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Is 24/7 In-House Intensivist Staffing Necessary in the Intensive Care Unit?

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Abstract

Over the past few decades, an increasing number of studies have shown that intensivist-staffed intensive care units (ICUs) lead to overall economic benefits and improved patient outcomes, including shorter length of stay and lower rates of complications and mortality. This body of evidence has convinced advocacy groups to adopt this staffing model as a standard of care in the ICU so that more hospitals are offering around-the-clock intensivist coverage. Even so, opponents have pointed to high ICU staffing costs and a shortage of physicians trained in critical care as barriers to implementing this model. While these arguments may hold true in low-acuity, low-volume ICUs, evidence has shown that in high-acuity, high-volume centers such as teaching hospitals and tertiary care centers, the benefits outweigh the costs. This article explores the history of intensivists and critical care, the arguments for 24/7 ICU staffing, and outcomes in various ICU settings but is not intended to be a comprehensive review of all controversies surrounding continuous ICU staffing.

Keywords: intensivist, critical care unit, intensive care unit, ICU, 24/7 staffing, advanced practice provider

INTRODUCTION

Critically ill patients in the intensive care unit (ICU) have complex sets of medical issues involving multiple organ systems. A comprehensive understanding of cardiac, pulmonary, and hematologic pathophysiology is required to skillfully manage these issues. Therefore, physicians trained and experienced in critical care are the obvious choice to assess, diagnose, and treat these patients. As the demand for more ICU beds has grown in recent years, the administrative structure of ICUs in terms of staffing and cost has become a subject of controversy. With patient outcomes and efficient resource allocation at the center of the debate, experts have yet to agree on whether or not 24/7 in-house intensivist staffing is beneficial. Although this article is not intended to be an exhaustive review of the many controversies surrounding continuous ICU coverage, it does explore the history of intensivists and their role in critical care, the justification for 24/7 ICU staffing, and outcomes in settings with and without ongoing intensivist staffing.

HISTORY OF INTENSIVISTS

The “intensivist” was born out of a need for physicians who are trained to meet the unique demands of critically ill patients in America's ICUs (Figure 1). As the number of ICUs increased in U.S. hospitals throughout the late 20th century, so did the demand for physicians who could care for this population. Several physician specialties aimed to fill the void, including internists with pulmonology or cardiovascular training, anesthesiologists, surgeons, and pediatricians. Although each specialist brought a unique expertise to the ICU, none possessed the comprehensive training needed to manage the complex set of medical needs in critical care. Thus, each specialty created its own training program and offered certifications in critical care medicine.1

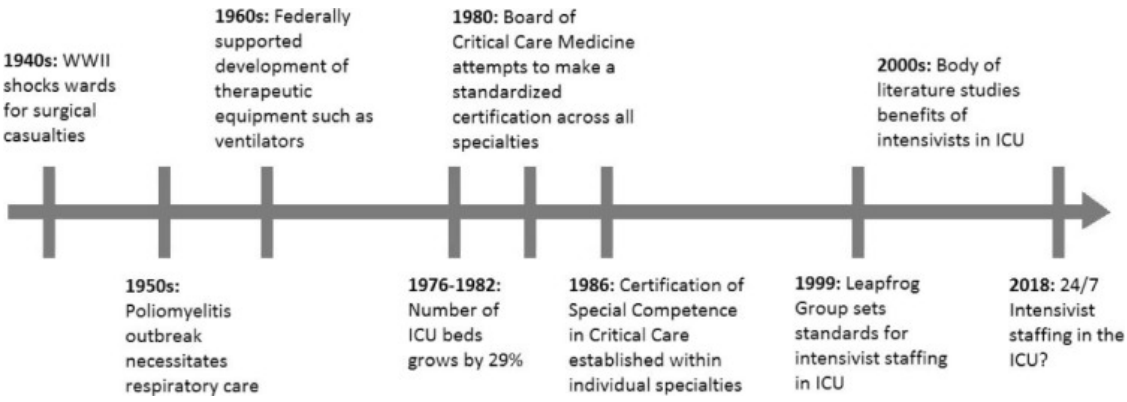

Figure 1.

