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Factors Associated with Head-of-Bed Elevation Compliance for Prevention of Ventilator-Associated Pneumonia

To the Editor—Ventilator-associated pneumonia (VAP), a complication that is associated with significant morbidity and mortality, can develop in patients undergoing prolonged mechanical ventilation.¹⁻³ To avoid this complication among mechanically ventilated patients, the Institute for Healthcare Improvement developed a bundle care document for the prevention of VAP in 2004.⁴ Elevation of the head of the bed (HOB) is one of the major components of the ventilator bundles.⁴ However, the study about the factors associated with HOB elevation compliance is limited,⁵ so this study was conducted to investigate the factors associated with HOB elevation compliance among critical care nurses.

This study was carried out at a regional teaching hospital that has 63 adult intensive care unit (ICU) beds and 20 subacute respiratory care center (RCC) beds.⁶ Compliance was defined as the frequency of the number of performed actions compared to the number of HOB elevation opportunities. Observation of HOB elevation compliance was carried out by trained critical care nurses, and observers were required to reach 85% concordance with researchers before performing practice observation. Between October 1 and October 14,

2013, compliance with HOB elevation among critical care nurses was observed. Ethics approval was obtained from the Institution Review Board of Chi Mei Medical Center.

Categorical variables were compared using the χ^2 test. All significant variables with a *P* value of $\leq .05$ in the univariate analysis were considered for inclusion in the logistic regression model for the multivariate analysis. All statistical analyses were conducted using the statistical package SPSS for Windows (ver 19.0), and a *P* value of $< .05$ was considered to show statistical significance.

During the study period, 759 HOB elevation opportunities were observed, with overall compliance of 19.2%. The factors that may impact the HOB elevation compliance are shown in Table 1. Subgroups involving age 30 years and older, senior registered nurse (RN), and RCC stay had significantly higher HOB elevation compliance than those with age less than 30 years, junior RN, and ICU stay, respectively (all *P* $< .05$). Further multivariate analysis showed that ranking of RN and location were independently significantly associated with HOB elevation compliance.

Among this 2-week observational study of 759 HOB elevation opportunities, the overall HOB elevation compliance was as low as 19.2% among critical care nurses, while performance was lower than 27.8% in the previous study.⁵ A recent investigation by Liu et al⁵ showed that nursing workload and lack of knowledge of VAP were the most important factors for nonadherence with the HOB goal, by questionnaire survey. We found that the adherence to HOB elevation varied substantially according to individual nurses' characteristics and the site of clinical service by this observation study. This finding demonstrates that HOB elevation compliance is higher among critical care nurses with higher ability.

In conclusion, despite elevation of HOB being a relatively simple procedure while caring for the patient with a mechanical ventilator, the variability of HOB compliance can be observed among individual nurses. A plan to effectively enhance overall performance in HOB compliance should be based on the surveillance study to find the specific groups with lower compliance and then to target these groups to improve.

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TABLE 1. Factors Associated with Head-of-Bed Elevation Compliance: Association with Seniority of Nursing Staff and Location

Variables	No. of observations	Compliance, %	Univariate	Multivariate	
			P	P	95% CI
Age			.02	.24	−0.02 to 0.10
>30 years	238	23.9			
≤30 years	521	17.1			
Gender			.61		
Female	706	20.0			
Male	53	9.4			
Academic degree			.07		
University and master's	685	18.4			
College	74	27			
Experience of critical care			.78		
>2 years	455	19.6			
≤2 years	304	18.8			
Ranking of RN			.009	.004	0.01 to 0.21
RN3 + RN4	118	28.0			
RN + RN1 + RN2	641	17.6			
ICU licensed nurse			.28		
Yes	655	19.8			
No	104	15.4			
Location			<.001	<.001	−0.24 to −0.12
ICU	531	14.3			
Respiratory care center	228	30.7			
Received VAP education			.08		
Yes	652	20.2			
No	107	13.1			

NOTE. CI, confidence interval; ICU, intensive care unit; RN, registered nurse; VAP, ventilator-associated pneumonia.

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Nosocomial Transmission of Carbapenem-Resistant *Pseudomonas aeruginosa* among Burn Patients

To the Editor—We report a nosocomial transmission of a *Pseudomonas aeruginosa* strain producing VIM-2 type metallo- β -lactamase in association with oxacillinase OXA-10 among burn patients.

Patient A, a 32-year-old woman, suffered from a burn injury involving 15% of her body surface area after a suicide attempt by self-immolation in Tunisia in 2012. She was transferred to the burn unit at Grenoble University Hospital, France, on May 14, 2013. She received wound care and dressing changes in the balneotherapy room and the operating room. Contact precautions were used because cephalospor-