

Using the Vivo 50

Reducing Hospital Readmissions with NIV and End Tidal CO₂ in COPD patients at home: a case series.

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Introduction

Chronic Obstructive Pulmonary Disease (COPD) is becoming an increasingly problematic healthcare issue in the United States. A study done in 2005 found COPD was causing 1.5 million emergency room admissions, 725,000 hospitalizations yearly, with estimated costs approaching \$60 billion – which led to the decision by the U.S. Centers for Medicare and Medicaid Services (CMS) to expand its Hospital Readmission Reduction Program (HRRP), part of the Affordable Care Act (Centers for Medicare & Medicaid Services), to include the COPD diagnosis (Feemster & Au, 2014). Today hospitals are being penalized by CMS for COPD readmissions occurring within 30 days of discharge via the HRRP. Hospitals stand to be penalized up to 3% of their regular reimbursements for excess readmissions (Advisory Board, 2016). These penalties on hospitals have generated an increased demand for DME providers to become even more involved and concerned with therapies directed at meeting the clinical needs of the patient in the home.

Capnography (measurement of EtCO₂) is fairly new to the durable medical equipment industry and has been received with some scepticism as there are no billable codes for this modality. However, the potential benefits for capnography include a clinical perspective into the patient's condition which was not possible prior to the development and integration of EtCO₂ measuring modalities. With capnography monitoring in the home, clinicians have a chance to intervene in the patient's care prior to exacerbations occurring. Per AARC Guidelines capnography may be indicated for evaluation of EtCO₂ gases, monitoring increases in severity of pulmonary disease, monitoring for patency of the airway and circuit (correct placement of trach, etc.), efficiency of the ventilator, and other indications (McArthur, 2003).



Non-invasive Mechanical Ventilation (NIMV) has been shown to decrease readmission rates in COPD patients (Murphy, PhD, et al., 2017). EtCO₂ monitoring of ventilator patients has been proven to be an effective tool in monitoring hemodynamic changes in patients in acute-care settings. This paper aims to study how EtCO₂ monitoring, specifically with the Breas Vivo50 ventilator, affects hospital readmission and clinical outcomes for patients in the home-setting.

Case presentation

Capnography is often done by nasal cannula sampling, mouthpiece sampling, or in-line with a ventilator circuit. All readings were collected via in-line sampling within the ventilator circuit. The test group was comprised of 15 patients who were placed on Breas Vivo 50 ventilators with integrated monitoring continuously for 30 days. Each of the 15 patients have the diagnoses of acute on chronic hypercapnic respiratory failure secondary to COPD. Each patient had more than two hospital admissions in the last 6 months. All patients were setup upon discharge from a hospital readmission. Each patient was setup in PSV(TgV) mode (pressure support ventilation with target volume). Each patient was instructed to use the Vivo ventilator for greater than 8 hours a day and document the EtCO₂ daily approx. the same time each day. Each patient was provided education regarding the EtCO₂ monitoring. Patients were instructed to call in if their EtCO₂ went 10 mmHg above their initial baseline reading. Alarms were set so the ventilator would alarm if the EtCO₂ went 10 mmHg above the initial baseline EtCO₂.

Patients from both groups were called 24-hours after set-up, had clinical visits 2-weeks and 4-weeks after set-up.

“When clinicians utilize EtCO₂ in the home setting, less hospital re-admissions occur.”



EtCO₂ readings for 30 days in mmHg: Initial refers to the EtCO₂ reading at initial setup

EtCO ₂	Initial	Lowest	Highest
A	45	40	47
B	44	36	50
C	53	44	52
D	42	31	44
E	34	33	40
F	42	33	44
G	47	45	47
H	55	47	54
I	51	47	51
J	54	46	52
K	54	52	55
L	40	35	48

For our control / comparison group, for 30 days we studied 25 patients with COPD and Chronic Hypercapnic Respiratory Failure discharged from hospital admissions that were set-up on the Breas Vivo 50 ventilator with PSV(TgV) mode, but without EtCO₂ monitoring. All education and equipment provided was along identical guidelines from the test group except for EtCO₂ monitoring. We were given clinical support via Dr. Rami Arfoosh who was available for consult before and during the process of our data collection.

Conclusion

From our control group (no EtCO₂ monitoring), 12 patients were readmitted with hypercapnic respiratory failure consequent to COPD exacerbation. Several of these patients were readmitted prior to the 2-week clinical visit while several made it past the 2-week visit, but none who were re-admitted made it past the 4-week visit.

There were no patients from the test group admitted to the hospital for exacerbation of chronic respiratory failure consequent to COPD, or for any other issue. Patients with

EtCO₂ monitoring were more engaged with their own care due to the diagnostic data they could utilize in their own care management. They were also more compliant, had higher daily usage, and demonstrated a more comprehensive understanding of the ventilator role in their care. Their caregivers (family, friends, and others involved in the patient's care) were more supportive of the use of the device due to the EtCO₂ giving them visual representation of the effectiveness of the ventilator. Our clinicians were given the opportunity to intervene in several instances which may or may not have contributed to the lack of readmissions.

There were two instances where the EtCO₂ alarm signalled, the patient called into our local branch, and with troubleshooting via phone our clinicians discovered the patient had been omitting their nebulizer medication therapies. Clinicians were able to re-educate those two patients on the importance of nebulized medication and likely prevent further harm. Each patient was contacted again after 48-hours and the hypercapnia (measured by the EtCO₂ monitor) was resolved back to normal levels. When clinicians utilize EtCO₂ monitoring in the home setting, less hospital re-admissions occur. We believe causality is most likely related to interventions brought about by clinician interpretation of EtCO₂ readings.

References

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