Timeline of the development of intensivists.

The benefit of additional training in critical care has been examined since the 1980s. Several studies compared a “closed” ICU model, in which critical care specialists direct patient care, to an “open” model, in which the admitting physician oversees care with input from a critical care specialist. The majority of these found improved patient outcomes in the closed model.2–7

EVIDENCE FOR ICU INTENSIVIST STAFFING

The period between 1985 and 2000 saw a significant increase in ICU beds. Although the total number of beds in hospitals with ICUs decreased by 26.4%, the number of ICU beds increased by roughly the same percentage (Figure 2), giving rise to the demand for dedicated intensivist staffing.7 A 1988 study by Reynolds et al. indicated improved mortality in septic shock patients who received care in an ICU staffed by critical care specialists.8 Since then, a number of studies have emerged to further support the need for trained intensivists in the ICU, with several studies showing lower hospital mortality and length of stay (LOS) in ICUs with dedicated intensivist staffing.3–6,9–22

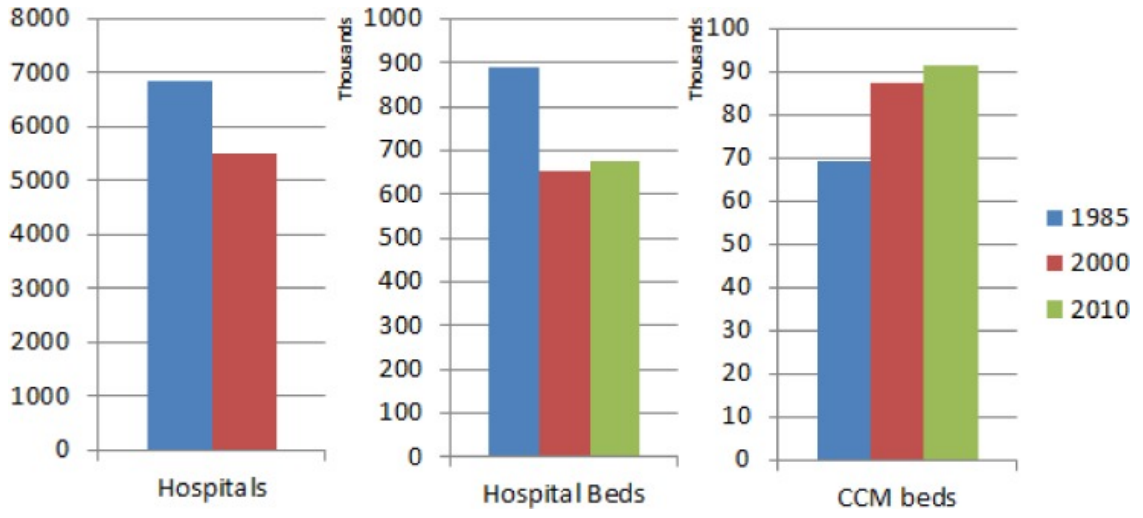

Figure 2.

Changes in hospital and ICU beds from 1985 to 2010.

One of the greatest forces compelling hospitals towards intensivist-staffed ICUs came from the Leapfrog Group, a team of representatives from close to 200 companies that purchase healthcare for their employees. Using its collective influence, the Leapfrog Group requires healthcare providers to demonstrate accountability by employing measures that improve patient care and safety and contain costs, with hospitals earning grades for meeting specific performance standards. One of the group's initial areas of focus was on ICU staffing due to its potential to benefit patients. Supported by the Society of Critical Care Medicine, the Leapfrog Group in 2001 published specific regulatory guidelines for intensivist-led ICU staffing that are intended to substantially reduce costs and improve quality of care.[23] Hospitals that meet this standard must have intensivists who work exclusively in the ICU during daytime hours and, when not on site or available via telemedicine, must answer pages within 5 minutes 95% of the time and be able to direct a physician, physician assistant, nurse practitioner, or FCCS-certified nurse to the ICU within 5 minutes. These recommendations are based on evidence that doing so would reduce costs by decreasing ICU LOS as well as unnecessary tests, procedures, and consultations.[23]

