

Katherine R. Courtright<sup>1</sup>, Meeta Prasad Kerlin<sup>1</sup>

## Intensive care unit staffing and quality of care: challenges in times of an intensivist shortage

*A equipe da unidade de terapia intensiva e a qualidade do cuidado: desafios nos tempos de poucos intensivistas*

1. Pulmonary, Allergy, and Critical Care Division, University of Pennsylvania, Philadelphia, PA.

Demand for critical care is growing, partly in response to an aging population with an increased prevalence of critical illnesses and to advances in higher-risk medical therapies.<sup>(1,2)</sup> In addition to an increase in the sheer numbers of intensive care unit (ICU) beds,<sup>(3)</sup> the responsibilities of critical care specialists (“intensivists”) now extend outside of the ICU, as they act as members of medical emergency teams and staff at long-term acute care hospitals. Thus, the gap between the demand for critical care and the supply of intensivists available to provide it continues to widen. It is difficult to know exactly how many are needed to meet the increasing critical care needs;<sup>(4)</sup> however, in 2000, the Committee on Manpower for Pulmonary and Critical Care Services (COMPACCS) projected a 22% shortfall of demand for intensivist hours by 2020, increasing to 35% by 2030.<sup>(2)</sup>

The challenges of this imbalance present an opportunity to rethink and refine the structure and processes of ICU care delivery, including staffing.<sup>(5,6)</sup> In this commentary, we will discuss the current evidence for the impact that ICU staffing models have on patient outcomes, serving as one measure of quality of care, and will propose directions for further research in this area.

### Intensive care unit physician staffing models

The most widely studied ICU physician staffing models vary in the degree to which intensivists are involved in patient management. “High-intensity” ICUs are those where most patients are managed by a full-time or consulting intensivist, whereas “low-intensity” ICUs have either no intensivist involvement or offer elective intensivist consultations.<sup>(7)</sup> There have been no randomized clinical trials comparing high- and low-intensity ICUs, but there is strong observational evidence to suggest that high-intensity staffing is associated with reduced hospital and ICU mortality and length of stay.<sup>(7)</sup> This finding was consistent across medical and surgical patients, academic and community hospitals, and studies within and outside the United States. The predominant conclusion drawn from these data is that the expertise of intensivists in ICUs indeed matters. However, it is important to note that no study has evaluated exactly which elements of a high-intensity organizational model are responsible for improving patient outcomes. Given the current fiscal constraints on healthcare and the potential cost implications of hiring more intensivists, many ICUs may be unable to adopt a high-intensity staffing

**Conflicts of interest:** None.

Submitted on May 23, 2014  
Accepted on June 13, 2014

**Corresponding author:**

Katherine R. Courtright  
3400 Spruce Street  
Gibson Building, Suite 5002  
Philadelphia, PA 19104  
E-mail: katherine.courtright@uphs.upenn.edu

**Responsible editor:** Jorge Ibrain de Figueira Salluh

DOI: 10.5935/0103-507X.20140031

model. Indeed, a 2006 survey of 393 ICU directors in the United States revealed that half of ICUs were low intensity, 26% were high intensity, and the remainder had an intermediate intensivist presence.<sup>(8)</sup>

If some degree of exposure to intensivists is beneficial to patients, then would more exposure be even better? This notion, combined with international prioritization of patient safety, has led to proliferation of the nighttime intensivist staffing model, without a solid evidence base. The largest retrospective cohort study thus far found no mortality benefit from an intensivist presence at night in ICUs with high-intensity daytime staff, but did detect a significant reduction in mortality in those with low-intensity daytime staffing.<sup>(9)</sup> One high-intensity academic ICU conducted the only randomized clinical trial of nighttime intensivist staffing and similarly found that it conferred no mortality benefit compared with nighttime staffing by medical trainees with telephone access to an intensivist.<sup>(10)</sup> Thus, the available data suggest that an ICU with daytime intensivist staffing may not need nighttime intensivist staffing. Alternatively, perhaps any physician present overnight is as effective as an intensivist. Furthermore, the nighttime presence of an intensivist has potentially significant cost, educational, and team communication implications, the extent of which is not yet fully understood.

### Potential solutions

We believe that there are three potential solutions to the supply-demand mismatch: (1) expand the supply of intensivists, (2) utilize non-intensivist providers in ICUs, and (3) utilize harness technology such as ICU telemedicine. Although no single solution will likely suffice to bridge the gap, together, these solutions may synergize to maintain or even enhance the quality of care provided by intensivists.

