Continuous Quality Improvement and Ventilator Associated Pneumonia • 2003 to Present

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Objectives

1) Describe a performance improvement process utilizing PDCA — Plan, Do, Check and Act.
2) Describe nursing and respiratory therapy interventions used to prevent ventilator associated pneumonia (VAP).
3) Describe changes in VAP rates over time after initiating prevention guidelines.

Rationale

- VAP increases length of stay (LOS) and use of antibiotics.
- Prevention of VAP has been shown to decrease morbidity, use of antibiotics, and LOS.
- The protocol utilizes research based practices to enhance the care and comfort of the patient while decreasing the incidence of VAP.
- Costs savings — $17,000 to $40,000 cost per VAP.

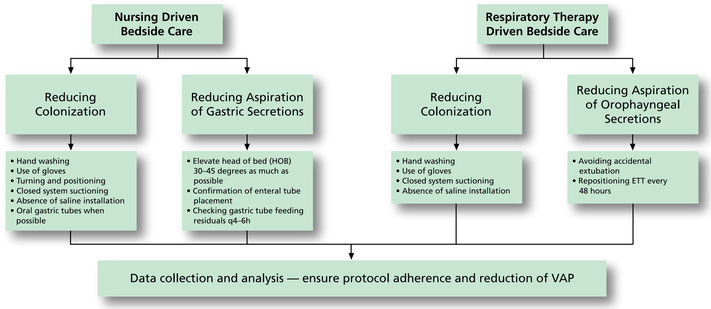
Population

- Bronson Methodist Hospital (BMH) is a community teaching hospital. The MICU has a capacity of 14 beds and the SICU has a capacity of 20 beds.
- The SICU is a mix of neuro, burn, trauma, surgical and medical patients. The model for trauma patients is to admit and discharge from the SICU.
- The MICU is mostly medical critically ill patients with a small percentage of post-CABG patients.

2003 Multidisciplinary Team Meeting

- VAP rates were reported at BMH to be within the 50th percentile in 2003.
- Nursing and respiratory staff authored a VAP prevention protocol based on the literature that targeted interventions for their respective scopes of practice. As Keystone ICU developed, the VAP prevention protocol became a multi-disciplinary protocol.

Bedside Interventions to Decrease the Incidence of Ventilator Associated Pneumonia (VAP)



Liberation from Mechanical Ventilation Protocol

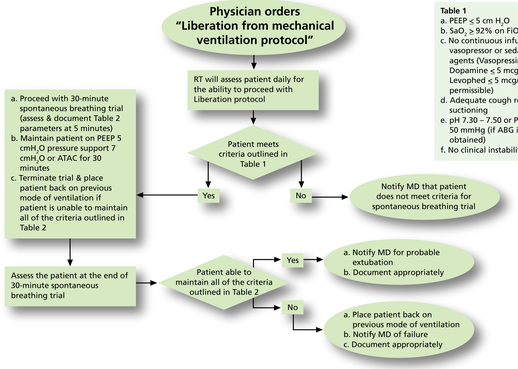
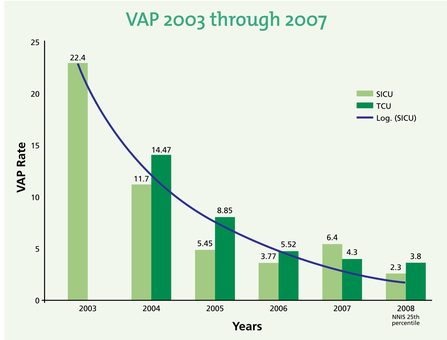


Table 1
a. PEEP ≤ 5 cm H_2O
b. SaO_2 ≥ 92% on FiO_2 ≤ .50
c. No continuous infusions of vasopressor or sedating agents (Vasopressin, Dopamine ≤ 5 mcg/kg, or Levophed ≤ 5 mcg/kg is permissible)
d. Adequate cough reflex on suctioning
e. pH 7.30 – 7.50 or $PaCO_2$ 25 – 50 mmHg (if ABG is obtained)
f. No clinical instability