Initially, these recommendations were met with resistance based on the lack of solid evidence supporting improved patient outcomes in the intensivist staffing model.[24–27] Additionally, many argued that the increased staffing costs are not outweighed by potential benefits and would prove prohibitive.[26,28] However, in the decade following the Leapfrog recommendations, a number of studies were published to support the claim that intensivist staffing does decrease patient mortality, complications, ICU LOS, and costs in a number of patient populations (Table 1).[9–12,29] Hospitals using this model were also more likely to practice evidence-based medicine, providing a possible explanation for the improved outcomes.[13]

Table 1.

Impact of intensivists on management and outcomes. Reprinted with permission from Lancet.[29]

Reduced mortality rates
Shorter ICU stay
Shorter duration of mechanical ventilation
Reduced arrhythmias and hypotensive episodes
Lesser incidence of renal failure
Increased number of central venous and pulmonary-artery catheterizations
Reduced number of arterial blood-gas analyses
Fewer consultations requested
Reduced ICU costs

SUPPORT FOR A 24/7 ICU STAFFING MODEL

Along with increasing support of intensivists in the ICU, there is growing momentum in the literature showing that 24/7 intensivist care has benefits that go beyond daytime-only staffing. While contradictory results exist, several studies have shown that acute care admission during nights and weekends is an independent risk factor for mortality.[30–33] Bell et al. analyzed roughly 4 million acute care admissions over a 10-year period and compared mortality during weekends and weekdays. The study found a higher mortality rate in patients with three preselected high-acuity conditions (ruptured abdominal aorta, acute epiglottis, and pulmonary embolism) as well as with 23 out of 100 other conditions accounting for the highest rates of mortality. However, none of the diseases demonstrated a significantly lower mortality on weekends. The authors attributed this phenomenon to fewer and less-experienced ICU staff during the weekends.[31] Additionally, a recent meta-analysis of 853,032 admissions demonstrated that the adjusted risk of death for ICU admissions was greatest during the weekends compared with weekdays. It also showed that the absence of on-site dedicated intensivists at night may be associated with increased mortality for acute admissions.[30] These studies support the claim that patients requiring high-acuity care derive the greatest benefit from 24/7 intensivist care.

Blunt and colleagues were among the first to directly compare 24/7 versus daytime-only ICU staffing. The study evaluated 721 ICU patients over the 18-month period before and after changing to a 24/7 intensivist staffing model and found a significant improvement in the standardized mortality ratio after switching to full-time intensivist care (0.8 compared to 1.1).[14] Other studies have shown decreases in hospital LOS and the number of ICU complications as well as improvements in staff satisfaction and adherence to standard processes when a 24/7 staffing model is employed.[15,16] For example, Gajic et al. examined quality of care before and after implementing a continuous 24-hr critical care academic specialist at a teaching hospital over a 2-year period. Roughly half of the 2,622 patients received care before implementing the 24/7 staffing change, while the other half were admitted after the change took place. Although there was no difference in mortality, the change resulted in an 8% absolute decrease in process of care omissions, a 1.4-day decrease in hospital LOS, and a 2% drop in the readmission rate.[15] In a retrospective cohort study, however, Wallace et al. compared patient outcomes in 49 ICUs and found a reduction in risk-adjusted in-hospital mortality when nighttime intensivists were added to a low-intensity daytime staffing model.[16] Additionally, with nighttime intensivist staffing, many of the procedures and services previously only available during the day—such as extubation, goal-of-care discussions, and initiation of comfort care—can be done at night, further eliminating any delay of care that could extend ICU LOS.[18]

