

RESEARCH ARTICLE

# UTILIDAD DE LA ESCALA ESTADO RESPIRATORIO COMO UNA HERRAMIENTA PRÓNOSTICA PARA IDENTIFICAR LA NECESIDAD DE CUIDADO EN PERSONAS CON INFECCIÓN RESPIRATORIA AGUDA

## USEFULNESS OF THE RESPIRATORY STATUS SCALE AS A PROGNOSTIC TOOL TO IDENTIFY THE NEED FOR CARE IN PEOPLE WITH ACUTE RESPIRATORY INFECTION

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Recibido: 15 de enero de 2025.

Aprobado: 15 de Marzo de 2025

### RESUMEN

Las infecciones respiratorias agudas son alteraciones del tracto respiratorio superior o inferior que pueden provocar una variedad de enfermedades, desde infecciones asintomáticas o leves hasta enfermedades graves y fatales, por ende, se requiere un mecanismo para identificar las necesidades de cuidado para así proporcionar un mejor cuidado en los estadios clínicos que lo requieran. **Objetivo** Determinar la utilidad del resultado NOC estado respiratorio como una herramienta pronostica en la identificación de la necesidad de cuidado en personas con infección respiratoria aguda. **Materiales y métodos:** Estudio de naturaleza cuantitativa, observacional y analítico de carácter retrospectivo a partir del análisis de historias clínicas desde urgencias hasta la finalización de la estancia hospitalaria de paciente con infección respiratoria aguda. **Resultados** Se observó que el NOC Estado respiratorio permite pronosticar el ingreso de pacientes a UCI desde el servicio de urgencias desde un 49 a 70% según R cuadrado de Cox y snell

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**Cómo citar este artículo:** Jerez-Mantilla Dayron, Velásquez-Daza Juan, Echavez-Becerra José, Utilidad de la escala estado respiratorio como una herramienta pronostica para identificar la necesidad de cuidado en personas con infección respiratoria aguda. Revista Ciencias Básicas En Salud, 3(1):127-141. Abril 2025, ISSN 2981-5800



y de Nagelkerke, se determinó que los pacientes con puntuación de 5 a 10 pronostican su ingreso a UCI valor  $P < 0.05$ . No se observó significancia estadística del modelo para pronosticar ingreso a Hospitalización y cuidado ambulatorio Valor  $P > 0.05$ . **Conclusiones** El NOC estado respiratorio mediante sus indicadores evaluados logra mejorar la identificación de pacientes que ingresarán a Uci y necesitarán mayores cuidados desde el servicio de urgencias por el profesional de enfermería, sin embargo, se recomienda un estudio prospectivo a futuro donde se pueda puntualizar los indicadores y no influyan variables de confusión como calidad del dato, entre otras.

**Palabras clave:** Atención de Enfermería, Puntuación de Alerta Temprana, Enfermedad respiratoria, Pronóstico, Terminología normalizada de enfermería.

## ABSTRACT

Acute respiratory infections are disorders of the upper or lower respiratory tract that can cause a variety of illnesses, ranging from asymptomatic or mild infections to severe and fatal diseases. Therefore, a mechanism is required to identify the care needs to provide better care in the clinical stages that require it. **Objective:** To determine the utility of the outcome measure "Respiratory Status" as a prognostic tool in identifying the need for care in individuals with acute respiratory infection. **Materials and methods:** This was a quantitative, observational, and analytical study conducted retrospectively through the analysis of medical records from the emergency department to the end of hospitalization of patients with acute respiratory infection. **Results:** It was observed that the Respiratory Status outcome measure allows for the prediction of patient admission to the Intensive Care Unit (ICU) from the emergency department, with a range of 49% to 70% according to the Cox and Snell and Nagelkerke R-squared values. It was determined that patients with scores ranging from 5 to 10 predict their admission to the ICU with a P-value  $< 0.05$ . No statistical significance was observed in the model for predicting admission to hospitalization and outpatient care (P-value  $> 0.05$ ). **Conclusions:** The Respiratory Status outcome measure, through its evaluated indicators, improves the identification of patients who will be admitted to the ICU and require higher levels of care from the emergency department by nursing professionals. However, a prospective study is recommended in the future to specify the indicators and avoid confounding variables such as data quality, among others.

