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# Correspondence

## Evaluating rates of ventilator-associated pneumonia: Consider patient, organizational & educational risk factors

Sir,

We read with interest the research article by Chaudhury *et al*[1] reporting on rates of ventilator-associated pneumonia (VAP) and associated multidrug resistance (MDR) patterns in a tertiary care hospital in India. VAP remains an important cause of critical illness-related morbidity and results as such in an important economic burden[2,3]. While VAP is associated with substantial mortality, the attributable fraction of the death toll remains a matter of controversy[4]; for sure, the final impact of this infectious complication is multifactorial encompassing patient risk factors such as older age, immune status and other comorbidities as well as adequacy of intensive care management[5,6]. The latter includes aspects of organ support and efforts to optimize antimicrobial therapy. MDR involvement is an important factor complicating the infection[7,8]. MDR decreases the likelihood of appropriate empiric coverage of the assumed causative pathogens[9,10], and further complicates adequate dosing, which is already a challenge in critically ill patients[11].

The work reported by Chaudhury *et al*[1] is important because detailed insights in microbial ecology, either on unit level or individual patient level, is important to steer empiric antibiotic therapy[12,13]. We have however, some comments on the reported data. First, over the three year study (2011-2013) the authors report a substantial number (n=63) of *Candida* species considered pneumonia pathogens[1]. While respiratory tract colonization with *Candida* species is common in mechanically ventilated patients, true *Candida* pneumonia is considered to be extremely rare[14-16]. In addition, the diagnosis of *Candida* pneumonia is challenging as it requires histological sampling to demonstrate tissue invasion. Therefore, we wonder on what basis the authors discriminated *Candida* colonization from *Candida* pneumonia. Second, the rates of VAP reported are although high, yet no data are provided on patients' profile. That is a pity as infection rates cannot be fairly judged in the absence of case mix data. Furthermore, to evaluate any trends in VAP rates, shifts in case mix (*i.e.*, risk profile for infection) should be considered. Finally, VAP rates also depend on organizational factors such as the nurse-to-patient ratio. An acceptable workload is conditional to achieve high compliance rates with infection prevention measures. For example, excessive workload is a main obstacle to adhere with general recommendations in hand hygiene, a cornerstone in infection prevention. An additional issue is the educational level of staff members and the nursing team in particular. Significant gaps in knowledge regarding VAP prevention have been demonstrated before, and modern educational formats have been developed to these gaps[17,18]. More important however, is the overall background of the intensive care nurses. One cannot build high levels of specific insights when a solid overall base of critical care nursing is lacking. A survey indicated huge differences in critical care nursing education in European countries[19]. This survey was a clear call to join forces in the development of an international critical care nursing curriculum. As the last question to the authors of this study[1], we wonder if a specialized critical care nursing education exists in India and how it is organized.

***Conflicts of Interest*:** None.

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