a tool to work in the organization, planning, execution and assessment of this action (2). The use of taxonomies in the Nursing Process helps to standardize nursing records around the world (3). Among the existing taxonomies, it is worth mentioning the NANDA International (NANDA-I)(4), as a Classification of Nursing Diagnoses, the Nursing Interventions Classification (NIC)(5), and the Nursing Outcomes Classification (NOC)(6). These three classifications can be used simultaneously.

The A NOC displays the outcomes related to patient conditions, behaviors or perceptions of nursing care, which are assessed by specific indicators. These results are closely related to the Nursing Diagnoses of NANDA-I and appear as *additional associated* or *suggested* outcomes to a particular diagnosis given to the patient. Thus, the NOC taxonomy can be used in combination with NANDA-I diagnoses in care planning<sup>(6)</sup>.

In a university hospital in southern Brazil, nurses perform the nursing process in their daily practice, and most patient records are already computerized. This system includes periodically updated NANDA-I nursing diagnoses based on Wanda de Aguiar Horta's Theory of Basic Human Needs<sup>(7)</sup>, as well as NIC interventions, which has become a reference for nursing care for computer systems since 2005. Only the step of nursing outcomes, recorded in the daily evolution of the patient, does not observe a standardized terminology. Therefore, studies on the NOC may facilitate their insertion in the computer system, complementing the classifications used in the different steps of the Nursing Process<sup>(8)</sup>.

The present study is part of a wider project aimed to implement the NOC in to the computerized system of the university hospital, to contribute to improving the quality of nursing care in the institution and nursing research as a whole.

In this scenario, a survey conducted in the three intensive care units showed the following nursing diagnoses: Ineffective Breathing Pattern and Impaired Spontaneous Ventilation as the most prevalent diagnoses related to psychobiological need of oxygenation (8). Ineffective Breathing Pattern is defined by NANDA-I as "Inspiration and/or expiration that does not provide adequate ventilation" and the Impaired Spontaneous Ventilation diagnosis is defined as "Energy reserves decreased, resulting in an inability of the individual to maintain proper breathing to sustaining life" (4). The NOC classification has, respectively, six and four outcomes suggested for these diagnosis, beside 20 and 12 additional associated outcomes (6).

Other studies corroborate that lung diseases are a major cause of hospitalization of patients in intensive care units<sup>(9,10)</sup>. This fact justifies the selection of these diagnoses in the present study, which is aimed to validate the results of Nursing selected from the link NANDA-I-NOC (Nursing Outcomes Classification – NANDA -International) for diagnosis Ineffective Breathing Pattern and Impaired Spontaneous Ventilation in adult intensive care unit.

## **METHOD**

Cross-sectional study for evaluation of content validity conducted in three adult intensive care units of a university hospital in southern Brazil, between June 2010 and March 2011. The method of content validation proposed by Fehring was used(11). This method was developed for the validation of nursing diagnoses, and by analogy has been used for nursing outcomes. The author suggests a systematic evaluation of a content performed by carefully selected experts. This evaluation should define cutoff points, so that the priority and secondary contents, as well as contents to be discarded from the study, are listed. (11). Fifteen expert nurses who worked in the referred intensive care units participated in the study. The total population was composed of 53 professionals. The inclusion criteria were: have a minimum of two years relevant work experience; work for at least one year in the researched units using the assessed diagnoses in their daily practice; currently participates or has participated in study activities and updating on the Nursing Process at the institution for at least four months in the past five years, or have academic or scientific production in the area of Nursing Process or Nursing Classification.

Data collection occurred by means of completion of instruments composed of five-point Likert scales. In the first step of the study the nurses indicated in the scales their judgment regarding the importance of each *suggested* and *additional associated* outcome proposed by the NOC for each of the two diagnoses studied, with the degrees of importance defined in the scale as follows: 1=not important, 2= somewhat important, 3=moderately important. In the second step of indicator validation a similar instrument was created.

