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The Use of a Unique Mucus Shaver Clearing Device to Improve Ventilator Weaning

Linda Schofield PhD, RN • Gary Saur, MBA, RRT • Jeffrey Washington, M.D.

PURPOSE

Routine endotracheal suctioning techniques are unable to remove adherent secretions and biofilm from within the endotracheal (ET) tube, resulting in a narrowed airway, increased work of breathing, and colonization by ventilator associated pneumonia (VAP) organisms. The purpose of this study is to compare the efficacy of removing adherent endotracheal tube secretions with the use of a mucus shaver clearing device prior to weaning trials with the efficacy of routine suctioning alone prior to weaning trials.

BACKGROUND

Ventilator-associated pneumonia (VAP) is a frequently occurring nosocomial infection associated with increased morbidity and mortality. Bacteria that colonize the oropharyngeal area, including dental plaque, can aspirate into the lungs and cause nosocomial respiratory disease. Oral care does not address the potential risk of VAP associated with secretions and biofilm that collect within the ET tube. Partial occlusion or narrowing of the endotracheal tube has been associated with increased patient work of breathing and delayed extubation. Caring for ventilated patients in an ICU is substantially more expensive than caring for non-ventilated patients. A unique mucus shaver clearing device can be used to decrease airway resistance, expedite weaning and remove bacteria that cause VAP. The mucus shaver clearing device restores the ET tube to optimal weaning conditions by confirming ET Tube patency. The main indications for use of the mucus shaver clearing device include:

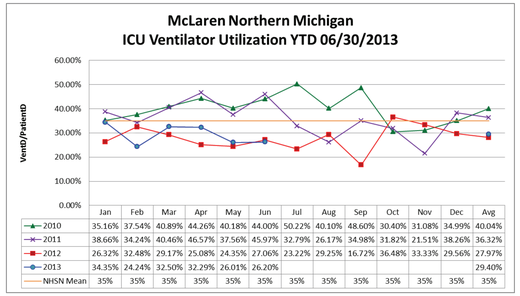
- Prior to spontaneous breathing trials
- Thick Secretions
- Difficulty suctioning/weaning
- Acute change in patient condition
- Hemoptysis
- Prior to Bronchoscopy/tube exchange/tracheostomy

METHODS

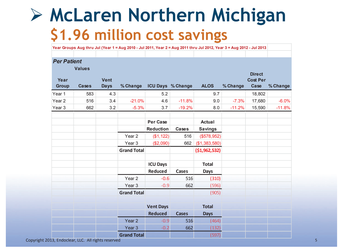
This is a three year retrospective study of all adult patients, age 18 or older, admitted to an 18 bed Intensive Care Unit in rural Northern Michigan who were on the ventilator greater than 24 hours, and who met the general criteria for the sedation awakening and weaning trials. 2011 ventilator days, ICU length of stay (LOS), hospital LOS, and VAP were compared with 2012 and 2013 patients who had their endotracheal tubes cleared with the mucus shaver clearing device prior to the weaning trial.

RESULTS

583 cases were reviewed during year one, 516 cases in year 2, and 662 cases in year three. Prior to the initiation of the endotracheal tube being cleared with the mucus shaver clearing device, ventilator days were 4.3, ICU LOS was 5.2, and hospital LOS was 9.7. After the initiation of the mucus shaver clearing device, there was a decrease in average ventilator days by 1.1 days. ICU LOS decreased from 5.2 to 3.7, and the hospital LOS decreased from 9.3 to 8.0. Our VAP rate went from 1.2 to 0, and the first 6 months of 2013 there were zero wentilator associated events (VAE). There was an estimated savings of $1,962,532 with the addition the use of the mucus shaver clearing device to daily weaning trials.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Avg
2010	35.16%	37.54%	40.89%	44.26%	40.18%	44.00%	50.22%	40.10%	48.60%	30.40%	31.08%	34.99%	40.04%
2011	38.66%	34.24%	40.46%	46.57%	37.56%	45.97%	32.79%	26.17%	34.98%	31.82%	21.51%	38.26%	36.32%
2012	26.32%	32.48%	29.17%	25.08%	24.35%	27.06%	23.22%	29.25%	16.72%	36.48%	33.33%	29.56%	27.97%
2013	34.35%	24.24%	32.50%	32.29%	26.01%	26.20%							29.40%
NHSN Mean	35%	35%	35%	35%	35%	35%	35%	35%	35%	35%	35%	35%	35%



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$1.96 million cost savings

Year Groups Aug thru Jul (Year 1 = Aug 2010 - Jul 2011, Year 2 = Aug 2011 thru Jul 2012, Year 3 = Aug 2012 - Jul 2013)

Per Patient

Year Group	Values Cases	Vent Days	% Change	ICU Days	% Change	ALOS	% Change	Direct Cost Per Case	% Change
Year 1	583	4.3		5.2		9.7		18,602	
Year 2	516	3.4	-21.0%	4.6	-11.8%	9.0	-7.2%	17,680	-6.0%
Year 3	662	3.2	-6.5%	3.7	-19.2%	8.0	-11.2%	16,590	-11.8%

	Per Case Reduction	Cases	Actual Savings
Year 2	($1,122)	516	($578,952)
Year 3	($2,090)	662	($1,383,580)
Grand Total			($1,962,532)

	ICU Days Reduced	Cases	Total Days
Year 2	-0.6	516	(318)
Year 3	-0.9	662	(594)
Grand Total			(912)

	Vent Days Reduced	Cases	Total Days
Year 2	-1.0	516	(516)
Year 3	-0.3	662	(198)
Grand Total			(714)

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CONCLUSIONS/RECOMMENDATIONS

The removal of adherent endotracheal tube secretions with the use of the mucus shaver clearing device prior to weaning trials provides better patient care outcomes and provides a cost savings to the hospital.

CLINICAL IMPLICATIONS

Utilizing the mucus shaver clearing device is a safe and more effective way to remove adherent secretions and biofilm from the endotracheal tube than routine suctioning techniques alone, and results in decreased time on the ventilator, decreased risk of ventilator associated events, and decreased direct costs to the hospital.

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4. Wilson, Thomas, et al. CHEST, Oct 2009

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