Westmed

CLINICAL EDUCATION BULLETIN

Date: July 5, 2013
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Topic: **Protect the Patient; Protect the Caregiver: Mitigating the Risks of Aerosol Therapy**

The risk/benefit proposition for medicated aerosol therapy rarely considers the risk side of the equation for the patient receiving the therapy or the attendant risk to caregivers and/or family members who provide it.

Protect the Patient; Protect the Caregiver

For all of its benefits to patients, aerosol therapy carries with it certain risks:

(1) *de novo* pulmonary infection,
(2) worsening of existing pulmonary infection,
(3) prolongation of existing infection, or
(4) interference with the effectiveness of prescribed antibiotics.

Caregivers, including family members, who are in close proximity to patients receiving aerosol therapy in either the hospital or the home, are also at risk due to:

(1) inhalation of exhaled patient droplets that may contain pathogens, leading to or causing a new upper or lower respiratory infection, and/or
(2) inhalation of prescription medications that have not been prescribed for them and are not indicated for them.

The consequences of inhaling certain medications that are neither prescribed nor indicated can be quite serious. The chief issue for caregivers, especially respiratory therapists, is the chronic, low-dose exposure to beta-agonist medications (albuterol). There are numerous reports in the medical literature of caregivers with no prior history of asthma developing asthma after working with beta-agonist aerosol administration for a period of time.[1-6] Other reports in the literature suggest that chronic exposure to beta-agonists may "downregulate" beta receptors, thereby causing increased bronchomotor tone and increased susceptibility to various asthma triggers.[7]

To protect the patient, the Circulaire II also protects the nebulizer.

With practically all other aerosol delivery systems, the nebulizer has no protection against becoming contaminated by the patient's saliva (mouthpiece drool), or by airborne patient droplets that may have been coughed retrograde back into the nebulizer itself. If this happens, any organisms present in the saliva, sputum or patient droplets may deposit in the nebulizer and possibly proliferate, only to be re-nebulized back into the patient's lungs during the same treatment or a subsequent treatment.

Only the Circulaire II and Circulaire II *Hybrid* contain a one-way flapper valve that is designed to ***protect the nebulizer*** and prevent it from becoming contaminated by the patient while in use. And, while protecting the nebulizer from contamination, the reservoir bag or reservoir ball that doubles the delivery rate of medication (compared to other devices) is also protected from contamination.

Protect the Nebulizer

A recent clinical microbiology study by Grzeskowiak and McKee, of Long Beach Memorial Medical Center & Miller Children's Hospital in Long Beach, CA has found no growth in 252 cultures taken from Circulaire II nebulizers and reservoir bags and balls in patients receiving aerosol therapy up to 4 consecutive days.

The authors state that the findings suggest that the design of the device (flapper valve) may isolate the nebulizer and reservoir to protect them from contamination.

This study has been submitted to the American Association for Respiratory Care to be presented at the AARC Open Forum in November 2013.

EVALUATION OF THE CIRCULAIRE II AEROSOL DRUG DELIVERY SYSTEMS FOR MICRO-BIOLOGICAL CONTAMINATION. Mark Grzeskowiak, RRT RCP FAARC. Respiratory Care Services; Barbara McKee, MT (ASCP), Microbiology Department, Long Beach Memorial Medical Center/Miller Children's Hospital, Long Beach, CA.

BACKGROUND: Small Volume Nebulizers (SVNs) are considered at risk for microbiological contamination due to their proximity to the patient's exhaled gas path and saliva. Routine use, post–treatment handling and storage practices may allow pathogens to proliferate to greater colony counts and inoculate the patient with contaminated aerosol during subsequent treatments. The Westmed Circulaire II (CII) and Circulaire II *Hybrid* (CII-H) are valved conserver type SVNs with two different types of aerosol reservoirs. Reservoirs substantially increase drug delivery but the condensation that forms inside them raises concerns about their potential for contamination. **PURPOSE**: This study was designed to determine if a valved conserver-type SVN with a reservoir would increase the potential for microbiological contamination. **METHOD**: Patients receiving at least 2 treatments daily had their CII and CII-H devices cultured at the end of each treatment day X 4 days. After each treatment, residual drug was poured out and the nebulizer stored in a plastic bag at the bedside. The nebulizer cup and reservoir was cultured using the BBL™ CultureSwab™ collection and transport system. Blood agar plates were inoculated with a specimen, streaked for isolation and incubated for 48 hrs. A semi-quantitative scale (rare, light, moderate or heavy) was planned to report any growth. Representative samples of each type of SVN were cultured prior to patient use to rule out contamination from the manufacturer. The study end-point was to collect 4 consecutive days of cultures (Cx's) from 10 patients each using CII and CII-H. Many patients remained on treatments for <4 days and thus had <4 cultures. **RESULTS**: Daily results are summarized in the table. Two cx's showed rare growth but cx's taken from those same nebulizers on a subsequent day showed no growth. Cultures from all other nebulizers and reservoirs showed no growth.

Circulaire II (CII) with 550 mL Thin Film Reservoir Bag

	DAY 1		DAY 2		DAY 3		DAY 4	
# of Patients	33		20		13		10	
	NEB	BAG	NEB	BAG	NEB	BAG	NEB	BAG
# of Cx's	32	32	20	20	12	12	10	10
# of + Cx's	0	0	0	0	0	0	0	0

Circulaire II Hybrid (CII-H) with 350 mL Elastomeric Reservoir Ball

# of Patients	29		13		11		10	
	NEB	BALL	NEB	BALL	NEB	BALL	NEB	BALL
# of Cx's	19	19	13	13	10	10	10	10
# of + Cx's	2 (rare)	0	0	0	0	1 (rare)	0	0

CONCLUSION: Despite using minimal post-treatment practices, in 252 cultures, no significant organism growth was found in either the nebulizer or reservoir of the Circulaire II devices. The rare growth found in 3 SVNs was considered insignificant. These findings suggest that the valved conserver device may isolate the nebulizer and reservoir and protect them from contamination.

Protect the Caregiver

While not a complete solution, use of the Circulaire II high-efficiency aerosol drug delivery system will mitigate exposure to exhaled patient droplets and medication aerosols during aerosol therapy. The Circulaire II and Circulaire II *Hybrid* are the only aerosol delivery systems on the market that automatically include an integral exhalation filter with every system. With all other aerosol delivery devices, exhalation filters are either an optional accessory or not available.

Isn't it about time?

- CRNAs and anesthesiologists have been protected for years from breathing trace anesthetics gases and vapors by scavenging systems.
- Central Sterile Supply technologists have been protected for years from breathing ethylene oxide gas sterilant vapors.
- Hospital pharmacists have been protected for years from exposure to dangerous chemotherapy agents that they mix and prepare.

Isn't it about time that respiratory therapists are protected from the occupational hazards that accompany their jobs: namely exposure to exhaled patient droplets and fugitive medication aerosols?

References

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Michael McPeck, RRT FAARC
Director of Clinical Education
WESTMED, Inc.
5580 S. Nogales Highway
Tucson, AZ 85706
Cell: (516) 729-9989
mmcpeck@westmedinc.com
www.westmedinc.com