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Physiotherapeutic Approach in the Treatment of Exacerbated Chronic Obstructive Pulmonary Disease: An Integrative Review

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Abstract

The objective of this study was to analyze the effectiveness of the physiotherapeutic approach using non-invasive mechanical ventilation (NIV) in the treatment of patients with exacerbated chronic obstructive pulmonary disease (COPD). An integrative literature review was carried out, which allows a broad analysis of published studies, contributing to knowledge synthesis and discussions about methods and results. A total of 123 articles were identified from national and international databases, of which only 5 met the inclusion criteria after screening through the Prisma flowchart. These studies showed consensus regarding the benefits of NIV for patients with exacerbated COPD, highlighting improvements in gas exchange, reduction in the need for orotracheal intubation, shorter hospitalization time, and lower mortality rates. It is concluded that NIV is a recommended intervention for this population, although future research is needed to determine whether specific subgroups may achieve even greater benefits.

Keywords

Chronic Obstructive Pulmonary Disease, Non-Invasive Mechanical Ventilation, Emergency and Respiratory Failure

1. Introduction

Chronic Obstructive Pulmonary Disease (COPD) is defined as a progressive and debilitating respiratory condition, characterized by a persistent obstruction of the respiratory tract, making it difficult to exhale air during the breathing cycle [1].

This obstruction limits airflow and can lead to Acute Respiratory Failure (ARF), generally classified as type II. ARF is classified as type I (hypoxemic) and type II (hypercapnic). In hypercapnic cases, there is an increase in carbon dioxide levels (PCO2) and hypoxemia may also occur in ambient air [2].

COPD is often marked by episodes of exacerbation, which represent critical moments in the clinical course of the disease, resulting in deterioration of lung function and significant impairment of patients' quality of life [3].

Faced with this challenging scenario, Non-Invasive Mechanical Ventilation (NIV) is a crucial tool in the management of exacerbated COPD. NIV seeks not only to relieve acute symptoms, but also to promote clinical improvement and improve patients' functional capacity [4].

In this context, this study sets out to carry out an integrative review, which is a method that aims to gather and synthesize research results on a specific topic or issue, in a systematic and orderly manner, with a focus on analyzing the effectiveness of the physiotherapeutic approach with NIV in the treatment of exacerbated COPD [5]. By investigating the scientific literature, the aim is not only to evaluate the effectiveness of this therapeutic modality, but also to identify its potential benefits and limitations, thus contributing to expanding knowledge and improving clinical practices in the area of respiratory physiotherapy [5].

The aim is to provide solid scientific information that can support clinical decision-making at the bedside, thus promoting evidence-based practice and, consequently, contributing to improving the quality of life and well-being of patients with COPD [5].

Based on the national and international literature and what has been described so far in this paper, the question that arose in order to elucidate possible readers is: what are the benefits of using NIV in the treatment of exacerbated COPD in the emergency room?

2. Justification

This study is justified by the need to search the national and international literature for better outcomes regarding the use of non-invasive mechanical ventilation in the event of COPD exacerbation in the setting of acute respiratory failure.

3. Objectives

The general aim of this study was to analyse the effectiveness of the physiotherapeutic approach using non-invasive mechanical ventilation in the treatment of exacerbated COPD. The specific aims were to identify the importance of physiotherapy in exacerbated COPD, to describe the physiotherapeutic approach using NIV in COPD, and to present results in the literature that justify this approach.

4. Methodology

This was an integrative literature review, which consists of constructing a broad analysis of published studies, which contributes to discussions about research methods and results by synthesizing knowledge. The main objective of this research method is to achieve an in-depth understanding of a specific scenario, based on previous studies [6].

In order to construct an integrative review, six stages need to be followed: Identification of the theme and guiding question, Sampling and literature search, Data collection, Critical analysis of the studies included, Discussion of the results and Presentation of the integrative review. Each of the stages in the preparation of an integrative review suggested by the authors cited [6] will be briefly presented below.

