Bundle of care approach to reduce ventilator-associated pneumonia in the intensive care unit in a tertiary care teaching hospital in North India

Sir,

Ventilator-associated pneumonia (VAP) is one of the most serious treatment-related infections resulting in increases risk of mortality and morbidity. Patients at risk of VAP must be managed with a "bundle of preventive measures." The implementation of care "bundles" is simple sets of evidence-based practices that, when implemented collectively, help to create reliable and consistent care systems and improve patient outcomes. The VAP bundle, which is derived from the IHI bundle, is composed of the following five major interventions: (1) Head-of-bed elevation between 30 and 45; (2) a daily "sedation vacation" and a readiness-to-wean assessment; (3) peptic ulcer disease prophylaxis; (4) deep vein thrombosis prophylaxis; and (5) daily oral care with chlorhexidine (a new intervention added since 2010).[1]

We evaluated the impact of the bundle care approach in VAP in intensive care units (ICUs). The study period was 15 months between November 2016 and January 2018 which was divided into three phases, each comprising 5 months – pre-VAP bundle phase, post-VAP bundle phase, and late postimplementation phase. During the pre-VAP bundle phase, the baseline VAP rates for ICU were calculated as per the standard healthcare-associated infections (HAI) surveillance guideline laid down by the Centers for Disease Control and Prevention's NHSN, 2016.[2] During the post-VAP bundle phase, besides the five primary interventions adopted from the IHI bundle, and Five Moments for Hand Hygiene by the WHO was added to the daily quality rounding checklist. The concerned doctors and nurses of the ICUs were educated (both by mass lectures and bedside training) about the importance of adherence to the bundle care approach. During the late postimplementation phase, the bundle care forms were continued to be used by the ICUs. At monthly meetings, performance feedback was provided to concerned ICU doctors and nurses by communicating and reviewing the rates of practices performed.

Demographic characteristics of ICU patients from the pre- and post-VAP phases are given in Table 1. Month-wise VAP rate of ICU during the study is given in Figure 1. About 35.8% of these patients had multidrug-resistant bacterial growth in their endotracheal aspirate with some Gram-negative bacteria more than Gram-positive bacteria. There was a statistically significant steady decline of VAP rate from preimplementation to late postimplementation phase from 16.12 to 13.15/1000 ventilator days ($P = 0.009$; 95% confidence interval = 1.22–6.31). Many studies have documented a similar decrease in VAP rate, following bundle implementation.[3,4] Khan *et al*. showed the rate of VAP decreased from 8.6/1000 ventilator-days to 2.0/1000 ventilator-days ($P < 0.0001$) after implementation of the care bundle.[5] This study suggests that the systematic implementation of a multidisciplinary team approach can reduce the incidence of VAP. Overall, our results support the use of VAP prevention bundle in clinical practice.

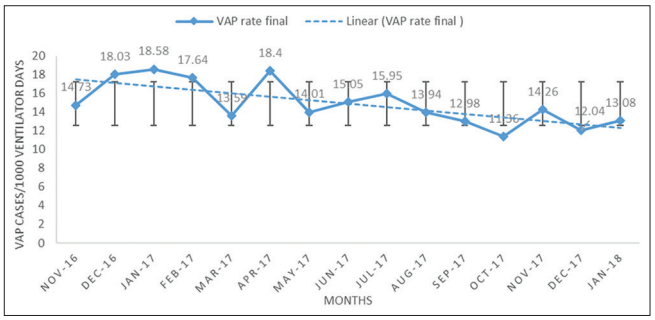

Figure 1: Month-wise ventilator-associated pneumonia rate of intensive care unit

Table 1: Demographic characteristics of intensive care unit patients

Variables	Pre-VAP bundle phase	Post-VAP bundle phase	Late postimplementation phase
Study period in months, *n*	5	5	5
Sex, male (%)	26 (61.9)	25 (62.5)	23 (65.7)
Age, mean±SD (years)	57.4±4.2	55.6±4.5	56±3.8
ICU stay, mean days	7.5	7.1	7.0
VAP rate per 1000 ventilation days	16.12	14.96	13.15
Significance between groups among VAP rate per 1000 ventilation days		P_1=0.440, P_2=0.009, P_3=0.022	

Pre-VAP bundle phase, November 2016-March 2017; Post VAP bundle phase, April 2017-August 2017; Late postimplementation phase, September 2017-January 2018. Ventilation days: The total number of days of exposure to mechanical ventilation by all of the patients in the selected population during the selected time period. P_1: *P* value for comparing between pre-VAP bundle phase and post-VAP bundle phase, P_2: *P* value for comparing between pre-VAP bundle phase and late postimplementation phase, P_3: *P* value for comparing between post-VAP bundle phase and late postimplementation phase, ICU: Intensive care unit, VAP: Ventilator-associated pneumonia, SD: Standard deviation

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Conflicts of interest

There are no conflicts of interest.

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