Transitionsing 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 southeastern Virginia in the City of Chesapeake.

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.

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).

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

Overall Outcomes:
The following major observations were made:
- Efficacy – we observed on average that treatment to affect was completed in one-third of the time with the BAN;
- ED use – Admissions to 2012 for COPD decreased 65.94% to 36.7%. Likewise admissions in 2012 for asthma decreased from 5.7% to 1.6%.
- Therapy frequency – the majority of treatments were switched from Q4 to Q6 saving 1 x 8 hour RT position with a net of benefits saving estimated at $73k.
- Quality of Care – HFAP and JCAHO standards were met by completing follow up this study by measuring if reduced hospital readmission rates can be correlated with this approach.

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.

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- The author has no conflict of interest to declare

Figure 1. Chesapeake Regional Medical Center.

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 when the patient inhales (Figure 3), drawing the baffle mechanism attached to the green button on the top of the device downwards.

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

Clinical Considerations:
Table 2: Cost Savings Associated with Nebulizer Conversion

<table>
<thead>
<tr>
<th>ITEM</th>
<th>CHANGE EFFECTED</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Saving in Staff Salary</td>
<td>Changing majority of treatments to Q6 hours instead of Q4 hours</td>
<td>$73,000.00 annual salary</td>
</tr>
<tr>
<td>Decrease in Hospital Admissions from ED</td>
<td>(1420 to 536 patients)</td>
<td>884 admissions</td>
</tr>
<tr>
<td>Average Reimbursement of COPD admission in 2012 minus Average Cost of COPD Admission in 2012</td>
<td>$5,371 - $6,269= $898</td>
<td>($money lost on each admission) = $783,832</td>
</tr>
<tr>
<td>TOTAL SAVED</td>
<td>$866,832</td>
<td>($866,832($avings) - $33,750(cost (Table 1)) = Total Savings of $833,082)</td>
</tr>
</tbody>
</table>

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

Table 1: Nebulizer Supplies Budget (2012)

<table>
<thead>
<tr>
<th>Nebulizer Type</th>
<th>Number of Nebulizers used in 2012</th>
<th>Comparative Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>AeroEclipse® II BAN</td>
<td>9,000</td>
<td>$40,500</td>
</tr>
<tr>
<td>Original Jet Nebulizer</td>
<td>9,000</td>
<td>$6,750</td>
</tr>
<tr>
<td>Cost Increase:</td>
<td></td>
<td>$33,750</td>
</tr>
</tbody>
</table>

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.

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

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