Based on the growing body of evidence, the combined task force of the American College of Critical Care Medicine (ACCCM) and the Society of Critical Care Medicine (SCCM) recommends 24/7 intensivist staffing in level 1 critical care units.[34] This task force categorizes critical care centers into 3 levels with decreasing levels of resources. Level 1 critical care centers have units with intensive care-trained staff, equipment, and support services to provide comprehensive care for a variety of disorders, which is why the task force recommends 24/7 ICU intensivist staffing at this level. If this is not possible, 24/7 coverage should be provided by an experienced physician in another specialty with an on-call intensivist available within 30 minutes and returning pages within 5 minutes. Level 2 and 3 critical care units are expected to have the necessary staff to provide quality care but to transfer to higher-acuity critical care centers when necessary.[34] Opponents who are hesitant to adopt the 24/7 staffing model argue that the increased staffing is cost prohibitive.[26] In fact, a 2006 financial model by Pronovost et al. showed that an ICU can save $500K to $3.3M per year if the Leapfrog staffing model is adopted. The cost savings were due to decreased LOS, more efficient ICU utilization, and reduced ICU ancillary costs. The study also points out that the larger the ICU, the larger the cost savings.[35] Hence, high-volume centers have the greatest opportunity to offset the cost of intensivist staffing. While this study is not specific to a 24/7 staffing model, the results can be extrapolated since 24/7 intensivist staffing has been shown to have even lower hospital LOS and complication rates compared to daytime-only staffing.[15] Additionally, Banerjee et al. found that 24-hr ICU intensivist staffing reduced LOS and generated an estimated cost savings between $5,000 and $5,500 per day for the sickest group of patients admitted at night in an academic hospital.[19] This is thought to be attributable to the lower level of developed complications and practice of evidence-based processes by intensivists. The sickest patients require the highest acuity of care, thus explaining the cost reduction of 24-hr intensivist staffing in high-acuity centers.

Other opponents have argued that having an intensivist on hand reduces resident independence and learning in academic hospitals. To the contrary, the previously mentioned study by Gajic et al. also included surveys of medical residents showing better decision-making support and higher educational value with the 24/7 model. In addition, the 24/7 change was associated with improved processes of care and staff satisfaction, lower levels of burnout, and decreased ICU complications and hospital length of stay.[15]

INTENSIVIST DEMAND VERSUS SUPPLY

In 2000, the Committee on Manpower for the Pulmonary and Critical Care Societies (COMPACCS) published a study detailing a projected shortage of critical care-trained intensivists. This was followed by a 2008 report by the U.S. Department of Health and Human Services (HHS) further emphasizing the growing disparity between supply and demand of critical care physicians.[36] As the population of adults aged 65 and older increases, demand for ICU services is projected to grow rapidly. Due to administrative structures in critical care training, however, there is a shortage of physicians to meet this demand. In fact, the HHS report projects a 35% shortage of intensivists by the year 2020 (Figure 3).[36] The shortage of intensivists has long been a point of argument made by those in opposition of 24/7 intensivist staffing (Figure 3). To address this shortage, many supporters have proposed the addition of critical care-trained nurse practitioners (NP) and physician assistants (PA) on care teams.[26,37,38] Acute care training allows NPs to receive certification as Acute Care Nurse Practitioner while PAs can complete a residency in critical care to receive specialized training. A review of 31 studies by Kleinpell found that the integration of NPs and PAs on multidisciplinary acute care teams has had a positive impact on patient care in the ICU.[37]