Identification of the theme and guiding question: The process begins with the formulation of a relevant question, a problem experienced in clinical practice. Defining the guiding question is the most important part of the review, as it determines the means of research, the information collected and the articles included;

Sampling and literature search: Closely linked to the previous phase, the literature search should be broad and diverse, using electronic databases, manual literature and definitions already learned by the reviewer. The sampling of inclusion and exclusion criteria is an important indicator of reliability and trustworthiness; the omission of this procedure may be the greatest threat to the validity of the review;

Data collection: This is similar to the data collection of a conventional study, in which the reviewer organizes the information to be extracted from the selected articles, forming a concise database. This information should include the study samples, the reviewer's objectives, the methodology used, the results obtained and the conclusions drawn;

Critical analysis of the included studies: Similar to conventional data analysis, this phase requires the use of appropriate tools in order to weigh up and organize the characteristics of each study's approach. The articles included in the overview must be analyzed in detail and critically, trying to explain the different or conflicting results, in order to guarantee the validity of the review. The literature points to questions that can be used in the critical evaluation of the selected articles, namely: the guiding question of the study; the basis for the research question; why is the question important? What were the questions of previous research? Is the methodology appropriate for the study? Are the subjects selected for the study

correct? What does the research question answer? Is the answer correct and what future research is needed?

Discussion of results: In this stage, the researcher compares the data evidenced in the analysis of the articles to the theoretical framework. Identifying gaps in knowledge allows suggestions for future research;

Presentation of the integrative review: This stage includes data visualization, which must be presented clearly and completely so that the reader can critically evaluate the results. Visualization modes can be expressed in tables, graphs or charts, without omitting any evidence. In this way, it is possible to compare all the selected studies.

This search was carried out using databases such as Lilacs, PubMed and BVS. The following descriptors and their combinations in Portuguese and English were used to search for articles: "emergency, non-invasive ventilation, acute respiratory failure, chronic obstructive pulmonary disease". The inclusion criteria defined for the selection of articles were: articles published in Portuguese and English; full-length articles that portray the theme of non-invasive ventilation in the treatment of exacerbated COPD; articles published and indexed in the aforementioned databases in the last five years, from 2019 to 2024, articles in English. Therefore, the exclusion criteria are: articles that do not establish the required inclusion criteria and those that were not made with the involvement of human beings (Table 1).

Table 1. Presentation of the search strategy.

PubMed
"emergency, non invasive ventilation, acute respiratory failure, and; copd and emergency; and non invasive ventilation; and acute respiratory failure"
BVS
("emergency" OR "non invasive ventilation" OR "acute respiratory failure") and ("copd") and ("emergency") and ("non invasive ventilation") and ("acute respiratory failure")
Lilacs
("emergency" OR "non invasive ventilation" OR "acute respiratory failure") and ("copd") and ("emergency") and ("non invasive ventilation") and ("acute respiratory failure")

5. Results and Discussions

According to the research made, 123 articles were presented through the collection of national and international literature and databases. They went through the prism flowchart, and of these 123, only 5 were selected for the presentation of results. Of these, 5 were presented below (Figure 1 and Figure 2) and the work shows the authors agreeing on the use of NIV to benefit patients with exacerbated COPD, since they were unanimous in their conclusions. The characteristics of the included studies were presented in Table 2 of this research [7]-[10].

