

## EDITORIAL COMMENT

# Two Sides of the Same Coin

## Evolving Staffing Models in Cardiac Intensive Care Units



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The first coronary care units were established in the 1960s, aiming to provide rapid defibrillation for ventricular arrhythmias among patients who had suffered an acute myocardial infarction. The contemporary cardiac intensive care unit (CICU) is comparably unrecognizable—clinicians caring for these complex and comorbid patients must now manage invasive mechanical ventilation, mechanical circulatory assist support devices, renal replacement therapy, and a multitude of complications arising from critical illness.

The workflow and staffing models of units caring for critically ill cardiac patients have changed in parallel with the transition from the traditional coronary care unit to modern day CICUs. For years, many centers functioned as “open units,” whereby patients were managed by their admitting cardiologist. This was followed by a transition to “closed units,” with care provided by a dedicated team, often with intensivist consultation for general critical care issues. Within the general systems ICUs, closed units are shown to improve the efficacy and quality of therapies delivered, with greater coordination, collaboration, and communication between team members.<sup>1</sup> A similar benefit among closed CICUs has been shown, with transition from an open to closed CICU associated with lower CICU and in-hospital mortality, particularly among those patients admitted for respiratory failure or following cardiac arrest.<sup>2</sup>

More recently, with the advent of cardiologists with dedicated training in critical care, there has been a movement toward closed CICUs to be staffed and led by cardiac intensivists. The benefit of dedicated critical care cardiologists in improving patient outcomes in CICUs has been well-established.<sup>3,4</sup> Historically, first-line provider staffing models have been physician-only, with the inclusion of allied health care team members, including nurses, pharmacists, and respiratory therapists as part of a multidisciplinary care team. However, the field has been struggling with staffing shortages in part due to the limited pool of trained cardiac intensivists and the long road of training and certification required in critical care cardiology. Furthermore, changes within the physician training model, including competency-based medical education and limitations on clinical duty hours, have led to a smaller cohort of trainees rotating through critical care units. As such, similar to many other areas of clinical medicine, advanced practice providers (APPs) may represent both a short- and long-term solution to address the unmet need of staffing shortages in CICUs. Previous studies have shown improved outcomes among patients admitted to a CICU with the addition of a nurse practitioner to physician-based medical teams.<sup>5</sup>

In this issue of *JACC: Advances*, Zhang et al<sup>6</sup> shed light on a growing area of interest in cardiac critical care: how to cope with the staffing shortages born from rising CICU patient volumes, complexity, and acuity that has surpassed the supply of clinicians with expertise in this area. They conducted a retrospective analysis of patient outcomes following the initiation of a second CICU team staffed with APPs when coupled with the original CICU team, made up of housestaff (physicians only) in their tertiary care academic medical center in New York City. The APP-based teams were predominantly physician assistants, with a smaller proportion comprised of nurse practitioners. The included patient population

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reflects a high-acuity unit, similar to other tertiary care centers with 20% of admissions for cardiogenic shock or decompensated heart failure, and 5% of patients admitted following cardiac arrest.

There are several features of this study that are important to highlight. First, each team was staffed by an attending cardiologist—with one of the attending physicians being a critical care cardiologist with dual training in cardiology and critical care medicine. This cardiac intensivist was available to address general critical care issues for both teams. Second, both teams had access to an in-house cardiology fellow at any time for emergencies, including activation of the catheterization lab, echocardiography, and cardiac implantable electronic device interrogations. Thirdly, there was a designated APP, or “quarterback” who was involved in the daily workflow and allocation of new admissions to either team. There was no predefined algorithm for triaging admissions to each team and baseline characteristics appeared comparable—although no validated measure of illness severity was reported. Ultimately, the authors found no difference in the primary outcome of CICU mortality, or in in-hospital mortality. They did find lower median CICU length of stay among the housestaff team compared to the APP team, but no difference in overall in-hospital length of stay.<sup>6</sup> Based on these results, the authors suggest that integration of APPs, including an APP-based team under the direction of an attending cardiologist, likely provides comparable care for patients with a wide range of cardiac critical illness and the analysis supports this practice.

Notably, trainee education and clinical exposure should remain a priority in larger, academic CICUs. Interestingly, Zhang et al<sup>6</sup> demonstrated improved rotation evaluation with the implementation of a second APP-based team. The balance between clinical work and education can be tenuous in a high-volume, high-acuity CICU, but it is important to note that trainee rotation evaluations do not necessarily reflect educational value or future performance in caring for critically ill cardiac patients. Two teams necessarily lessen exposure to case volumes and, while out of the

scope of the current paper, the impact on trainee performance is unclear. While evaluations reflect improved satisfaction, it remains unclear if the addition of a second APP-based team would negatively impact long-term exam and clinical performance by trainees at centers with similar models.

The major limitation of this study remains the lack of randomization of admitted patients to each team—although the authors have tried to account for baseline differences. While no definitive algorithm existed undoubtedly more complex or unique clinical scenarios would be targeted to teaching services as is broadly practiced in services outside the ICU. Thus, there is likely some degree of unmeasured confounding which should give pause about definitively concluding equivalence. Nonetheless, the findings are reassuring that the proposed model is unlikely to have a large impact on outcomes as practiced in this single center.

Undoubtedly, cardiac critical care remains in its infancy and we are tasked with the formidable goal of defining how these patients will be optimally cared for in ICUs. True randomized studies would appear both feasible and warranted given the high stakes nature of CICU care. Furthermore, studies should include metrics around cost-effectiveness, complications of invasive procedures, and long-term impact on trainee performance including standardized testing and clinical outcomes. Pending these studies, the study by Zheng et al<sup>6</sup> reassures the current expansion of care models to include APPs in physician-led CICU teams.

#### FUNDING SUPPORT AND AUTHOR DISCLOSURES

The authors reported that they have no relationships relevant to the contents of this paper to disclose.

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**KEY WORDS** advanced practice providers, cardiac intensive care units, team models