Contents lists available at ScienceDirect

Respiratory Investigation

journal homepage: www.elsevier.com/locate/resinv

Review

Cost-utility of non-invasive mechanical ventilation: Analysis and implications in acute respiratory failure. A brief narrative review

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ARTICLE INFO

Article history:
Received 20 July 2017
Received in revised form
9 November 2017
Accepted 20 December 2017

Keyword:
Noninvasive mechanical ventilation
Cost analysis
Acute respiratory failure
Organization
Cost-utility analysis

ABSTRACT

The growing interest in the quality of patient care at the levels of the health care managers, insurance companies, and health professionals is evident. Further, the growing population requires good quality health services. In this review, we analyzed the cost-effectiveness of noninvasive ventilation (NIV) in an acute setting for the treatment of respiratory failure. The strength of this review is that it identified and summarized the most relevant studies regarding various aspects of the cost-utility of NIV in an acute setting. This is the first review that focuses on the importance of the skills and training of the team in the reduction of costs associated with NIV. However, the small number of studies, heterogeneity of quality, and different outcomes of the different studies are the greatest limitations of this review. In conclusion, although there is great variation in the data drawn from the literature, NIV seems to be a cost-effective tool, especially in specific patients (those with chronic obstructive pulmonary disease) for whom the addition of NIV improves outcomes and has a positive impact on this expenditure.

Contents

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https://doi.org/10.1016/j.resinv.2017.12.011
2212-5345/

Please cite this article as: Nicolini A, et al. Cost-utility of non-invasive mechanical ventilation: Analysis and implications in acute respiratory failure. A brief narrative review. Respiratory Investigation (2018), https://doi.org/10.1016/j.resinv.2017.12.011

1. Introduction

The growing interest in the quality of patient care at the levels of health care managers, insurance companies, and health professionals is evident. The growing population requires good quality health care and cost-efficient treatment [1,2]. However, managers and insurance companies are more concerned about health care expenditures and question the purpose of the money spent on health care services and the cost of health care [3,4]. Finally, health care professionals have always been, at least implicitly, concerned with the quality of care they can provide to their patients with the best available treatment options, as well as the ethics related to the following three fundamental points: 1) to meet the patient's expectations; 2) to be consistent with the inherent scientific commitment and to practice evidence-based medicine; and 3) the responsibility of maintaining professional competence. These aspects are of interest to those in the respiratory intensive care field where the introduction of less invasive airway management devices, such as noninvasive ventilation (NIV), as alternatives to intubation has led to lower mortality and intubation rates compared to those observed with the standard medical treatment [1–3].The available evidence suggests that for optimum success, the multidisciplinary nature of the implementation of NIV must be recognized. The NIV program should be a quality-improvement initiative. Following these principles, a successful program can be initiated in any acute care setting [2]. The aim of this review is to evaluate the clinical effectiveness and cost-effectiveness of NIV in an acute setting.

2. Methods

Database searches included a MEDLINE and other relevant databases based on a systematic literature search from 1990 to 2017 of the current literature, randomized controlled studies, systematic reviews, and health technology assessment (HAT) reports, clinical studies, health-economic evaluations, primary studies with cost analyses, and quality-of-life studies related to the research questions.

2.1. *Evaluation of therapeutic results and benefits*

It is comprehensible that ineffective therapy might lead to a worse outcome, more complications during the clinical course, and rising costs [1,2]. With respect to NIV, careful patient selection is mandatory. The effectiveness of NIV can be assessed or measured in several ways (clinical response; improvement in gas exchange, reduction in the need for endotracheal intubation and admission to the intensive care unit [ICU] admission, hospital and ICU readmissions, and mortality) [1–7]. It has been demonstrated that it is less expensive to administer NIV outside of the ICU [8].

2.2. *Clinical studies*

Randomized, multicenter, controlled trials demonstrate that NIV reduces the need for endotracheal intubation (ETI) from 5% to 60% [9] and in-hospital mortality from 14% to 24% [10] when instituted early in patients with chronic obstructive pulmonary disease (COPD) exacerbation.

NIV has proven to be a highly effective therapeutic tool in the treatment of certain acute respiratory failures (ARFs), mainly an acute exacerbation of COPD and acute cardiogenic pulmonary edema (ACPE) [11]. NIV is also a recommended as treatment for immunocompromised patients presenting with fever and pulmonary infiltrates [12,13]. In addition, available data suggest that early institution of NIV in obese patients with acute hypercapnic respiratory failure may avert the need for ETI [14]. The clinical benefits includes the reduction of the risk of respiratory muscle fatigue, improvement of gas exchange and results of arterial blood gases, and signs of increased work of breathing (WOB) [15–18].

2.3. *Cost analysis of NIV*

Like other medical procedures, NIV therapy aims to achieve a good balance between cost and benefit. It includes improvement of symptoms, such as dyspnea, and clinical parameters, such as the parameters of an arterial blood gases, avoidance of intubation, reducing the need for invasive mechanical ventilation, and a reduction in the duration of ICU and hospital stay [19,20]. Other factors may influence the success of NIV therapy; hence, its cost-effectiveness in patients with ARF. The clinical benefits of NIV in patients with ARF are

Please cite this article as: Nicolini A, et al. Cost-utility of non-invasive mechanical ventilation: Analysis and implications in acute respiratory failure. A brief narrative review. Respiratory Investigation (2018), https://doi.org/10.1016/j.resinv.2017.12.011