How Do Hospitalized Patients Tolerate Non-Invasive Positive Pressure Ventilation: A Pilot Patient-Centered Survey

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Abstract

Background: Non-invasive positive pressure ventilation (NIPPV) is increasingly used to treat in-patients with acute respiratory failure. NIPPV tolerability is often overlooked because it is usually thought of as a life-saving intervention. Studies examining patient tolerability of NIPPV are scarce and mostly qualitative.

Objective: Our objective was to understand the hospitalized patient’s experiences and NIPPV tolerability.

Methods: We conducted a pilot study using a novel NIPPV Tolerability Survey tool and conducted a cross-sectional study. Subjects were hospitalized patients admitted for acute respiratory failure, over age 18 and able to self-report. Primary endpoints were willingness for ongoing NIPPV use and future NIPPV use. Secondary endpoints were symptom relief, mask discomfort, and ADL limitations.

Results: We found that older adults (≥ 65, N = 137) were less willing to continue using NIPPV during the current stay when compared to younger adults (< 64, N = 41) (55% vs. 76%, p = 0.02). Older subjects reported significantly more mask discomfort, a lower rate of feeling better overall and less improvement in sleep.

Conclusions: We found significant device discomfort and poor tolerability especially in older adults, which suggests that reassessments should be performed frequently and goals of care should be addressed. Our NIPPV Tolerability Survey tool may be useful for hospital clinicians to assess how patients tolerate NIPPV and promote patient-centered care.

Keywords
Non-invasive positive pressure ventilation, Tolerability, Acute respiratory failure, Older adults, Goals of care, Patient experience

Abbreviations
NIPPV: Non-Invasive Positive Pressure Ventilation; NYPQ: New York-Presbyterian Queens; ADL: Activities of Daily Living; BIPAP: Bi-level Positive Airway Pressure; EMR: Electronic Medical Records

Introduction

Physicians and clinical providers frequently use non-invasive positive pressure ventilation (NIPPV) to treat patients with acute respiratory failure [1]. Prior studies have shown that NIPPV use may reduce respiratory distress by reducing the work of breathing, improving alveolar ventilation and hypercapnia. Use of NIPPV in the acute-care setting may reduce the incidence of endotracheal intubation and increase both ICU and hospital survival [2,3]. NIPPV use has increased...
significantly since its invention and clinical use in 1981 [4]. Despite this, evidence about its effect on patient experience remains limited.

Previous descriptive studies suggested the following patient concerns: First, patients may experience difficulty comprehending both the benefits and burdens of NIPPV [5,6]. Potential relief of dyspnea must be weighed against mask discomfort, claustrophobia, air leaks, and noise [5-7]. Second, patients may face the fear of unfamiliar technology, pain and suffering, or death and dying [6]. Third, patients may perceive a low level of involvement in treatment decision making, a lack of alternatives, and limited opportunities for discussion given the urgency of the initial presentation [6,8]. Data suggest that some of these concerns, particularly anxiety and loss of control may be addressed by engaging with healthcare professionals [6-10]. Prior studies also found that NIPPV discomfort can be improved by using alternative mask designs or NIPPV titration strategies [11-14].

Most of these patient-experience oriented studies were limited by small sample size or inclusion of only patients with one diagnosis (e.g. COPD, cancer). Moreover, because these studies were performed in non-US patient populations, these findings may be less generalizable to patients in the US [5-10,15].

This study aims to explore the patient’s perspective on NIPPV use in the hospital setting in a larger sample of ethnically diverse patients with a variety of medical diagnoses. We examined specific patient characteristics that were associated with tolerance of acute use of NIPPV.

Methods

Study design, settings, and participants

The study was approved by the New York-Presbyterian Queens (NYPQ) Institutional Review Board. This pilot cross-sectional survey study was performed in an urban, mixed academic-community hospital from October 2017 through February 2018. NYPQ is a 500-bed community teaching hospital located in Queens County, NY, the most racially/ethnically diverse community in the US [16].