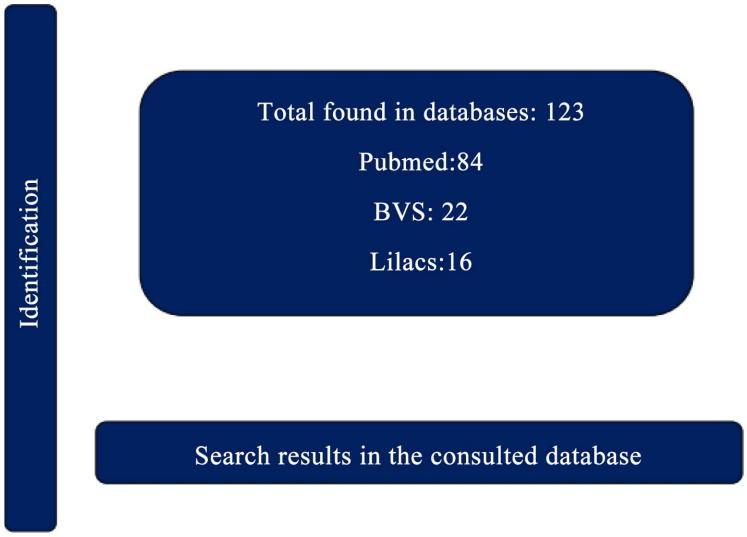

Figure 1. Identification of bases and their results.

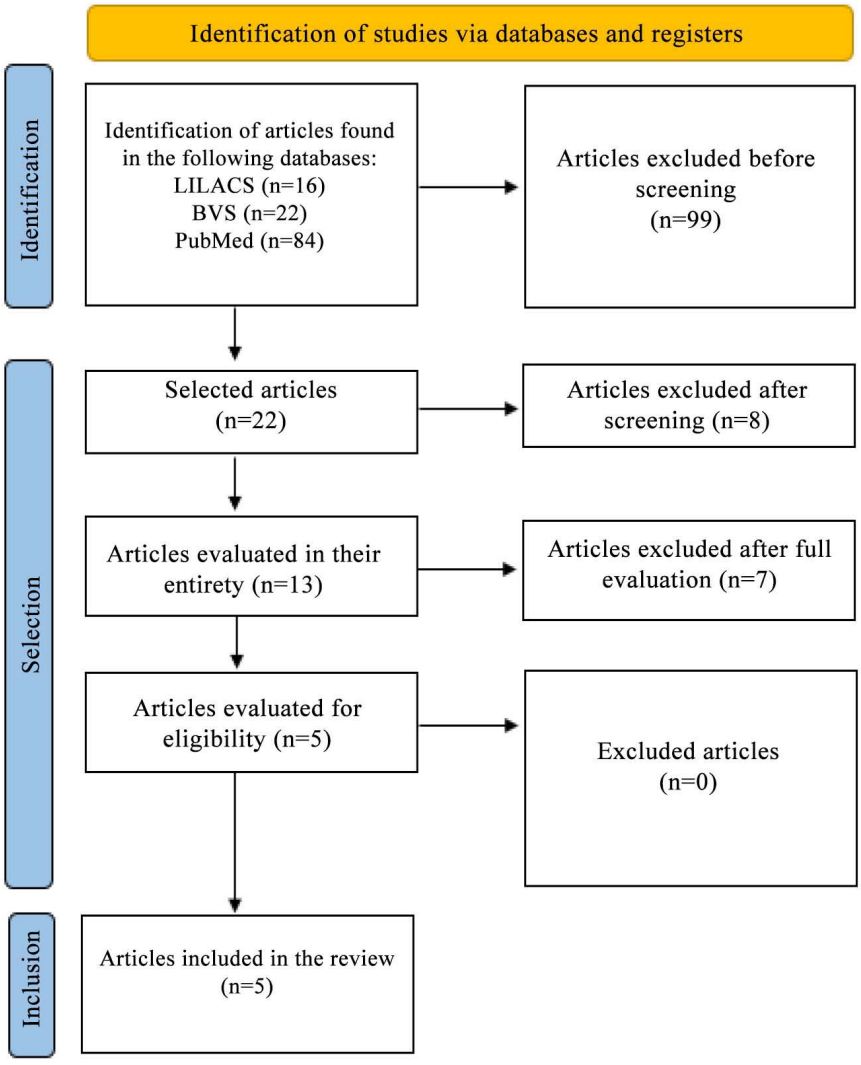

Figure 2. Prisma flowchart.

Table 2. Presentation of the characteristics of the included studies.

