

## Commentary

# ICU staffing and patient outcomes: more work remains

David J Murphy, Eddy Fan and Dale M Needham

Pulmonary and Critical Care Medicine, Johns Hopkins Medical Institutions, 1830 E. Monument Street, Baltimore, MD 21205, USA

Corresponding author: Dale M Needham, [dale.needham@jhmi.edu](mailto:dale.needham@jhmi.edu)

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See related research by Cooke *et al.*, <http://ccforum.com/content/12/6/R134>

## Abstract

Many studies have demonstrated that closed intensive care units (ICUs), staffed by trained intensivists, are associated with improved patient outcomes. However, the mechanisms by which ICU organizational factors, such as physician staffing, influence patient outcomes are unclear. One potential mechanism is the increased utilization of evidence-based practices in closed ICUs. Cooke and colleagues investigated this hypothesis in a cohort of 759 acute lung injury patients in 23 ICUs in King County, Washington, USA. Although closed ICUs were independently associated with a modestly lower mean tidal volume, this finding did not explain the mortality benefit associated with a closed ICU model in this patient cohort. Future studies should evaluate other potential mechanisms by which closed ICUs improve patient outcomes. An improved understanding of these mechanisms may yield new targets for improving the quality of medical care for all ICU patients.

The mechanisms by which closed intensive care units (ICUs), defined as units in which patient care is directed by board certified intensivists, improve patient outcomes are unclear. Increased use of low tidal volume ventilation (LTVV) has been hypothesized as a mechanism underlying the lower hospital mortality observed in acute lung injury (ALI) patients treated in closed ICUs. To investigate this issue, Cooke and colleagues [1] assessed the effect of a closed ICU physician staffing model on the provision of LTVV for ALI patients. In their secondary analysis of data from an observational cohort of 759 ALI patients from 10 open and 13 closed ICUs, Cooke and colleagues examined differences in tidal volume 3 days after ALI onset. Patients in closed versus open ICUs received modestly lower mean tidal volumes (9.3 versus 10.8 mL/kg predicted body weight,  $p < 0.001$ ). However, adjusting for this difference in tidal volume did not influence the odds ratio for hospital mortality in closed versus open ICUs (crude and adjusted odds ratios: 0.73 and 0.74, respectively).

In this study, the mean weekday coverage by intensivists was similar between open and closed ICUs (6.8 versus 7.3 hours,

$p = 0.84$ ). Consequently, ALI patients in both closed and open ICUs in the King County cohort may have received relatively similar 'doses' of intensivist care. In particular, there was a lack of difference in ALI quality indicators measured in this study. For example, open and closed ICUs were similar with respect to: documentation of ALI/pulmonary edema (46% and 47%, respectively); measurement of patient height as required for calculation of predicted body weight (81% and 80%, respectively); and the level of positive end-expiratory pressure (PEEP) provided on day 3 (median = 5 mmHg in both open and closed ICUs).

The lower hospital mortality in closed versus open ICUs, which was previously reported in this patient cohort [2], may be explained by mechanisms not evaluated in this study. For instance, the closed ICUs may have had more timely patient evaluation and treatment initiation, which are important predictors of mortality in critically ill patients [3-5]. Alternatively, there may have been differences in ICU nurse staffing ratios or experience level, which can affect patient outcomes [6,7]. This issue of nurse experience may be particularly relevant to ALI since ICU nurses with greater work experience have demonstrated increased knowledge regarding LTVV and reported lower barriers to providing it [8]. Furthermore, a closed ICU staffing model may more readily foster an interdisciplinary team-based approach to critical care with enhanced coordination, communication, and collaboration, which have been associated with improved patient outcomes [9]. Finally, closed ICUs may more frequently create and use clinical protocols, reminders, and checklists, which can improve the reliable provision of other aspects of evidence-based critical care [10-13].

Future studies should continue to evaluate potential mechanisms by which closed ICUs improve patient outcomes. Given the significant shortage of intensivists in some jurisdictions [14,15], understanding these mechanisms are

ALI = acute lung injury; ICU = intensive care unit; LTVV = low tidal volume ventilation; PEEP = positive end-expiratory pressure.

particularly important for improving the quality of medical care for patients in all types of ICUs.

### Competing interests

The authors declare that they have no competing interests.

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