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(Not) Everybody's Working for the Weekend

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The intensity of intensivist staffing in the intensive care unit (ICU) has been known to be an important influence on ICU outcomes for many years [1]. In the United States requirements for certification by organizations such as the Leapfrog Group, specifying intensivist presence during daytime hours, are potentially at odds with a putative shortage of intensivists and models of care required to address the needs of a burgeoning critical care patient population [2–4]. Although the intensive care unit may be staffed on weekends with highly skilled nurses and respiratory therapists, lessened intensivist availability during that time has led to concerns about care delivery and outcomes.

Epidemiological clues about suboptimal medical care on the weekends have been present since the 1970s. Rogot *et al.* in 1976 published the daily variations in congestive heart disease, stroke and influenza mortality which clearly demonstrated higher rates of death on weekends compared to weekdays, the so-called “weekend effect.” [5]. It was unclear from this initial observational study whether increased mortality was the result of increased disease incidence, severity or suboptimal care. That question was addressed in a study by Bell and Redelmeier in 2001 which evaluated a cohort of over 3 million hospital admissions from 1988 to 1997 [6]. The authors demonstrated conditions such as ruptured abdominal aortic aneurysm, acute epiglottitis and pulmonary embolism had an increased mortality when a patient was admitted over the weekend. Furthermore, of the top 100 conditions that resulted in in hospital mortality, 23 demonstrated this alarming pattern of higher weekend mortality.

Since 2001, over 17 cohort studies have focused on the question of whether out-of-hours ICU admission is associated without worsened outcomes. These studies have been highly variable and discrepancies between studies have been attributed to different work shift schemes, intensivist coverage, physician-to-patient ratio and even definition of “out-of-hours”. Previously, the most complete analysis was done by Cavallazzi *et al.* in a meta-analysis of 10 cohort studies consisting of a total of over 135,000 patients [7]. Contrary to

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expectations there was no association between night admission and worsened outcomes; however, an association between weekend admissions and mortality was found. This latter finding was met with skepticism as it was mainly driven by results from only one of the ten studies included in the analysis. Another shortcoming of Cavallazzi's systematic review was the lack of consideration of potential causes for the increased weekend mortality.

Subsequently, in the years since 2010 at least seven studies have been published which appeared to confirm the weekend effect. In this issue of *Critical Care Medicine*, Galloway *et al.* present an updated systematic review regarding the impact of out-of-hours admission on mortality. An analysis of 902,551 patients from 16 cohort studies conducted across multiple countries was conducted in order to identify whether time of admission or day of admission was associated with increased ICU mortality. Consistent with Cavallazzi *et al.*, nighttime admissions were not at an increased risk of death but a significant increase in mortality for patients admitted over the weekend (OR 1.05, 95% CI 1.01–1.09) was found. Additionally, the authors sought to determine which factors contributed to increased weekend mortality. Interestingly, the weekend effect had a strong geographic component. Studies conducted in North America clearly demonstrated increased weekend mortality (OR 1.08, 95% CI 1.03–1.12) while studies based in Europe (OR 1.05, 95% CI 0.99–1.13) and Asia (OR 0.89, 95% CI 0.63–1.25) did not. While there are several differences which might explain this geographic variation, the presence of an onsite intensivist is one factor that varies significantly between North America and Europe and Asia: continuous intensivist presence in the ICU is common in Europe and Asia but is quite uncommon in North American hospitals [9]. For the purposes of this study, an onsite intensivist was defined as a critical care trained fellow or physician without non-ICU service obligations present in the ICU at night. The availability of intensivists on the weekend was never formally established in this study, although it is possible hospitals with an intensivist at night also are likely to have one on the weekend. In studies conducted at hospitals with an onsite intensivist, there were no significant differences in patient mortality whether they were admitted on a weekday or a weekend (OR 1.05, 95% CI 0.98–1.13). Unfortunately, due to the heterogeneity and limitations in data reporting it was not possible to estimate how much of the geographic component was accounted for by the presence of an on-site intensivist.

The suggestion that an onsite intensivist is associated with lower mortality in patients admitted on weekends stimulates multiple questions about their protective role. Do they provide better recognition of critical illness, faster response to changes in clinical trajectory, decreased time to advanced procedures, or simply more manpower? Are all critical care providers (i.e. fellows, attendings) equal or is attending level experience important? Alternatively, could a critical care advanced practitioner provide the same benefit? Moreover, it is unknown whether other factors such as a high patient-to-physician ratio, staff fatigue or delays in obtaining diagnostic tests and procedures also play an important role.

Although exact definitions vary between studies, a weekend consisting of the time period between 6 pm Friday to 8 am Monday constitutes roughly 37% of an entire week. Hence, in an ICU environment where patients are unstable and disease trajectory unfolds rapidly over the course of a few short days, it is unsurprising to discover a higher mortality during the weekend particular to circumstances of lessened intensivist coverage. The data presented by

Galloway *et al.* suggest the sustained presence of trained, dedicated critical care practitioners during the weekend provides an incremental mortality benefit. The changes necessary to meet the challenge inherent in these findings will likely require a culture shift for both professional societies and individual practitioners.

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