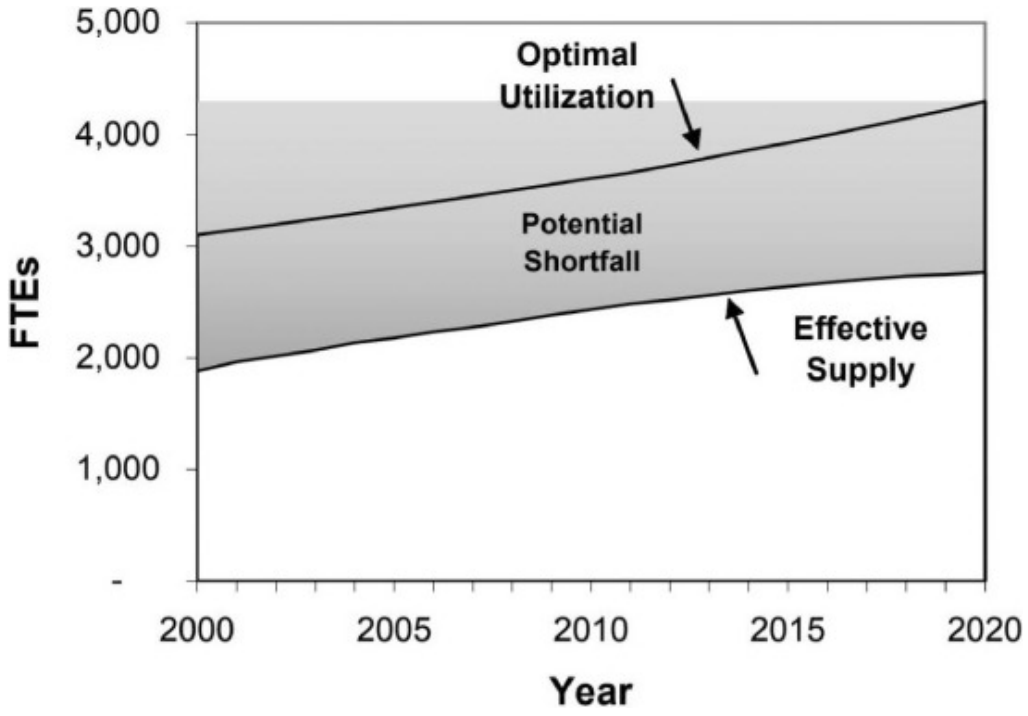

Figure 3.

Projected supply versus optimal utilization for intensivists, 2000–2020.[36] FTEs: full-time equivalent physicians

Another approach to the shortage of intensivists has been to equip ICUs with telemedicine (or tele-ICU) capabilities, thus allowing intensivists to provide medical expertise from an offsite location. Several studies have demonstrated that tele-ICU provides the same benefits of on-staff intensivists, including reductions in LOS, mortality, and costs.[39–41] A review by Venkataraman et al. summarizing the literature on tele-ICU showed that tele-ICUs are well-accepted by ICU staff, improve compliance with best care practices, and are more cost effective when used in high volume centers and in the

sickest subset of patients.[41] Another study from Emory Critical Care Center confirmed that implementing an advanced practice provider residency program and tele-ICU staffed with critical care nurses and consultant intensivists in a teaching hospital resulted in a $4.6 million cost savings.[39]

INTENSIVISTS IN HIGH- VERSUS LOW-ACUITY ICUS

Several studies to date cite the advantages of 24/7 intensivist staffing, including decreased mortality, complications, hospital LOS, and costs and improved physician satisfaction.[14–19,26,30–33] However, the benefits are not necessarily applicable across all ICUs. Angus et al. found that over half of the country's ICUs are small general medicine ICUs in nonteaching community hospitals, whereas large teaching hospitals often contain multiple ICUs and are more likely to have intensivist coverage.[26] The current studies regarding benefits of 24/7 staffing have been conducted mainly at tertiary or academic centers that are both high acuity and high volume.[15,19,31,35] Additionally, the greatest reported benefit to mortality occurs in diseases requiring high-acuity care that are likely managed at tertiary care centers.[18,31,35] Unfortunately, no studies currently exist comparing patient outcomes or costs of 24/7 intensivist staffing in low- versus high-acuity and volume centers. The ACCCM/SCCM task force has categorized critical care centers based on resources and the level of acuity they are equipped to handle. Of the three levels, only level 1 critical care units—typically found in tertiary care centers—are recommended to have 24/7 intensivist coverage.[34] Given the shortage of intensivists, it is not practical nor necessary for low-acuity, low-volume hospitals to have this level of staffing. Rather, as the ACCCM/SCCM task force suggests, these level 2 and 3 centers should recognize when high-acuity patients require care beyond their capabilities and transfer them to level 1 centers.[34]

APPLICATION TO CARDIAC SURGICAL ICUS

In ICU patients who have undergone cardiac surgery, studies have shown that care from a nighttime intensivist decreases ICU LOS, use of blood products, post-op complications including nosocomial infections and surgical site infections, rates of cardiac arrest, and duration of mechanical ventilation.[20,21] Additional administrative benefits include a reduction in cardiac surgical ICU readmissions and fewer surgical postponements from lack of cardiac ICU beds.