Descriptive statistics was used for data analysis, in which the weighted averages were calculated for each outcome/indicator, considering the following values of the Likert scale: 1 = 0; 2 = 0.25; 3 = 0.50; 4 = 0.75 and 5 = 1. Fehring<sup>(11)</sup> proposed the cutoff point for disposal below 0.50. The outcomes/indicators that obtained weighted average equal to or higher than 0.8 were considered priority, and those that obtained a weighted average between 0.50 and 0.79 were considered secondary, according to the author's proposal. Only the indicators of outcomes suggested by the NOC that were validated as priority were selected for the second step, that is, those that obtained a weighted average equal to or higher than  $0.8^{(11)}$ in the first step of the study, for each of the two diagnoses.

All ethical aspects were respected, and participants have signed the Free Informed Consent Form. This project was approved by the Research Ethics Committee of the involved institution under No. 100112.

## **RESULTS**

Fifteen nurses participated in the study, all female with a mean age around 30-34 years (40% of the participants). Among the experts the educational level was a master degree (13.22%), followed by a specialization (86.67%). Regarding the professional experience, most participants (60%) had between 4-9 years of work as nurse, and of these 66.67% have been working in the study institution for 1 to 5 years.

For the nursing diagnosis P Ineffective Breathing Pattern, of the 26 outcomes proposed by the NOC, five were considered priority, 17 secondary and four were discarded in the evaluation of the experts, as shown in Table 1. The outcomes are presented with their scores that consisted in the weighted average.

For the diagnosis Impaired Spontaneous Ventilation, of the 16 nursing outcomes proposed by the NOC, five were considered priority, seven secondary and four were discarded in the assessment of the nurses. The outcomes of this validation are shown in Table 2.

In the second step of the study validation of the indicators of nursing outcomes suggested by the NOC for the diagnoses that obtained a weighted average equal to or higher than 0.8 in expert evalu-

**Table 1** – Score of NOC *suggested* and *additional associated* Nursing Outcomes for the diagnosis Ineffective Breathing Pattern. Porto Alegre, RS, 2011.

REs for Ineffective Breathing Pattern (n=26)	Score
Respiratory status: airway permeability*	0.85
Electrolyte balance and acid-base	0.80
Severity of Infection	0.80
Cardiopulmonary status	0.80
Respiratory status	0.80
Respiratory status: ventilation*	0.73
Level of pain	0.72
Level of fatigue	0.72
Vital signs*	0.70
Respiratory status: gas exchange*	0.68
Response to mechanical ventilation – adult*	0.68
Severity of excessive intake of fluids	0.67
Neurological status – central motor control	0.65
Neurological status – autonomous	0.62
Smoking cessation	0.60
Weight loss	0.60
Level of anxiety	0.57
Risk management – infectious process	0.57
Level of discomfort	0.55
Weight – body mass	0.55
Weight maintenance	0.55
Pre-procedure preparation	0.53
Cognition	0.42
Systemic allergic reaction *	0.40
Self-management and control in asthma	0.38
Conservation of energy	0.35

<sup>\*</sup> Nursing Outcomes suggested by NOC for the diagnosis Ineffective Breathing Pattern.

ations was performed. For the diagnosis Ineffective Breathing Pattern only the outcome Respiratory Status: airway permeability meets this criterion. Table 3 shows the outcomes of the validation of NOC indicators for this criterion.

For the nursing diagnosis Impaired Spontaneous Ventilation only the outcome Response to Mechanical Ventilation: adult was included in the second step of the study because this was the only, among the assessed outcomes, which is *suggested* by the NOC for this diagnosis and obtained score equal to or higher than 0.8, being considered

priority. The findings of this validation are shown in Table 4.

## **DISCUSSION**

In this study we attempted to value the participation of nurses that have clinical practice in patient care on diagnoses studied in intensive care unit environment, considering the lack of specific criteria described in the literature regarding the selection of experts for such studies<sup>(12)</sup>. However, we noticed that the sample was composed

**Table 2** – Score of NOC *suggested* and *additional associated* Nursing Outcomes for the diagnosis Impaired Spontaneous Ventilation. Porto Alegre, RS, 2011.