**KEYWORDS:** Nursing Care, Early Warning Scores, Respiratory Tract Diseases, Prognosis, Standardized Nursing Terminology

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## Introduction

Acute respiratory infections (ARI) are infectious disorders of the upper or lower respiratory tract that can cause a variety of illnesses, ranging from asymptomatic or mild infections to severe and fatal diseases (1). For this reason, the World Health Organization describes ARI as one of the most important causes of medical consultations, hospitalizations, and mortality worldwide. It particularly affects children and the elderly, and is associated with high healthcare demands, overburdened health systems, and significant economic costs (2). Currently, epidemiological studies have documented multiple infectious viral agents responsible for acute respiratory infections, including adenovirus, parainfluenza, influenza, and respiratory syncytial virus (3).

In response to this condition, the nursing professional plays an essential role in both clinical and community nursing fields, where they are often required to holistically approach individuals with

acute respiratory infections. To carry out a systematic nursing care process, professionals rely on standardized terminologies that represent a practice- and science-based nursing language, composed of the taxonomy of nursing diagnoses (NANDA), the Nursing Interventions Classification (NIC), and the Nursing Outcomes Classification (NOC) (4). However, currently, due to the decline in research conducted by clinical nurses—associated with insufficient investment in nursing research, limited availability of time, and work overload—there is no published evidence of a proprietary and autonomous mechanism that enables the urgent care needs of patients with acute respiratory infections to be identified. This hinders the timely derivation of interventions, allocation of time, and clinical judgment necessary to address the needs of patients presenting with these characteristics (5,6).

The lack of a mechanism to stratify a patient's care needs according to urgency hinders the nursing

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professional's ability to provide an individualized care process. Such a mechanism would allow for the delivery of nursing services with greater nurse-patient interaction, reduce the nurse-patient ratio, improve the quality of care in clinical stages that require it, and meet patient preferences (7). Furthermore, nursing as a profession requires its own mechanisms to assess a person's health status in order to carry out autonomous interventions that influence the patient's health-illness condition. Currently, nursing is often perceived as a practice-based discipline grounded in tradition and routine rather than evidence and autonomy (8).

Similarly, in order to carry out an adequate nursing care process, a nursing diagnosis must first be established. This requires a cognitive process in which the

The objective of the research was to determine the usefulness of the NOC outcome Respiratory Status as a prognostic tool for identifying the need for care in individuals with acute respiratory

observed data are interpreted to generate actions and predict outcomes (9). However, there are still insufficient mechanisms available for nurses to autonomously identify the patient's condition and the need for individualized care, as well as to provide stronger support for nursing diagnoses based on scientific evidence (10). Therefore, it is appropriate to develop, based on standardized language such as the Nursing Outcomes Classification (NOC), a tool that enables nurses to identify and stratify the need for individualized care in patients with acute respiratory infections according to their clinical status. Hence, the research question arises: What is the usefulness of the respiratory status indicator in its adaptation as a prognostic tool for the care needs of individuals with acute respiratory infections?

infections. For this purpose, a quantitative, observational, and analytical research model with a retrospective design was selected, based on the analysis of medical records from the emergency department through the end

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of hospitalization for patients with acute respiratory infections.

The study population was selected from reported cases under epidemiological surveillance corresponding to forms 346 and 348, which refer to acute respiratory infections, in first- and second-level healthcare centers in Norte de Santander, Colombia. A filter was applied to include individuals over 20 years of age, resulting in 150 patients who met the inclusion criteria. Using the STATS MOBILE application, a sample size of 109 cases was calculated with a 95% confidence interval and a 5% margin of error.

The inclusion criteria considered in this study were: patients admitted to the emergency department in 2022 with a medical diagnosis of acute respiratory infection, reported as case 346 or 348, and individuals aged between 20 and 88 years. Exclusion criteria included: patients with comorbidities such as

immunosuppression, cancer, congestive heart failure, and exacerbated COPD, as these could lead to clinical deterioration and introduce bias in the final evaluation of the patients; and patients whose medical records lacked sufficient data to be assessed using the selected indicators of the NOC outcome Respiratory Status.

