Home Noninvasive Ventilation Therapy Reduces Readmissions Due to COPD Acute Exacerbation

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INTRODUCTION

About 12 millions Americans live with Chronic Obstructive Pulmonary Disease (COPD) and acute exacerbations of COPD (AECOPD) are responsible for 2/3rd of COPD-related healthcare costs, hospital readmissions accounting for $15 billion annually.

HYPOTHESIS

Noninvasive ventilation (NIV) improves survival among patients with acute hypercapnic respiratory failure in hospital. NIV consists of the administration of ventilatory support in patients with stable ventilation needs.
In this study, we investigated whether continuing home-NIV in patients with persistent hypercapnia after a COPD exacerbation reduced readmission due to acute COPD exacerbation.

METHODS

- The intervention was conducted from January 2016 to December 2019.
- Patients with persistent chronic hypercapnia and a $PaCO_2$ >52mmHg were put on long-term home NIV following hospitalization with acute exacerbation and persistent hypercapnia, 1-2 weeks after resolution of acute respiratory acidemia.
- Admission rates 120 days prior were compared to readmissions 120 days post home-NIV intervention.
- Patient's risk factors, smoking history, pulmonary function test, compliance with NIV machine use, and ventilatory modes and settings were recorded.

RESULTS

TABLE 1: BASELINE CHARACTERISTICS, N=57	
Age at initial NIV treatment, mean (SD)	65.5 (13)
Female, n (%)	34 (58%)
BMI, kg/m2, median (IQR)	35 [25-41.5]
Former or current smokers, n (%)	33 (58%)
Heart Failure, n (%)	24 (44%)
Diabetes, n (%)	28 (50%)
CKD ≥ 3, n (%)	19 (34%)
Most recent LVEF%, median (IQR)	55 [55-60]
Home oxygen, n (%)	45 (82%)
Home oxygen, L, median (IQR)	3 [2-4]
$PaCo_2$ at time of initiation, mmHg, median (IQR)	66 [57-70]

BMI: body mass index; CKD: chronic kidney disease; LVEF: left ejection fraction; PaCo2: Partial pressure of carbon dioxide.

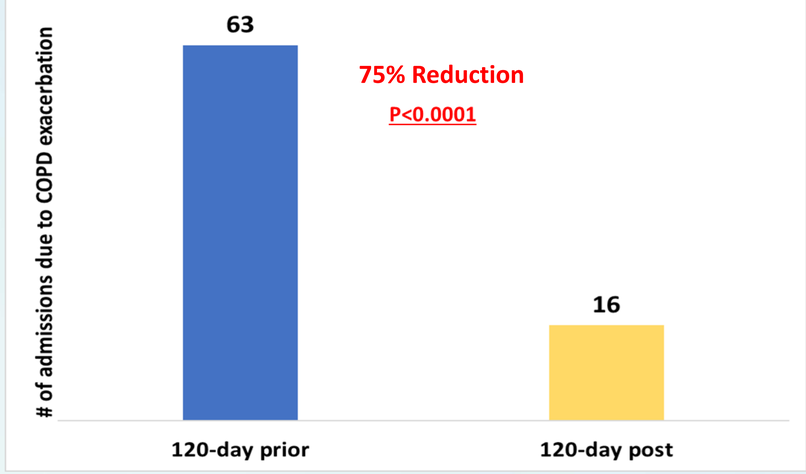
TABLE 2: NIV SETTINGS AND COMPLIANCE	
AVAPS, n (%)	16 (29%)
BiPAP, n (%)	3 (5%)
iVAPS, n (%)	37 (66%)
Daily NIV, hr., median [IQR]	8 [5.5-9]
IPAP, cm H_2O, median [IQR]	7 [5-8]
EPAP, cm H_2O, median [IQR]	21 [20-25]
Average target Vt NIV, Ml, median [IQR]	450 [400-530]
Compliance > 4 hr./day, n (%)	40 (82%)

AVAPS: average volume assured pressure support; BiPAP: bilevel positive airway pressure; iVAPS intelligent volume assured pressure, target Vt NIV: target volume NIV.

Readmissions due to acute COPD exacerbation were significantly reduced from 120 days prior to 120 days post intervention P <0.0001 (Fig 1).There were 63 admissions due to COPD exacerbation 120 days prior to the intervention and 16, 120 days post intervention. The intervention resulted in a 75% reduction in hospital admissions.
There was an 82% compliance rate and 8 [5.5-9] hours daily use of NIV (Table 2).

RESULTS

Fig1: COPD admissions prior vs. post intervention



DISCUSSION

Most Patients were on new generations of volume assured pressure support, (29% on AVAPS) with target tidal volume and variable pressure support and (66% on iVAPS) with target alveolar ventilation and variable pressure support. Five percent of patients were on BiPAP with two levels of continuous airway pressure. Overall, NIV settings were on median [IQR] IPAP of 21 [20-25] cmH_2O, on EPAP of 7 [5-10] cmH_2O, and target tidal volume of 450 [400-530] ml.
We recommend that for TriHealth patients with a $PaCO_2$ >52mmHg, a home-NIV be added to the standard of care. At $PaCO_2$ >52mmHg, patients are eligible for insurance coverage.

VALUE IMPACT

The use of home-NIV reduces the number of readmissions and helps avoid the Centers for Medicare & Medicaid penalties for excessive readmissions (up to 3% of total reimbursement). This is often the case for teaching hospitals or those caring for vulnerable populations.