

Audit on compliance of ventilator associated pneumonia care bundle in Intensive Care units in National Hospital Sri Lanka

Ruvini Jayanimali Kosgollawatta Walimanna Gamage^{1*}

Specialty Registrar in Anaesthesia and Critical Care, North Wick Park Hospital, United Kingdom.

Introduction: Nosocomial infections are a major health concern worldwide, ventilator-associated pneumonia (VAP) is the most common healthcare-associated infection in adult critical care units. VAP is associated with increased length of stay in intensive care units (ICU), days in ventilator, and mortality by about 30%. Because of the seriousness of the needs, VAP care bundle was introduced in 2007.

Objective -To assess the compliance to the ventilator care bundle in critical care units in the National Hospital Sri Lanka (NHSL).

Method – A descriptive cross-sectional study was conducted over a period of one month in ICUs in the NHSL. Evidence of compliance of the ventilator care bundle components were assessed using a standard data collection form. The assessed components were elevation of head of bed, adequate endotracheal tube cuff pressure, oral care with chlorhexidine, sedation vacation, peptic ulcer prophylaxis, and adherence to sub glottis suction. Ethical clearance was obtained from the Ethical review committee of NHSL.

Results – Adherence to all six components of the bundle was low as 28%. Out of different ICUs at NHSL only three of them adhered to the total bundle care, namely medical, surgical and neuro trauma ICU. Head of bed elevation was adhered universally, and minimum adherence was shown to subglottic suction which was 39.08%.

Conclusion - Total VAP care bundle compliance was low (28%) in this study sample. Even though there is improvement of ventilator bundle care from 2011, overall practice was unsatisfactory and particular attention should be paid in terms of adherence to subglottic suction, oral care with chlorhexidine and sedation vacation.

Ventilator-associated pneumonia (VAP) is a nosocomial infection that develops in patients receiving mechanical ventilation for more than 48 hours and is the commonest intensive care units associated infection.¹ Incidence is reported to be 10–60% and is highly influenced by the criteria used for diagnosis as there is no accepted universal criteria for diagnosis.²

VAP is associated with increased length of stay in ICU, days in ventilator and increases mortality by about 30%.^{3,4} Initial VAP care bundle introduced in 2007 had four high impact (HII) interventions. Those are bed head elevation, daily sedation holds, prophylaxis for gastric ulcers, and oral hygiene.

High impact components were updated in 2010 to add oral hygiene with adequate strength anti-septic, subglottic suction, and cuff pressure monitoring.⁵

Implementation of VAP care bundles has proven to reduce the rate of occurrence of VAP in ICU. Benefits are evident even when the compliance rates are poor as 30%.^{6,7}

As there are limited published data on this topic in Sri Lanka, this audit attempts to fill this gap.

*Correspondence: Ruvini Jayanimali
Kosgollawatta Walimanna Gamage
E mail: malikosgollawatta@yahoo.com



<https://orcid.org/0000-0002-2639-5931>

Received: 30/10/2018

Accepted: 20/11/2018

DOI: <http://doi.org/10.4038/slja.v27i1.8387>



Objective

To assess the compliance to the ventilator care bundle in critical care units in NHSL.

Audit standards and criteria

	Evidence of adherence to VAP	Standard (%compliance)	Exclusions	Definitions
1	Intubated patients should be positioned in semi-recombinant position (30-45°) for as much of the time as possible.	100%	Spine injury	All adult intubated patients in ICU
2	Maintenance of adequate endotracheal tube cuff pressure. Between 20-25 cmH ₂ O	100%	None	All adult intubated patients in ICU
3	Oral hygiene with 0.5% Chlorhexidine solution eight hourly	100%	Oropharyngeal trauma, allergy to Chlorhexidine	All adult intubated patients in ICU
4	Sedation must be reviewed and daily sedation vacation and readiness to wean and extubation has to be assessed.	100%	Difficult to ventilate, refractory hypoxia, high intra cranial pressure	All adult intubated patients in ICU
5	Peptic ulcer prophylaxis	100%	None	All adult intubated patients in ICU
6	Using Endo tracheal (ET) tubes with subglottic suction	100%	None	All adult intubated patients in ICU

Methodology

A descriptive cross sectional, baseline audit was conducted in all intensive care units in NHSL over a period of one month. Study population was adult patients who were intubated and ventilated during the study period. Pregnant and peripartum patients and patient who are under 16 years were excluded.