(RS) Respiratory Status for Impaired Spontaneous Ventilation (n=16)	Score
Response to mechanical ventilation – adult*	0.88
Electrolyte balance and acid-base	0.88
Cardiopulmonary status	0.87
Respiratory status	0.85
Response to weaning from mechanical ventilation – adult	0.80
Respiratory status: gas exchange *	0.78
Respiratory status – ventilation*	0.75
Vital signs*	0.75
Post-procedure recovery	0.70
Neurological status – central motor control	0.68
Neurological status – awareness	0.63
Level of anxiety	0.62
Self-management of anxiety	0.43
Tolerance	0.43
Systemic allergic reaction	0.38
Conservation of energy	0.35

<sup>\*</sup> Nursing Outcomes  $\mathit{suggested}$  by the NOC for the diagnosis Impaired Spontaneous Ventilation

**Table 3** – Score of the Indicators proposed by the Nursing Outcome Respiratory Status – airway permeability related to the diagnosis Ineffective Breathing Pattern. Porto Alegre, RS, 2011.

RS: Respiratory status – airway permeability Indicators ( $n = 16$ )	Score
Ability to expel secretions	0.97
Respiratory frequency	0.95
Respiratory rhythm	0.95
Adventitious breath sounds	0.95
Use of accessory muscles	0.95
Cough	0.95
Accumulated respiratory secretions	0.95
Depth of inspiration	0.92
Dyspnea with mild exertion	0.92
Dyspnea at rest	0.90
Difficult breathing	0.80
Movements of nasal flaps	0.70
Anxiety	0.55
Fear	0.55
Suffocation	0.45
Agonizing breaths	0.45

**Table 4** – Score of the Indicators proposed for the Nursing Outcome Response to mechanical ventilation: adult related to the diagnosis Impaired Spontaneous Ventilation. Porto Alegre, RS, 2011.

RS: Response to mechanical ventilation: adult	Score
Indicators (n = 28)	
Respiratory frequency	1.00
Respiratory rhythm	1.00
Depth of inspiration	1.00
Inspiratory capacity	1.00
Current volume	1.00
Vital capacity	1.00
FiO <sub>2</sub> (fraction of inspired oxygen) that meets the demand of oxygen	1,00
PaO <sub>2</sub> (partial pressure of oxygen in arterial blood)	1.00
PaCO <sub>2</sub> (partial pressure of carbon dioxide in arterial blood)	1.00
Arterial pHl	1.00
Oxygen saturation	1.00
Peripheral tissue perfusion	1.00
Difficulty breathing with ventilator	1.00
Adventitious breath sounds	1.00
Atelectasis	1.00
Нурохіа	0.95
Unrest	0.95
Carbon dioxide removal	0.95
Pulmonary function tests	0.95
Chest X-ray results	0.95
Ventilation / perfusions balance	0.95
Asymmetrical movement of the chest wall	0.95
Asymmetrical expansion of the chest wall	0.95
Anxiety	0.95
Respiratory secretions	0.95
Pulmonary infection	0.92
Integrity of the skin impaired at the site of tracheostomy	0.45
Difficulty communicating needs	0.22

of qualified professionals who had knowledge about nursing classifications and were familiar with the computer system of the assessed institution, using such diagnoses in their day-to-day care activities.

Among the nursing outcomes validated as priority (with weighted average equal to or higher than 0.8) for the diagnosis Ineffective Breathing Pattern it should be noted that only Respiratory Status: airway permeability was *suggested* in the

NOC-NANDA-I link. Similarly, it was found that in the validation of outcomes for the diagnosis Impaired Spontaneous Ventilation that only the outcome Response to Mechanical Ventilation: adult was *suggested* in the referred connection. The outcome Respiratory Status: airway permeability is defined by NOC as "Tracheobronchial passage open and clean allowing gas exchange" and Response to Mechanical Ventilation: adult as "Exchange of gases between the alveoli and

tissue perfusion obtained by mechanical ventilation"<sup>(6)</sup>. Based on these definitions, and analyzing the other results validated for both diagnoses, it is inferred that nurses give the Impaired Spontaneous Ventilation diagnosis for patients using mechanical ventilation, while Ineffective Breathing Pattern is given to patients who do not use such technology. This inference is based on the selection of an outcome for assessing the interventions adopted based on a diagnosis given to such patient. It should be stressed that such outcomes are *suggested* in the NOC-NANDA- link, or else, they are closely related to the diagnoses assessed in this study.

