Implemetation of a Breath Actuated Nebulizer Regimen May Reduce Nosocomial Influenza Acquired by Exposure to Fugitive Droplet Emissions from Continuous Nebulizers Whose Droplets Produced During Exhalation are Vented to the Environment

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INTRODUCTION

- Most nebulizers generate aerosol continuously, resulting in the expulsion of droplets to the environment during each exhalation.
- Influenza virus particles attached to such droplets is a potential cause of infection for hospital staff. The influenza virus can survive up to 2-3 hours following droplet attachment.
- Transfer from continuous to Breath Actuated Nebulizer (BAN)-based therapy might be beneficial in terms of reducing staff-acquired infections.
- The present study examined comparative costs associated with the care of patients in the Emergency Department of a mid-sized hospital on either continuous or BAN-based therapy.
  - This facility pays 1.5 times standard rate for 'call in' staff together with the normal time rate for the person sick, resulting in an overall charge of 2.5 times standard rate per event.
- The hospital Infection Control department was consulted and supported this prospective study.

NEBULIZATION AND DROPLET GENERATION

Continuous Nebulization

- In a continuously operating nebulizer, aqueous droplets containing medication are produced throughout the patient tidal-breathing cycle (Figure 1).
- Droplet generation continues during each exhalation.
- There is the possibility that virus particles, such as influenza may also be entrained with these droplets.
- They rapidly evaporate into the surroundings and the very fine residual particles can be transported tens of meters by local air currents, conveying infection to others in the vicinity.
- Medical grade facemasks afford protection to the patient from larger droplets coveying bacteria/ virus particles emitted from caregivers, but do not necessarily protect the caregiver from these evaporated nebulizer-generated droplets.

Breath Actuated Nebulization

- In a BAN, aqueous droplets containing medication are ONLY produced during the inhalation portion of the tidal breathing cycle (Figure 2).
- Droplet generation therefore does not occur during exhalation

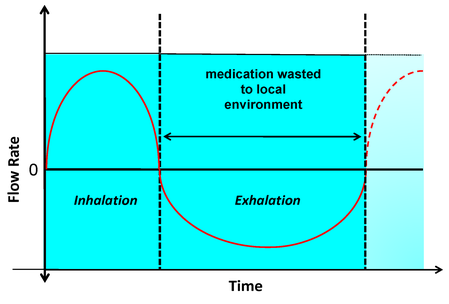

Figure 1: Flow Rate – Time Profile for Continuous Nebulization. Droplets containing virus particles may be emitted to the local environment during the exhalation phase of each breathing cycle .

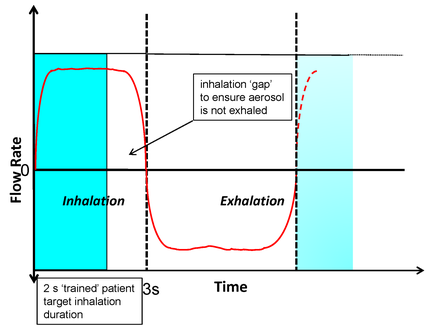

Figure 2: Flow Rate – Time Profile for Breath Actuated Nebulization. Droplets are not produced during the exhalation phase.

METHODS

- Attendance records were examined for staff associated with the care of patients known to be carrying influenza virus and therefore isolated from the general population undergoing care in the ED.
- The following conditions were evaluated

Group 1 **Airlife† MistyMax-10†**

- Nov 2016 – Mar 2017 for level 1 surgical procedure face mask for only the patients undergoing continuous nebulizer-based therapy

Group 2 **Airlife† MistyMax-10†**

- Nov 2017 – Dec 2017 for level 1 surgical procedure face mask for both staff and patients, the latter on continuous nebulizer therapy

Group 3 **AEROECLIPSE® II**

- Jan 2018 – March 2018 for level 1 surgical procedure face mask for both staff and patients, the latter on BAN-based therapy

Airlife† MistyMax-10† continuous disposable nebulizer
CareFusion, San, Diego, CA

AEROECLIPSE® II breath actuated nebulizer
Monaghan Medical Corp., Plattsburgh, NY

RESULTS AND DISCUSSION

Summary of Findings

Outcomes	Group 1 Continuous	Group 2 Continuous	Group 3 BAN
Precautions to reduce virus spread	Facemask for patients only	Facemask for patients and staff	Facemask for patients and staff
Staff 'sick' days	17	8	2
Cost of 'sick' days	$4,471	$2,444	$284
Call-back pay-days	17	8	2
Cost of call-back pay-days	$7,632	$3,762	$1,254
Positive influenza tests for staff	9	5	2

- While the use of facemasks by both staff and patients reduced the number of positive influenza tests, implementation of BAN-based therapy resulted in a further improvement protecting caregivers.
- The influenza treatment protocol did not change, with the exception of the use of facemasks and the BAN, as shown in the Table
- The same staff were involved throughout the investigation, and all members were vaccinated against influenza
- The influenza season for 2018 was worse than in 2017 before the BAN was introduced, but fewer therapists reported sick with influenza

CONCLUSIONS

- Implementation of BAN-based therapy has the potential to reduce costs associated with acquisition of nosocomial influenza in the ED

Disclosures: None

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