Results

Compliance on VAP care bundle was analyzed in 100 patients admitted to ICUs in NHSL. The total number of ventilatory days assessed were 417 (MICU- 109, NT- ICU 73, SICU-64, CICU-33, CTICU-18)

Table 1: Compliance to the VAP care bundle

Compliance level*	Number (417)	%
Compliance for all six components of the bundle	117	28
Compliance for five components of the bundle	82	19.66
Compliance for four components of the bundle	169	40.5
Compliance for three components of the bundle	44	10.55
Compliance for two components of the bundle	5	1.1

***The compliance was calculated for total ventilator days**

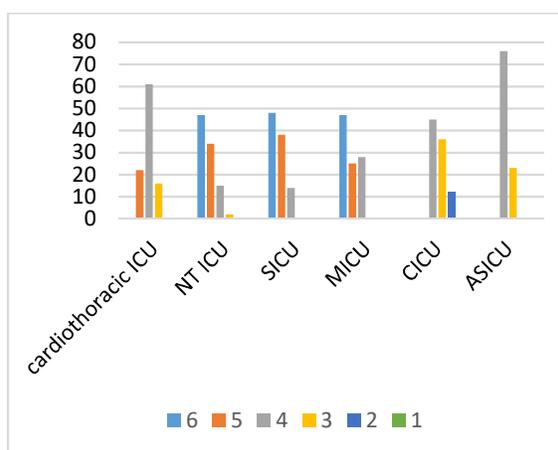
Total compliance to VAP care bundle was as low as 28%. Highest compliance of 40.5% recorded for the compliance in four components.

Table 2: Compliance to total VAP care bundle (all 6 components) by different ICUs

Different ICUs	% of compliance
Surgical ICU (SICU)	48.43
Neuro Trauma ICU (NT-ICU)	47.94
Medical ICU (MICU)	46.78
Accident Service ICU (ASICU)	0
Cardiology ICU	0
Cardiothoracic ICU	0

Total bundle compliance was observed only in SICU, NT-ICU and MICU and it ranged from 46.78% to 48.43%.

Figure 1: Adherence to total bundle care by different ICUs



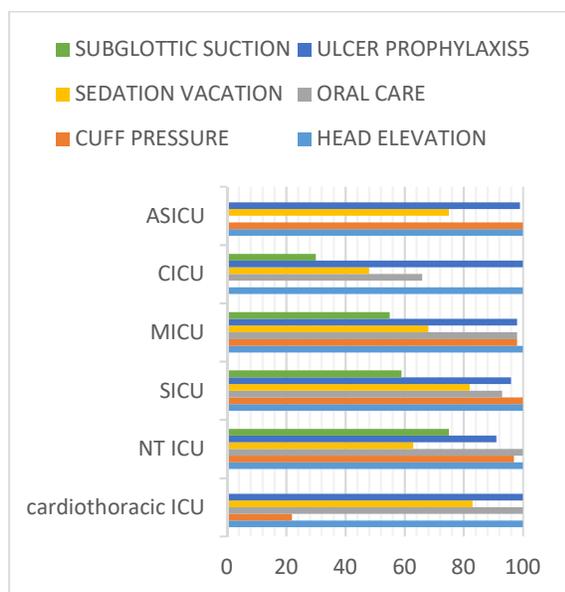
Almost all ICUs show higher percentage of adherence to four or more than four components of the bundle.

Table 3: Percentage adherence to individual components of the VAP care bundle

Components	Percentage adherence (%)
Head-of-bed elevation: 30 to 45	100
Adequate endotracheal tube cuff pressure (>20-25 cmH2O)	87.76
Oral care with chlorhexidine solution every 8h	67.38
Daily “sedation vacation” and daily assessment of readiness for extubation	71.22
Peptic ulcer prophylaxis	97.36
Subglottic suction	39.08

A 100% adherence was shown for head end elevation while the lowest 39.08% was recorded for subglottic suction.

Figure 2: Compliance for different components of VAP care bundle by ICU



Oral care with chlorhexidine and adherence to subglottic suction were not practiced in the ASICU.

Discussion

A care bundle is defined as a group of evidence-based interventions related to a specific condition when applied together significantly improves

patient outcome. Studies done worldwide have proven that adherence to VAP care bundle reduces the VAP rates. Compliance to all components of high impact interventions (HII) was very low (28%) in this study sample. Highest percentage of 40.5% was shown with adherence to four components of the bundle. Significant reduction in VAP rates were shown by a large multi centered trial conducted in Scotland, by achieving 70% adherence to total bundle care⁵. Another study done in Spain on HII showed that though, the compliance was <30%, there were significant reduction in VAP rate, length of stay and days of mechanical ventilation.^{6,7}

Only three ICUs in NHSL showed total adherence to VAP care bundle namely SICU, NT-ICU and MICU. Percentage compliance was 48.43%, 47.94% and 46.78% respectively. Cardiothoracic ICU showed adherence to five components of the bundle of 22% and four components of 66%. Compliance with four components of 44% recorded in cardiology ICU while ASICU showed 76.66%.