To use the NOC Respiratory Status outcome, the indicators most frequently assessed in the emergency department and clinically applicable in this setting will be considered. For this purpose, a review of the 109 medical records will be conducted to identify which indicators are most commonly evaluated in the service.

Subsequently, patients will be scored according to the identified indicators using the Likert scale from the NOC Respiratory Status outcome. One evaluator will score the patients, while a second evaluator will tabulate the data related to ICU admission, hospitalization, and outpatient care, aiming to reduce evaluator bias.

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## RESULTS

Of the 109 patients included in the sample, 44.9% (49 individuals) were male and 55.1% (60 individuals) were female. The age distribution presented a first quartile (Q1) under 60 years, a median (Q2) under 73 years, and a third quartile (Q3) under 83 years.

When evaluating the most frequently used indicators in patients with acute

respiratory infection, it was observed that respiratory rate, auscultated breath sounds, oxygen saturation, cognitive impairment, and pulmonary function test via X-rays were the most commonly assessed indicators, each evaluated in more than 85% of cases (see Table 1).

**Table 1** Most evaluated indicators of Noc respiratory status in persons with acute respiratory infection during admission to the emergency department.

| Es evaluado en pacientes con infección respiratoria aguda en urgencias | INDICADORES             |                    |                               |                                  |                     |                   |                 |            |                            |                     |                                     |
|------------------------------------------------------------------------|-------------------------|--------------------|-------------------------------|----------------------------------|---------------------|-------------------|-----------------|------------|----------------------------|---------------------|-------------------------------------|
|                                                                        | Frecuencia respiratoria | Ritmo respiratorio | Profundidad de la inspiración | Ruidos respiratorios auscultados | Vía aérea permeable | Volumen corriente | Capacidad vital | Saturación | Uso de msuculos accesorios | Deterioro cognitivo | Prueba de función pulmonar: Rayos X |
| Sí                                                                     | 100%                    | 27%                | 3%                            | 100%                             | 0                   | 0                 | 0               | 100%       | 95%                        | 96%                 | 85%                                 |
| No                                                                     | 0                       | 73%                | 97%                           | 0                                | 100%                | 100%              | 100%            | 0          | 5%                         | 4%                  | 15%                                 |

Source: Own elaboration.

Consequently, the following indicators were selected to evaluate the patients' respiratory status using a Likert scale from 1 (Severely Compromised) to 5 (Not Compromised): respiratory rate, auscultated breath sounds, oxygen saturation, cognitive impairment, and pulmonary function test via X-rays. The

total possible score ranged from a minimum of 5 points to a maximum of 25 points. Each of the 109 sampled patients was scored according to these indicators, along with recording their final status at hospital discharge or outpatient care. It was found that 31 (28.4%) patients were admitted to the ICU, 62 (56.9%) received

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inpatient care, and 15 (13.8%) were managed as outpatients.

A logistic regression model was conducted, where the independent variable was the total score of the NOC

Respiratory Status and the dependent variable was ICU admission. The model showed statistical significance in the omnibus test with a p-value < 0.001 (see Table 2).

*Table 2 Omnibus test*

| Pruebas ómnibus de coeficientes de modelo |        | Chi-cuadrado | gl | Sig.  |
|-------------------------------------------|--------|--------------|----|-------|
| Paso 1                                    | Paso   | 74,106       | 17 | <,001 |
|                                           | Bloque | 74,106       | 17 | <,001 |
|                                           | Modelo | 74,106       | 17 | <,001 |

Likewise, it was observed that the independent variables explain between 49% and 70% of the variance in the

dependent variable, as indicated by the R-squared test.

*Table 3 R-squared test*

| Resumen del modelo |                                  |                           |                          |
|--------------------|----------------------------------|---------------------------|--------------------------|
| Paso               | Logaritmo de la verosimilitud -2 | R cuadrado de Cox y Snell | R cuadrado de Nagelkerke |
| 1                  | 56,055 <sup>a</sup>              | ,493                      | ,708                     |

a. La estimación ha terminado en el número de iteración 20 porque se ha alcanzado el máximo de iteraciones. La solución final no se puede encontrar.