Title/Authors	Database/Year /Type of publication	Objective	Methodology	Results
Protocol for assessing mortality reduction with the early use of noninvasive ventilation in prehospital emergency services: A multicentre, observational cohort study in Madrid, Spain. /Garcia *et al*.	PubMed/2021/Observational cohort study	To compare the use of NIV between prehospital and inhospital settings in the search for mortality reduction	Multicentre, observational, and prospective cohort.	Improvement in baseline dyspnea, SpO_2, BP, HR and RR in patients treated with prehospital NIV, when compared to the group without NIV.
Non-invasive ventilation as a therapy option for acute exacerbations of chronic obstructive pulmonary disease and acute cardiopulmonary oedema in emergency medical services./Schmitt, *et al*.	PubMed/2022/ Multicentre observational study	To assess the association of NIV with clinical outcomes in patients with acute respiratory failure due to exacerbated COPD and cardiogenic pulmonary edema, compared with standard oxygen therapy and endotracheal intubation.	Multicentre, prospective, and observational.	Improved ventilation in exacerbated COPD and APE reduced ICU length of stay compared to OTI.
Non-invasive positive pressure ventilation for acute cardiogenic pulmonary edema and chronic obstructive pulmonary disease in prehospital and emergency settings./Abubacker *et al*.	PubMed/2021/Systematic review	To compare the use of NIV between patients with pulmonary edema and those with COPD exacerbation.	Systematic review.	CPAP and BiPAP are effective in emergencies, with a lower rate of therapeutic failure
ICU Utilization for Patients with Acute Exacerbation of Chronic Obstructive Pulmonary Disease Receiving Noninvasive./Myers *et al*.	PubMed/2019/Retrospective cohort study	To investigate whether COPD patients could safely receive NIV outside the ICU.	Retrospective cohort.	Similar mortality rates and length of stay between the ward and ICU; hospitals with lower ICU use have less monitoring.

A narrative review included studies and guidelines focused on the identification, management, and prognosis of hypercapnic acute respiratory failure in adult patients, especially those treated in emergency departments and intensive care

units [11]. These primary outcomes were presented as improved respiratory function, prevention of orotracheal intubation, and the need for ICU admission associated with the use of mechanical ventilation. This corroborates the results presented in our study. A systematic review study further supports the use of this therapy, presenting a reduction in hospitalization and mortality as the primary outcome, which echoes the perspectives of the studies presented in our research [12].

A specific literature review reported that the application of positive pressure significantly increases arterial oxygen levels (PaO_2) and reduces arterial carbon dioxide levels ($PaCO_2$) in patients with hypercapnic acute respiratory failure, resulting in considerable improvements in gas exchange [13]. In a study including 112 patients evaluated and managed for acute exacerbations of chronic pulmonary disease, non-invasive mechanical ventilation (NIV) was applied as a ventilatory therapy, yielding favorable outcomes. Only 14% of the patients experienced failure of NIV when it was implemented due to disease exacerbation. Another noteworthy finding of this study refers to the preventive role of NIV in avoiding orotracheal intubation. Among this population, when respiratory muscle failure occurred, only 5.4% required invasive ventilatory support after the use of non-invasive mechanical ventilation—findings that are consistent with the results presented in our study [14].

Furthermore, the authors argue for the possibility of barotrauma and pneumonia in patients subjected to excessive pressures or inadequate tidal volumes.

6. Limitations

This study presents some limitations. The available evidence base remains limited, which restricts the generalization of the conclusions, and the possibility of publication bias cannot be excluded, as studies with positive results tend to be more frequently reported than those with neutral or negative findings. In addition, the heterogeneity among study designs, populations, and evaluated outcomes limits comparability and reduces the strength of general inferences. Therefore, additional studies are needed to strengthen the currently available evidence.

7. Final Considerations

Based on the information presented in this review, we suggest that NIV can be recommended for patients with exacerbated chronic obstructive pulmonary disease, as it reduces the need for orotracheal intubation, improves gas exchange, and reduces hospital stay and mortality, confirming the possibilities investigated in this study. Future research is needed to determine whether specific subgroups might benefit more.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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