100% compliance was shown to head-of-bed elevation, which is the standard percentage compliance. When compared with the audit done in NHSL in 2011 this component was adhered only in 89% instances.⁸ Thus, this is a clear improvement. Worldwide audits in this aspect have shown variation between 50% adherence to 100%. Peptic ulcer prophylaxis was practiced in 97.36% of ventilator days, which is clearly closer to the recommendation. Non-adherence with this component was due to the negligence of the prescriber. In the audit in 2011 in the NHSL this component showed a percentage of 99%.⁸

Maintenance of ET cuff pressure is a proven factor to reduce the VAP rates. It was 87.76% in this audited sample. The previous audit documented a percentage of only 27%.⁸ Over the years the practice of cuff pressure monitoring has improved dramatically. Main reason not to adhere to this component of the bundle was different VAP care guidelines practiced by different ICUs.

Sedation vacation and assessment for readiness for weaning and extubation is a common practice in critical care aiming to reduce the mortality and morbidity of these patients. It was adhered only in

71.22% (after excluding the exceptions like difficult to ventilate, refractory hypoxia, high intra cranial pressure) by the critical care units in NHSL. This is clearly substandard and almost no improvement from the audit in 2011 which showed 70%.

Oral care with 0.5% chlorhexidine was introduced in 2010 to the HII bundle and compliance to that was 67.38%. Audit performed in NHSL ICUs in 2011 chlorhexidine mouth wash was used only in cardiothoracic ICU. Thus, this is a significant improvement in nursing care in critically ill.⁸ Subglottic suction was not at all evident in the previous audit in the same population. But in this study sample it has improved from 0% to 39.08%. Reason for not using sub glottis suction was non-availability of the endotracheal tube with subglottic suction in every intensive care unit, theaters, trauma and emergency departments.

Audit limitations

Overall sample size obtained during the study period was limited. Improved validity would have been achieved by increasing the duration of the audit period.

Sample sizes from different ICUs are not equal, thus that would have affected the overall bundle compliance analysis.

Audit recommendations

The findings of the audit are to be discussed with relevant intensive care units to raise awareness among the doctors as well as critical care nurses on the ventilator associated pneumonia care bundle and encourage ongoing practice improvement. Necessary equipment like endo-tracheal tubes with subglottic suction should be made freely available. Critically ill ventilated patients would benefit from further frequent audit cycles to improve reliability of good practice. Incorporation of VAP care bundle to the daily nursing monitoring chart would improve the bundle care in the intensive care setup.

Conclusion

Total VAP care bundle compliance was very low (28%) in this study sample. Even though there is improvement of ventilator bundle care from 2011, overall practice was unsatisfactory and particular attention should be paid in terms of adherence to

subglottic suction, oral care with chlorhexidine and sedation vacation.

References

1. Vincent JL, Sakr Y, Sprung CL et al. Sepsis in European intensive care units: results of the SOAP study. *Crit Care Med* 2006;**34**: 344–53
<https://doi.org/10.1097/01.CCM.0000194725.4892.8.3A>
PMid:16424713
2. Young PJ, Ridley SA. Ventilator-associated pneumonia. Diagnosis, pathogenesis and prevention. *Anaesthesia* 1999; **54**: 1183–97
<https://doi.org/10.1046/j.1365-2044.1999.01035.x>
PMid:10594417
3. Vincent JL, Rello J, Marshall J et al. International study of the prevalence and outcomes of infection in intensive care units. *J Am Med Assoc* 2009; **302**: 2323–9
<https://doi.org/10.1001/jama.2009.1754>
PMid:19952319
4. Kollef MH, Shorr A, Tabak YP et al. Epidemiology and outcomes of healthcare associated pneumonia. *Chest* 2005;**128**: 3854–62 Not cited in text. Remove or cite.
<https://doi.org/10.1378/chest.128.6.3854>
PMid:16354854
5. Morris AC, Hay AW, Swann DG et al. Reducing ventilator-associated pneumonia in intensive care: impact of implementing a care bundle. *Crit Care Med* 2011; **39**: 2218–24
<https://doi.org/10.1097/CCM.0b013e3182227d52>
PMid:21666444
6. Rello J, Alfonso E, Lisboa T et al. A care bundle approach for prevention of ventilator-associated pneumonia. *Clin Microbiol Infect* 2013; **19**: 363–9
<https://doi.org/10.1111/j.1469-0691.2012.03808.x>
PMid:22439889
7. Zilberberg MD, Shorr AF, Kollef MH. Implementing quality improvements in the intensive care unit: ventilator bundle as an example. *Crit Care Med* 2009; **37**: 305–9
<https://doi.org/10.1097/CCM.0b013e3181926623>
PMid:19050626
8. B K Udaya Nirmalle Rodrigo. An audit on ventilator management in critical care units in National Hospital Sri Lanka. *Sri Lankan Journal of Anaesthesiology* 2012;**20**(2):78 – 83.
<https://doi.org/10.4038/slja.v20i2.4153>