VENTILATOR-ASSOCIATED PNEUMONIAS IN INTENSIVE CARE UNITS

By Goh Helen

ABSTRACT

This paper compares the Ventilator-Associated Pneumonias (VAP) rates in the various intensive care units (ICUs) of public acute-care hospitals with international benchmarks. Since the last report published in 2006, we have seen improvements of VAP rates in our public sectors ICUs, particularly in the surgical ICU.

INTRODUCTION

Critically ill patients require a wide range of therapeutic and diagnostic services to meet their needs. As a result, devices such as central lines, ventilators and indwelling urinary catheters are frequently used in critical care settings. Although these devices are meant to be life-saving, they can expose the patient to an increased risk of device-associated infections.

Ventilator-associated pneumonia (VAP) is a type of lung infection that could occur in an ICU patient placed on a ventilator (a mechanical device used to assist or control breathing). It is reported that in general, between 15% and 40% of patients who undergo mechanical ventilation for more than 48 hours develop pneumonia.

As pneumonia is a possible complication associated with mechanical ventilation, public sector hospitals in Singapore have been monitoring the incidence of this infection amongst their ICU patients and have been working on decreasing their VAP rates.

This paper presents the progress made thus far by our local public hospitals as compared against the hospitals participating in the US National Healthcare Safety Network (NHSN). The NHSN is a benchmarking database based on the cumulative incidence of nosocomial infections among participating US hospitals reported since 2005. The NHSN is under the auspices of the US Centers for Disease Control and Prevention (CDC).

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DEFINITION

The rate of VAPs in our public sector ICUs is calculated using the standardized data definition and collection methodology of the NHSN.

**Ventilator Associated Pneumonia Rate:** \( \frac{\text{Number of Ventilator-Associated Pneumonias}}{\text{Number of Ventilator-Days}} \times 1000 \)

To improve comparability of our results with NHSN results, we have stratified the comparison by type of ICUs, i.e. Coronary Care Unit (CCU), Medical ICU (MICU), and Surgical ICU (SICU).

OUTCOMES

The pooled incidence rates of VAP statistics for our local public hospitals for the years 2006 to 2010 were compared against that of the NHSN pooled mean rate reported for years 2006 and 2010\(^2\) for the following ICUs: (1) CCU, (2) MICU, and (3) SICU.

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\(^2\) In January 2002, NNIS hospitals begin using new criteria for case finding for ventilator associated pneumonia. The new definition has a more stringent inclusion criterion for VAP (resulting in less cases being defined as VAP). This definition was adopted by the first local hospital in April 2004 for MICU and SICU. Other hospitals adopted this new definition only in January 2005 (after the period being studied).
1. Coronary Care Unit

In 2006, the VAP rate was 1.52 per 1000 ventilator-days in Singapore public hospitals’ CCUs. Although our VAP rates showed an increase in 2008 (1.66), it was still lower than that the NHSN pooled mean of 2.10 (Chart 1).

Chart 1 Ventilator Associated Pneumonias per 1000 ventilator-days in CCU (Years 2001 – 2010)

2. Medical Intensive Care Unit

In 2006, the VAP rate per 1000 ventilator-days of 1.0 in Singapore public hospitals’ MICUs was lower than the NHSN 2006. Since 2001\(^3\) from a high baseline of 12.28, the VAP rates in the MICUs of our public hospitals have decreased tremendously over the last 7 years to 1.10 in 2008, which was lower than the NHSN 2008 pool mean of 2.50 (Chart 2).

\(^3\) MOH Information Paper: 2006/015, Ventilator-associated Pneumonias in Intensive Care Units.
3. **Surgical Intensive Care Unit**

In 2006, the VAP rate per 1000 ventilator-days of 5.60 in Singapore public hospitals’ SICUs was higher than the NHSN 2006 mean of 5.20. Since 2001 from a high baseline of 14.77, the VAP rates in the SICUs in public hospitals have steadily decreased over the last 7 years to 2.31 in 2008, which is lower than the NHSN 2008 pooled mean of 5.30 (Chart 3).
CONCLUSION

Surveillance followed by action for improvement has significant impact on the rates of healthcare-associated infections. Although ventilator-associated pneumonia is a potential complication of mechanical ventilation, stringent infection control measures instituted in our public hospitals have led to a marked reduction of the VAP rates in Singapore since 2001. This improvement was most significant in SICU. As at 2010, through a programme of stringent infection prevention strategies and quality improvement initiatives, application of VAP bundle\(^4\) instituted by our public hospitals have seen a reduction of VAP rates across all public hospitals’ ICUs. This rate is also lower when compared with US hospitals enrolled in the NHSN.

Feedback to MOH

If you have any comments or questions on the information paper, you can email us directly at moh_info@moh.gov.sg. Alternatively, you can also fax or write to us at:

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\(^4\) The Ventilator Bundle consists of a set of concurrent measures that has been shown elsewhere to be effective in controlling infection rates: (a) elevate the head position of patient to 30–45 degrees, (b) daily sedation vacation and daily assessment of readiness to extubate, (c) peptic ulcer disease prophylaxis, (d) deep vein thrombosis prophylaxis (unless contraindicated)
Endnotes


2 In June 2011, CDC/NHSN published and updated definitions and criteria for Surveillance Definition of Healthcare-Associated Infection and Criteria for Specific Types of Infections in the Acute Care Setting and our hospitals have been following the set of criteria. Available at: http://www.cdc.gov/nhsn/PDFs/pscManual/17pscNosInfDef_current.pdf.