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Among the variables in the equation, it was determined that patients with a total score between 5 and 8 were able to

predict ICU admission with statistical significance, showing a p-value < 0.005.

*Table 4 Independent variables in the equation*

| Las variables en la ecuación |          |                  |            |     |      |
|------------------------------|----------|------------------|------------|-----|------|
|                              |          |                  | Puntuación | Gil | Sig. |
| Paso 0                       | Variable | Puntuación total | n          |     |      |
| 5                            |          | Puntuación total | 68,570     | 17  | ,000 |
|                              |          | Puntuación total | 15,978     | 1   | ,000 |
|                              | 5        |                  |            |     |      |
|                              |          | Puntuación total | 17,813     | 1   | ,000 |
|                              | 6        |                  |            |     |      |
|                              |          | Puntuación total | 11,733     | 1   | ,001 |
|                              | 8        |                  |            |     |      |
|                              |          | Puntuación total | ,344       | 1   | ,04  |
|                              | 10       |                  |            |     |      |
|                              |          | Puntuación total | ,024       | 1   | ,877 |
|                              | 11       |                  |            |     |      |
|                              |          | Puntuación total | ,633       | 1   | ,426 |
|                              | 12       |                  |            |     |      |

Regarding the logistic regression model in which the dependent variable was hospital admission and outpatient care, it was observed that the model did not have statistical significance. Therefore, the

NOC Respiratory Status does not explain the variable of admission to the intensive care unit (see Tables 5 and 6).

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*Table 5 Omnibus test in regression model patients admitted to hospitalization*

|        |        | <b>Pruebas ómnibus de coeficientes de modelo en<br/>pacientes que ingresaron a Hospitalización</b> |    |      |
|--------|--------|----------------------------------------------------------------------------------------------------|----|------|
|        |        | Chi-cuadrado                                                                                       | gl | Sig. |
| Paso 1 | Paso   | 22,308                                                                                             | 17 | ,173 |
|        | Bloque | 22,308                                                                                             | 17 | ,173 |
|        | Modelo | 22,308                                                                                             | 17 | ,173 |

*Table 6 Omnibus test in regression model patients admitted to hospitalization*

|        |        | <b>Pruebas ómnibus de coeficientes de modelo</b> |    |      |
|--------|--------|--------------------------------------------------|----|------|
|        |        | Chi-cuadrado                                     | gl | Sig. |
| Paso 1 | Paso   | 21,455                                           | 17 | ,100 |
|        | Bloque | 21,455                                           | 17 | ,100 |
|        | Modelo | 21,455                                           | 17 | ,100 |

To calculate the sensitivity and specificity of the NOC Respiratory Status, patients who scored between 5 and 10 points were analyzed to determine how many were admitted to the ICU and how many were not. This

data was then used to estimate these metrics through a 2x2 table. The results showed a sensitivity of 83%, specificity of 88%, a positive predictive value of 74%, and a negative predictive value of 93%.

*Table 7 Sensitivity and specificity of NOC respiratory status in relation to ICU admission.*

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| SENSIBILIDAD Y ESPECIFICIDAD |  |                   |                    |    |          |
|------------------------------|--|-------------------|--------------------|----|----------|
|                              |  | UCI               | NO UCI             |    |          |
| 5 a 10 puntos total          |  | 26                | 9                  | 35 | VPP: 74% |
| Más de 10 puntos totales     |  | 5                 | 69                 | 74 | VPN: 93% |
|                              |  | 31                | 78                 |    |          |
|                              |  | Sensibilidad: 83% | Especificidad: 88% |    |          |

**Source: Developed by the authors.**

## DISCUSSION

The Nursing Outcomes Classification (NOC) Respiratory Status outcome allows for the prognosis of urgent care needs in individuals with acute respiratory infection who score between 5 and 10 points, with a p-value < 0.05, demonstrating a sensitivity of 83% and a specificity of 88% for ICU admission. This enables the nursing professional, from the moment of emergency department admission, to autonomously exercise their role in providing individualized care and improve outcomes through interventions focused on the prognosis of patients with acute respiratory infections.