The selection of outcomes that refer to the use of mechanical ventilation in the study environment is valid because this technology is frequently used in this scenario. Mechanical ventilation, undoubtedly essential in some cases, is also a matter of concern by the healthcare team, since it is the leading cause of pneumonia in patients undergoing this treatment (90% of pneumonias in intensive care units occur in patients receiving mechanical ventilation)(13). Surprisingly, the result Severity of Infection does not appear as suggested or additional associated outcome in the NOC-NANDA-I link for the diagnosis Impaired Spontaneous Ventilation, since sepsis is the leading cause of death in this care context(13). Since this diagnosis is used, according to the validation performed, in patients receiving mechanical ventilation, and this being associated to high rates of pneumonia in intensive care units, wouldn't it be appropriate to consider Severity of the Infection as an outcome suggested for this diagnosis?

Similarities were found in the validation of both diagnoses. The outcomes Electrolyte Balance and Acid Base, Respiratory Status and Cardiopulmonary Status were considered priority for the two diagnoses studied. The definitions of these outcomes comprise steps of what is defined as respiratory process<sup>(14)</sup>. The validation of these outcomes as priority indicates that the experts have knowledge about the physiology process, and the scores obtained are adequate because the diagnoses concern the psychobiological need for oxygen therapy.

Regarding the validation of the indicators, in the second step of this research, the large number of indicators validated for both diagnoses is remarkable. The validation of 92.86% of the indicators of the outcome Response to Mechanical Ventilation: adult, as priority, demonstrates that the NOC contains the elements that nurses analyze daily in the patients, since in intensive care unit, the object of this study, the profile of patients is serious and unstable the nursing staff, because of their proximity, is the most important component in the monitoring of the evolution of these patients (15,16). But we have questions concerning the continuous assessment of these indicators, and, for example, the indicator "Tests of the pulmonary function" alone. A clinical validation of these indicators would be necessary to assess their practical application.

The indicators "Integrity of skin impaired at the site of tracheostomy" and "Difficulty communicating needs" obtained scores below 0.50, and were discarded. The literature suggests that tracheostomy is a surgical procedure that occurs in intensive care units and is associated to patients who require prolonged mechanical ventilation<sup>(17,18)</sup>. It is also a procedure that requires constant nursing care, in order to ensure that the patient's airway remains clear to prevent infections, particularly of the operative wound<sup>(17)</sup>. For this reason, it is surprising that this indicator has not been validated in the study.

The validation of the indicators "Anxiety" and "Fear", considered secondary for the result Respiratory Status: airway permeability, and the fact that the indicator Anxiety was validated as priority for the outcome Response to Mechanical Ventilation: adult demonstrate that even in hospital settings with high technology, as it is the case of an intensive care unit, holistic care is present in nursing (19).

This study revealed the importance of creating conceptual and operational definitions for NOC indicators to prevent disparities in the understanding of their meanings. Some indicators are similar, e.g. Difficult Breathing and Agonizing Breaths, which may lead the evaluator to a misjudgment on which indicator to use. This need has already been identified in a recent study. (20).

## **CONCLUSION**

The study was aimed to validate the NOC nursing outcomes, selected from NOC-NANDA-I

link for the diagnoses Ineffective Breathing Pattern and Impaired Spontaneous Ventilation in the clinical practice of an adult intensive care unit. In this process of validation a similarity was detected between the assessed diagnoses, since three identical outcomes were validated as priority for both. Some differences were also observed, which caused us to infer that the experts give the diagnosis Impaired Spontaneous Ventilation for patients who use mechanical ventilation.

The NOC was found to be valid in the study context, containing the elements—that nurses evaluate in the patients in their daily care activities. We suggest the inclusion of the outcome Severity of Infection in the NOC-NANDA-I link for the diagnosis Impaired Spontaneous Ventilation based on the justifications presented in this study.

The study was limited to the analysis of the outcomes *suggested* in the NOC-NANDA-I link for only two nursing diagnoses in a specific scenario, and was composed of a sample of 15 expert nurses. It is necessary to analyze other diagnoses/outcomes, as well as continue the validation of the indicators of other outcomes that did not obtain a weighted average equal to or higher than 0.8 in the first step of the study and were not *suggested* in the NOC-NANDA-I link. The lack of similar studies limited the discussion of the present findings, due to the lack of comparison data.

For comparison of the findings of the present study. clinical validation is needed to evaluate the practical application of the indicators validated in this study, and in further studies in different settings.

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