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The impact of onset time on the isolated pathogens and outcomes in ventilator associated pneumonia

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KEYWORDS
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Summary Several guidelines base the empirical therapy of ventilator-associated pneumonia (VAP) on the time of onset. However, there is emerging evidence that the isolated microorganisms may be similar regardless of onset time. This study evaluated the characteristics and outcomes of VAP with different onset times. All of the mechanically ventilated patients admitted to the ICU of a 900-bed tertiary-care hospital between 01/08/2003 and 31/12/2010 were prospectively followed for

Abbreviations: VAP, ventilator associated pneumonia; ICU, intensive care unit; MV, mechanical ventilation; NHSN, National Healthcare Safety Network; HAI, healthcare-associated infection; MDRO, multi-drug resistant organism; EE-VAP, early onset VAP/early hospital admission; EL-VAP, early onset VAP/late hospital admission; LL-VAP, late-onset/late hospital admission; HR, hazard ratios; CIs, confidence intervals.

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VAP development according to the National Healthcare Safety Network criteria. The patients were categorized into four groups: EO if VAP occurred within 4 days of intubation and hospital admission; LO if VAP occurred after 4 days of admission; EL if VAP occurred within 4 days of intubation, but after the fourth hospitalization day; and LL if VAP occurred after the fourth day of intubation and hospitalization. Out of the 394 VAP episodes, 63 (16%) were EO episodes, 331 (84.0%) were LO episodes, 40 (10.1%) were EL episodes and 291 (73.1%) were LL episodes. The isolated microorganisms were comparable among the four groups, with a similar rate of potentially multidrug resistant organisms in the EO-VAP (31.7%), LO-VAP (40.8%), EL-VAP (37.5%) and LL-VAP (43.3%) samples. The hospital mortality was 24% for EO-VAP cases, 28% for LO-VAP cases, 40% for EL-VAP cases and 49% for LL-VAP cases. However, in the adjusted multivariate analysis, neither LO-VAP, EL-VAP nor LL-VAP was associated with an increased risk of hospital mortality compared with EO-VAP (OR, 0.86 95% CI, 0.34—2.19; 1.22; 95% CI, 0.41—3.68, and 0.95; 95% CI, 0.43—2.10, respectively). In this study, the occurrence of potential multidrug resistant pathogens and the mortality risk were similar regardless of VAP timing from hospital admission and intubation. The bacterial isolates obtained from the VAP cases did not follow an early vs. late-onset pattern, and thus, these terms may not be clinically helpful.

Introduction

Ventilator-associated pneumonia (VAP) is a common device-related healthcare-associated infection (HAI), with an incidence in critically ill patients ranging between 6 and 52% [1—3]. VAP remains a principal cause of morbidity, mortality and economic burden in intensive care units (ICUs) [4]. In a recent study, VAP was the third most common HAI infection, accounting for 31.7% of the annual cost of HAIs to the American health care system [5]. Additionally, it accounts for approximately half of all antibiotics prescribed to critically ill patients [6].

The concept of early and late-onset VAP was introduced in 1986 by Mandelli and colleagues [7]. Traditionally, early onset VAP is caused by antibiotic-sensitive bacteria and has a better prognosis. In contrast, late-onset VAP is more likely to be caused by multi-drug resistant organisms (MDROs) and is associated with increased mortality and morbidity [8]. However, there is widespread variation among researchers in defining the exact time that differentiates early from late VAP, with the time for ''early'' ranging from 2 to 6 days in the published data [8—17]. Conflict also exists in selecting the inception point; is it the date of admission or the date of intubation/device? [8—17]

Uncertainty exists in the current literature as to whether the classification of early vs. late VAP is clinically important [11,17—20]. Furthermore, this labeling does not clearly account for ''early onset VAP'' in patients with prolonged hospital stays. Compared with patients who are recently admitted and develop ''early onset VAP,'' patients with extended hospitalization who subsequently develop ''early onset VAP'' may constitute a special population, with distinctive risk factors and microbial flora, thus requiring careful thought when selecting their empiric antibiotic regimen and prevention measures. Therefore, we performed this study to ascertain if in fact this categorization still bears any medical significance and also to assess the most prevalent microorganisms responsible for VAP in these groups.

Materials and methods

Patients and setting

This prospective observational cohort study was performed in a 21-bed closed medical-surgical-trauma adult ICU at King Abdulaziz Medical City in Riyadh, Saudi Arabia, from August 1, 2003, to December 31, 2010. The ICU admitted approximately 900 patients annually and was covered by onsite board-certified intensivists 24 h per day, 7 days per week [21] with a nurse-to-patient ratio