

Transitioning to a Breath-Actuated Pneumatic Nebulizer in the Emergency Department and In-Patient Settings: Experience Gained from Stakeholders Involved with the Process

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Background:

We report experience gained in a recent transition from a conventional continuously operating nebulizer to a breath-actuated nebulizer (BAN) for the rapid treatment and rescue of patients in the ED and In-Patient settings of a 310 inpatient bed community hospital with an additional 60 bed ED and ED Observation unit (Figure 1). We are located in southeast Virginia in the City of Chesapeake.



Figure 1. Chesapeake Regional Medical Center.

Methods:

Our Respiratory Department transitioned from a continuously operating jet nebulizer to the routine use of the disposable **AeroEclipse® II BAN** (Monaghan Medical Corp., Plattsburgh, NY; Figure 2) in the ED during October of 2011, and on the inpatient side in January of 2012. Following a 2 year period of use, we surveyed the various stakeholders involved with the transition.



Figure 2. Disposable **AeroEclipse® II BAN**

This mechanically-operated pneumatic nebulizer only delivers medication when the patient inhales (Figure 3), drawing the baffle mechanism attached to the green button on the top of the device downwards. The caregiver can therefore observe that the device is operating correctly and the patient is receiving the intended medication dosage. The suction force at the mouthpiece generated by the patient on beginning each inhalation engages the baffles with the liquid medication feed and compressed air supply driving nebulization. At about 15 L/min, aerosol formation begins and the patient continues to receive medication until just before the end of inhalation, when the falling flow rate disengages the baffle mechanism, returning the green button to its upper position, ready for the next inhalation.

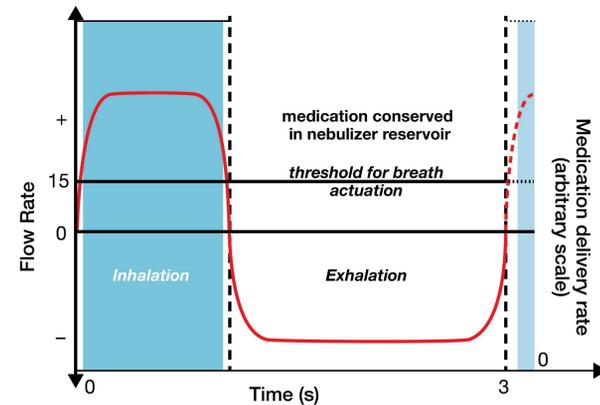


Figure 3. Tidal Breathing and the Operation of the Disposable **AeroEclipse® II BAN**

Clinical Considerations:

Admissions to the hospital floors from the Emergency Department (ED) for patients diagnosed with COPD or Asthma through 2011 to 2014 declined from 66.0% to 33.2% (Figure 4) and from 5.7% to 1.2% respectively (Figure 5).

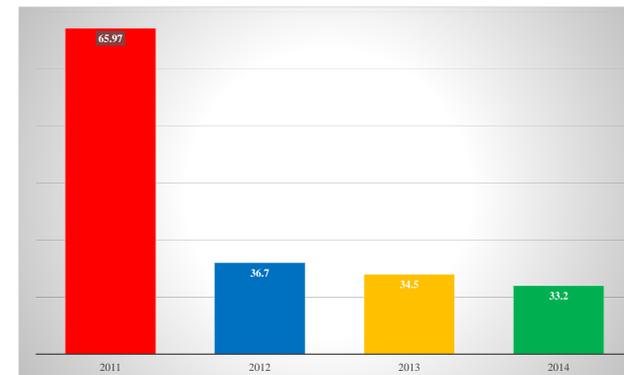


Figure 4: COPD Admissions from the ED as % of Total

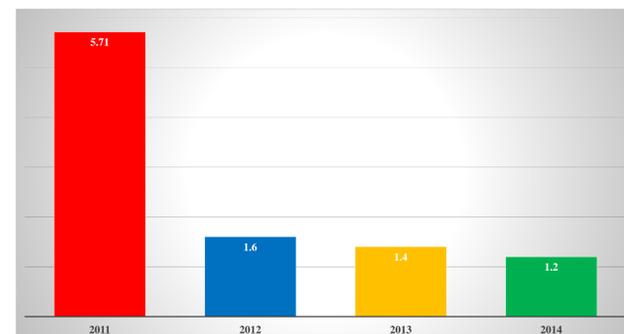


Figure 5: Asthma Admissions from the ED as % of Total

Table 2: Cost Savings Associated with Nebulizer Conversion

ITEM	CHANGE EFFECTED	COMMENTS
Saving in Staff Salary	Changing majority of treatments to Q6 hours instead of Q4 hours	\$73,000.00 annual salary
Decrease in Hospital Admissions from ED	From 66%-37% (1420 to 536 patients)	884 admissions
Average Reimbursement of COPD admission in 2012 minus Average Cost of COPD Admission in 2012	\$5,371 - \$6,269= -\$898	884 (number of saved admissions) x -\$898 (money lost on each admission) = \$793,832
TOTAL SAVED	\$866,832	\$866,832(savings) - \$33,750(cost (Table 1)) = Total Savings of \$833,082

Note: The saving in staff salary was achieved by decreasing the day shift by 1 full-time equivalent position

Economic Considerations:

There was an initial supplies cost increase associated with the change to the more complex BAN (Table 1)

Table 1: Nebulizer Supplies Budget (2012)

Nebulizer Type	Number of Nebulizers used in 2012	Comparative Cost
AeroEclipse® II BAN	9,000	\$40,500
Original Jet Nebulizer	9,000	\$6,750
Cost Increase:		\$33,750

This increase was however more than offset by a variety of savings associated with the delivery of the therapy by the BAN (Table 2). In particular the cost of re-admissions was a major benefit both in financial savings and also as a direct benefit to the patients themselves.

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Disclosures:

- The author has no conflict of interest to declare

Overall Outcomes:

The following major observations were made:

- Efficacy** – we observed on average that treatment-to-effect was completed in one-third of the time with the BAN;
- ED use** – Admissions in 2012 for COPD decreased 65.94% to 36.7%. Likewise admissions in 2012 for Asthma decreased from 5.71% to 1.6%. The following years have shown the same trend. ED admissions for COPD and asthma in 2013 were 34.5% and 1.4% respectively, and in 2014 were 33.2% and 1.2% respectively.
- Therapy frequency** – the majority of treatments were switched from Q4 to Q6 saving 1 x 8 hr/day RT position with a net-of-benefits saving estimated at \$73k;
- Quality of Care** – HFAP and JCAHO standards were met by completing all treatments one-on-one with the patient, which could not be achieved with the previous nebulizer because of time constraints of the nebulizer and average patient load.
- Patient Acceptance** – Customer Service was improved. Patients felt like they were receiving more medication in less time. In fact, we had to move up the time frame of the inpatient trial due to the patients that came from the ED did not want to be changed back to the continuous jet nebulizer. They preferred the BAN.
- Continuum-of-Care** – We asked Patient First Choice Home Care and ABC HealthCare two of our homecare providers to carry in stock the reusable **AeroEclipse® II BAN** intended for 6 months of home use, so that patients will continue to receive the benefits in terms of efficacy, with the ultimate aim of decreasing their readmissions rate.

Conclusions:

The adoption of the BAN as our primary device for delivery inhaled therapy to patients with severely obstructed airways has resulted in significant quality, clinical, financial, and patient satisfaction benefits. We intend to follow up this study by measuring if reduced hospital readmission rates can be correlated with this approach.