Nursing prognostic scales based on NOC represent an innovative tool and a new paradigm that allows for the evaluation and subsequent measurement of outcomes related to a specific nursing diagnosis. However, no information related to similar studies has been observed in various databases over the past 10 years (11).

It is important to recognize that the nursing professional performs their work in collaboration with an interdisciplinary health team. Studies have demonstrated the effectiveness of autonomous nursing assessment, nursing diagnosis, and intervention using techniques specific to the profession, showing positive

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outcomes in patient care. However, research has also indicated that these improved care practices and outcomes stem from the use of early warning scales based on patient prognosis to individualize care and improve morbidity and mortality outcomes during hospitalization up to 30 days, with a p-value  $< 0.05$  (12).

Ovidio Céspedes published a thesis related to the “Evaluation of NOC Outcomes (Nursing Outcomes Classification) in the Treatment of Patients with Anxiety Related to Pain, Following Nursing Interventions, Phytotherapy Management, and Behavioral Interventions.” For this research, the NOC Anxiety scale was used to assess anxiety levels in patients undergoing nursing interventions. The validity and reliability of the scale were evaluated by comparing the results with those obtained from other anxiety measurement instruments. It was concluded that the NOC Anxiety scale is a valid and reliable tool for assessing

anxiety in this population. These findings are similar to those demonstrating, with statistical significance, that the NOC outcome allows for the evaluation of respiratory status and prognosis of ICU admission, as well as care demands based on the severity assessed (13).

In Spain, nursing staff developed the Bcog-S scale to improve nursing care processes for patients with schizophrenia. This scale allows the evaluation of cognitive dimensions considered by the NOC, enabling the assessment of the cognitive status of the individuals under their care. It measures improvements and serves as a support tool for direct patient care. The Bcog-S scale demonstrated a Pearson correlation of 0.80 with the SCIP-S (sensitivity = 0.86, specificity = 0.80), validating its use for nursing personnel (14).

Similarly, the present research on the usefulness of the Respiratory Status outcome to identify care needs in patients with acute respiratory infection

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determined a sensitivity of 0.83, indicating a high capacity to correctly detect positive cases and thus avoid false negatives. A specificity of 0.88 was also observed, reflecting a strong ability to correctly identify negative cases—i.e., patients who do not require ICU admission. This high specificity implies a lower probability of false positives, meaning that negative cases are being accurately identified.

## CONCLUSSIONS

The results obtained in this research allow us to conclude that the NOC Respiratory Status indicator provides evidence as a tool for professional nurses to assess and predict the need for care through ICU admission in individuals with acute respiratory infection. This represents an important precedent in nursing science and the professional nursing field for developing improved care practices based on evidence. It contributes to generating new care paradigms and

The importance of sensitivity and specificity in nursing outcomes classification lies in their ability to provide accurate information regarding the presence or absence of a specific outcome in patients. These measures enable nursing professionals to make informed decisions about patient care and to design appropriate interventions (15).

perspectives for future research in this area.

However, it is recommended to score the variables objectively and conduct prospective studies to validate NOC outcomes as reliable sources of information derived from nursing assessment. Looking ahead, once patient prognosis is validated, controlled and randomized trials could be conducted on nursing interventions aimed at improving the prognosis of individuals with acute respiratory infection.

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Similarly, it can be concluded that among the indicators established by the NOC Respiratory Status, the ones most frequently evaluated and considered from the moment of admission to the emergency department in a second-level hospital are: respiratory rate, auscultated breath sounds, oxygen saturation, cognitive impairment, and pulmonary function test via X-rays. These indicators allow for patient scoring and enable the nursing professional to play a leading role in influencing the patient's health outcomes.

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**Cómo citar este artículo:** Jerez-Mantilla Dayron, Velásquez-Daza Juan, Echavez-Becerra José, Utilidad de la escala estado respiratorio como una herramienta pronostica para identificar la necesidad de cuidado en personas con infección respiratoria aguda. Revista Ciencias Básicas En Salud, 3(1):127-141. Abril 2025, ISSN 2981-5800



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