A study looking at subgroups of cardiac surgical ICU patients found subtle differences in outcomes between low-acuity, short-stay patients and high-acuity patients requiring prolonged stay. Kumar et al. studied the benefits of having 24/7 in-house intensivist coverage for patients requiring > 48 hrs in the ICU.[22] Although 24/7 intensivist coverage was not associated with changes in ICU LOS or 30-day mortality, the authors did observe reductions in median hospital LOS in the cardiac surgery ICU cohort as well as reductions in ventilation support and postop complications of acute kidney injury and sepsis. There was also a reduction in the number of interventions, including decreased use of blood products, vasoactive drugs, and pulmonary artery catheterization.[22]

At the Houston Methodist DeBakey Heart & Vascular Center, 24/7 in-house staffing has been in place for 15 years and has demonstrated meaningful reductions in sepsis mortality, infections, and ECMO mortality and an improvement in physician satisfaction.[42–46] In one study, an intensivist-led team developed and implemented a sepsis protocol in two hospital ICUs and compared mortality, cost, and LOS from the 6-month period before and after implementation. Mortality rates in both the general surgery and cardiovascular ICUs improved by 30% and 18.75%, respectively, while the overall cost savings was approximately $690,000.[42] The center also conducted a 3-year retrospective study to assess the impact of quality improvement initiatives on minimizing variability of care and lowering mortality for patients on ECMO. After implementing several processes, including intensivist ownership of criteria documentation and training of ECMO specialists, they saw mortality drop from 76% in 2012 to 46.7% in 2015.[43] A more recent observational study evaluated outcomes in patients discharged with diagnoses of severe sepsis and septic shock over 8 years after implementing a sepsis care performance

improvement initiative.44 It also launched an Advanced Practice Providers program that included physician assistants and nurse practitioners as part of critical care delivery teams. The sepsis care initiative involved system-wide education on sepsis guidelines and early recognition, establishing a care pathway model that included nurse practitioner-led sepsis screening and early intervention, and monitoring compliance and adherence to the sepsis bundles. During this 8-year period, there was a drop in sepsis-related mortality from 35.4% to 11.0%, a relative risk reduction of 58%, and a potential direct cost savings of $17.5 million.

SUMMARY

Intensive care units are some of the most expensive pieces of real estate in any given hospital. The complexities of caring for a growing aging population with multiple comorbidities coupled with an equally growing shortage of critical care physicians is giving rise to new models of ICU staffing that include advanced practice providers and tele-ICU capabilities. The presence of 24/7 in-house ICU intensivists has had a positive impact on the quality of care for critically ill patients in high-acuity, high-volume centers, where this model has demonstrated improved patient outcomes, reduced LOS, and lower costs. However, this impact has not been proven in all hospital settings. Although the American College of Critical Care Medicine and the Leapfrog group advocate continuous 24/7 intensivist and critical care-trained physician coverage, the benefits cannot be extrapolated to low-acuity, low-volume facilities enough to justify the increased staffing needs and costs.

KEY POINTS

- 24/7 intensivist staffing in the ICU has multifaceted benefits, including improved patient outcomes, decreased overall costs, and higher levels of physician satisfaction.
- Due to the shortage of intensivists to meet increasing ICU demands as well as rising hospital staffing costs, it may not be necessary for low-acuity, low-volume ICUs to employ 24/7 intensivists.
- Telemedicine and team-based healthcare provider models are evolving options to meet the demand of intensivists in the ICU.

Footnotes

Conflict of Interest Disclosure: Dr. Masud is a consultant for Mallinckrodt Pharmaceuticals and Chiesi USA, Inc.

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