Development of survey and pilot testing

An interdisciplinary team consisting of Geriatrics/Palliative Care, Pulmonary/Critical Care, Internal Medicine, and Respiratory Therapy developed a 13-item survey instrument (NIPPV Tolerability Survey). Initial survey questions were piloted with a small number of admitted patients for understandability. The survey consisted of four sections: Relief of symptoms, mask discomfort/anxiety, impact on activities of daily living (ADL), and willingness for ongoing and future NIPPV use. In the survey, we referred to NIPPV as bi-level positive airway pressure (BiPAP), as it is commonly known in our institution. Based on the pilot testing results, we eliminated several questions due to poor understandability or redundancy. We reworded other questions for clarity, based on feedback (See Supplement 1).

Eligible subjects included all admitted patients aged 18 and over, placed on NIPPV for acute respiratory failure, able to communicate and self-report. Interpretation service was used if subject’s primary language was not English. NIPPV subjects were identified in consultation with Respiratory Therapy personnel through use of the NIPPV order set in the electronic medical record (EMR). Exclusion criteria included refusal to participate, inability to respond to questions, having been interviewed previously during the same admission, use of chronic CPAP, or under 18-years-old.

Due to limited staffing, we used a convenience sampling approach: Once per week conducted by trained research assistants, all eligible subjects identified on those days were invited to participate. The survey was administered after obtaining consent. Subjects were asked to rate each concern using a Likert-type scale. Some questions asked for yes, no, and unsure options and some asked for elaboration when prompted. EMR was used to collect data including patient demographics, primary diagnoses, code status, and disposition.

Main outcomes and predictors

We had observed anecdotally and clinically that many older patients did not appear to tolerate NIPPV and would like to explore whether there were age-associated differences. Therefore, we set out to assess the following two primary outcomes: Subject’s willingness for ongoing use of NIPPV and willingness for future use of NIPPV. Secondary outcomes consisted of relief of symptoms such as breathing, sleep, alertness, and feeling better overall, mask discomfort/anxiety, and limitations in ADL. Potential predictors included age, gender, race/ethnicity, and code status.

Statistical methods

Descriptive statistics were calculated to characterize the study cohort. The chi-square test or Fisher’s exact was used, as appropriate, to compare demographic characteristics, NIPPV characteristics, and disposition status between the defined age groups of interest. Multivariable logistic regression analysis was performed to evaluate the independent effect of age group on ongoing use of NIPPV, after controlling for race, gender, and code status. Adjusted odds ratios and 95% confidence intervals for all variables of interest were estimated from the multivariable model. All p-values are two-sided with statistical significance evaluated at the 0.05 alpha level. Ninety-five percent confidence intervals for all parameters of interest were calculated to assess the precision of the obtained estimates. All analyses were performed in SAS Version 9.4 (SAS Institute, Inc., Cary, NC) and Stata Version 15.0 (Stata Corp, College Station, TX).
Multivariable logistic regression modeling was used to evaluate the independent effect of age group on ongoing NIPPV use, controlling for gender, ethnicity, and code status. The analysis showed that younger age was independently and significantly predictive of willingness to continue current NIPPV use (OR = 2.5, P = 0.03). Gender, race/ethnicity, and presence of a do not resuscitate/do not intubate (DNR/DNI) order were not significantly predictive.

**Discussion**

In this study of hospitalized adults with acute respiratory failure with a variety of diagnoses, we found that older adults reported NIPPV to be less comfortable and were less willing to use it in the present compared to younger adults. However, this did not affect their willingness to potentially use NIPPV in the future. Gender, race/ethnicity, and having a DNR/DNI order were not predictive of willingness to continue NIPPV use.

Our results confirm prior findings from smaller studies that reported significant mask or device discomfort. These results also suggest potential for palliative care interventions to enhance communication, expectations, and goals of care discussions.

This study has limitations. First, the survey instrument has not been validated. Second, the study design is susceptible to sampling bias. Last, the management and communication with patients regarding NIPPV...
clinicians to assess how patients tolerate NIPPV and promote patient-centered care.

Acknowledgments

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Conflicts of Interest

The authors have no conflict.

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References


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