Table 2
a. Respiratory rate ≤ 30
b. Spontaneous tidal volume ≥ 4ml/kg (IBW)
c. Respiratory rate/tidal volume ratio ≤ 100 (BSBI)
d. Minute ventilation ≤ 15 L/min
e. No diaphoresis
f. No new atrial or ventricular arrhythmias
g. No apnea lasting more than 45 seconds
h. Ability to maintain O_2 saturations ≥ 90% on FiO_2 ≤ .50 (MD should be notified if increases in FiO_2 > .10 are necessary)
i. Systolic pressure does not decline greater than 15 mmHg, or rise greater than 20 mmHg
j. No breathlessness or severe dyspnea occurs
k. No physician, nurse, or therapist assessment of failure

2008 VAP Prevention Guideline Updates

- 250 cc sterile water bottle to rinse catheter tip suction
- HOB to remain at minimum 30 degrees, if possible with any interventions and transports as well
- Deep oropharyngeal suction every 12 hours and when patient to be flat for an expected time greater than 30 minutes
- Timing of chlorhexidine oral rinse to occur just after deep oropharyngeal suctioning
- All VAPs to be reviewed by physicians. Trauma to utilize probability. Those patients with less than 50% probability of VAP who acquire a VAP are reviewed at M & M



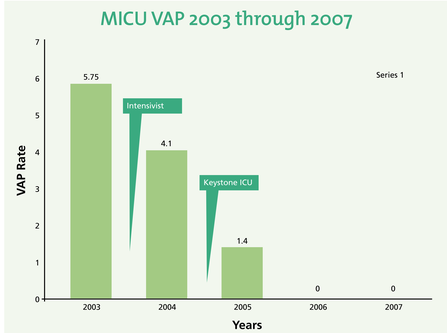
Analysis

Comparison analysis based on proportion

Unit	Year	Proportion	One-Sided p-value	Hypothesis	Statistical test
MICU	2003	0.007581	0.106	Year 2004 rate < Year 2003 rate	Z-test for two proportions
	2004	0.004107			
	2004	0.004107	0.145	Year 2005 rate < Year 2004 rate	Fisher's exact test
	2005	0.001373			
	2005	0.001373	0.211	Year 2006 rate < Year 2005 rate	Fisher's exact test
	2006	0			
	2006	0	1.000	Year 2007 rate < Year 2006 rate	Fisher's exact test
	2007	0			
	2007	0	1.000	Year 2008 ytd rate < Year 2007 rate	Fisher's exact test
	2008 ytd	0.001716			
SICU	2003	0.019822	0.035[1]	Year 2004 rate < Year 2003 rate	Z-test for two proportions
	2004	0.011714			
	2004	0.011714	0.031[1]	Year 2005 rate < Year 2004 rate	Z-test for two proportions
	2005	0.005453			
	2005	0.005453	0.237	Year 2006 rate < Year 2005 rate	Z-test for two proportions
	2006	0.003774			
	2006	0.003774	0.879	Year 2007 rate < Year 2006 rate	Z-test for two proportions
	2007	0.006372			
	2007	0.006372	0.570	Year 2008 Jan-Jun rate < Year 2007 rate	Z-test for two proportions
	2008 ytd (Jan–Jun)	0.006873			

Note: Use Fisher's exact text due to small numbers of events/nonevents

Result: 1. In SICU, year 2004 rate was significantly lower than year 2003 rate at 5% level of significance (p-value = 0.035)
2. In SICU, year 2005 rate was significantly lower than year 2004 rate at 5% level of significance (p-value = 0.031)



Conclusions

- Utilizing a multidisciplinary protocol to prevent ventilator associated pneumonia significantly decreased VAP.
- Ongoing use of PDCA is necessary for continued performance improvement.
- Savings > $1 million in first two years.

Limitations

- Prospective collection of VAP rates not risk adjusted.
- Changes in patient populations in the SICU have occurred over the last two years, including a marked increase in neuroscience patients.

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