Expansion of the supply of intensivists would require enhancing the recruitment, education, and retention of medical trainees. Proponents of increasing the critical care physician workforce have proposed improving the specialty's "brand" by addressing the oft-cited undesirable lifestyle aspects, streamlining training pathways, and aligning efforts among the specialty-specific critical care fellowship programs to minimize the current practice of ICU care delivery in siloes.<sup>(4,6)</sup>

Non-intensivist providers, such as hospitalist physicians and advance practice providers (APPs; such as nurse practitioners and physician assistants), offer the advantages of being more abundant and having fewer competing clinical responsibilities compared with specialty-trained intensivists. Observational evidence suggests that ICU and in-hospital mortality and length of stay are not different between hospitalist- and intensivist-led ICU models.<sup>(11)</sup> Similarly, integrating APPs into daytime staffing models appears to be as effective as traditional housestaff models and may actually improve care quality due to their increased adherence to clinical practice guidelines.<sup>(12,13)</sup>

ICU telemedicine is a novel approach that allows more patients to have access to critical care specialists remotely, and perhaps more economically. The early evidence supporting this newer technology suggests that it may result in higher quality of care, with better patient outcomes, although the data are still slightly conflicting.<sup>(14)</sup> Despite early, rapid adoption, the growth of new ICU telemedicine programs has slowed due to major organizational barriers to implementation, such as significant start-up costs, minimal reimbursement, uncertain efficacy, and a lack of knowledge about the most efficient and effective use of this technology.<sup>(15)</sup>

### One size does not fit all

The optimal approach to ICU staffing remains unclear, but in the face of growing intensivist shortages, it is apparent that alternative staffing options must be understood, optimized, and implemented. Future research should delve into the specific features of particular ICUs to further refine the processes and application of each staffing approach. Finally, as the evidence supporting low-value ICU care and appropriate bed utilization evolves, the ideal ICU staffing model will remain a moving target.

### ACKNOWLEDGMENTS

This work was supported in part by the National Institutes of Health/National Heart, Lung, and Blood Institute (NIH/NHLBI (K08HL116771, Kerlin and T32 HL098054, Courtright).

## REFERENCES

1. Adhikari NK, Fowler RA, Bhagwanjee S, Rubenfeld GD. Critical care and the global burden of critical illness in adults. *Lancet*. 2010;376(9749):1339-46.
2. Angus DC, Kelley MA, Schmitz RJ, White A, Popovich J Jr; Committee on Manpower for Pulmonary and Critical Care Societies (COMPACCS). Caring for the critically ill patient. Current and projected workforce requirements for care of the critically ill and patients with pulmonary disease: can we meet the requirements of an aging population? *JAMA*. 2000;284(21):2762-70.
3. Halpern NA, Pastores SM, Greenstein RJ. Critical care medicine in the United States 1985-2000: an analysis of bed numbers, use, and costs. *Crit Care Med*. 2004;32(6):1254-9.
4. Halpern NA, Pastores SM, Oropello JM, Kvetan V. Critical care medicine in the United States: addressing the intensivist shortage and image of the specialty. *Crit Care Med*. 2013;41(12):2754-61.
5. Barnato AE, Kahn JM, Rubenfeld GD, McCauley K, Fontaine D, Frassica JJ, et al. Prioritizing the organization and management of intensive care services in the United States: the PROMIS Conference. *Crit Care Med*. 2007;35(4):1003-11.
6. Garland A, Gershengorn HB. Staffing in ICUs: physicians and alternative staffing models. *Chest*. 2013;143(1):214-21. Review.
7. Pronovost PJ, Angus DC, Dorman T, Robinson KA, Dremsizov TT, Young TL. Physician staffing patterns and clinical outcomes in critically ill patients: a systematic review. *JAMA*. 2002;288(17):2151-62. Review.
8. Angus DC, Shorr AF, White A, Dremsizov TT, Schmitz RJ, Kelley MA; Committee on Manpower for Pulmonary and Critical Care Societies (COMPACCS). Critical care delivery in the United States: distribution of services and compliance with Leapfrog recommendations. *Crit Care Med*. 2006;34(4):1016-24.
9. Wallace DJ, Angus DC, Barnato AE, Kramer AA, Kahn JM. Nighttime intensivist staffing and mortality among critically ill patients. *N Engl J Med*. 2012;366(22):2093-101. Erratum in *N Engl J Med*. 2012;367(9):881.
10. Kerlin MP, Small DS, Cooney E, Fuchs BD, Bellini LM, Mikkelsen ME, et al. A randomized trial of nighttime physician staffing in an intensive care unit. *N Engl J Med*. 2013;368(23):2201-9.
11. Wise KR, Akopov VA, Williams BR Jr, Ido MS, Leeper KV Jr, Dressler DD. Hospitalists and intensivists in the medical ICU: a prospective observational study comparing mortality and length of stay between two staffing models. *J Hosp Med*. 2012;7(3):183-9.
12. Gershengorn HB, Wunsch H, Wahab R, Leaf DE, Brodie D, Li G, et al. Impact of nonphysician staffing on outcomes in a medical ICU. *Chest*. 2011;139(6):1347-53.
13. Kleinpell RM, Ely EW, Grabenkort R. Nurse practitioners and physician assistants in the intensive care unit: an evidence-based review. *Crit Care Med*. 2008;36(10):2888-97. Review.
14. Wilcox SR, Bittner EA, Elmer J, Seigel TA, Nguyen NT, Dhillon A, et al. Neuromuscular blocking agent administration for emergent tracheal intubation is associated with decreased prevalence of procedure-related complications. *Crit Care Med*. 2012;40(6):1808-13.
15. Kahn JM, Cicero BD, Wallace DJ, Iwashyna TJ. Adoption of ICU telemedicine in the United States. *Crit Care Med*. 2014;42(2):362-8.