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## Best arrive on time

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Many, but not all, published studies show an increase in mortality, complications, and length of stay for patients admitted to the intensive care unit (ICU) at night and at weekends.<sup>1,2</sup> Various reasons have been proposed for this increase—including different staffing arrangements and patient factors that result in those admitted outside normal 'office-hours' having a higher illness severity.

Brunot and colleagues<sup>3</sup> have recently shown that when adjusted for the effect of illness severity there was no effect on mortality depending on admission 'in-' vs 'out-of-office' hours. This study was a single-centre 9 yr cohort of 2428 patients. Wallace and colleagues<sup>4</sup> looked at the effect of 24 h intensivist physician staffing on outcome in 65 752 patients admitted to 49 ICUs in the USA. They found that in those units having low-intensity staffing during the daytime there was a significant reduction in the odds ratio for death with the presence of night time intensivist physician staffing. There was, however, no effect of intensivist staffing at night time in those units that were defined as having high-intensity daytime staffing. A 2 yr prospective cohort study of 195 428 unplanned ICU admissions in the UK found no influence of day of week or time of day of admission on mortality.<sup>5</sup> Moreover, a recent official American Thoracic Society systematic review of staffing models suggested that night time intensivist staffing was not associated with reduced ICU mortality or decreased ICU or hospital length of

stay.<sup>6</sup> A recent meta-analysis of 16 studies that included 902 551 patients did show an increased risk of death for those patients admitted at weekends, and this effect was most marked in those units lacking intensivist physician cover. There was no difference in mortality comparing night time and day time weekday admissions.<sup>2</sup>

In this issue of the *British Journal of Anaesthesia*, Morgan and colleagues<sup>7</sup> report the results of a retrospective analysis of the Australia and New Zealand ICU (ANZICS) database for all participating units in Australia and New Zealand. The database was interrogated to determine any possible effect of 'out-of-office hours' ICU admission in those surgical patients who had a planned ICU admission. Total hospital length of stay and hospital mortality were the primary outcomes of interest. Office hours were defined, like most other studies, as weekdays between 08:00 and 17:59. All Australasian ICUs have dedicated intensivist physician cover and a nurse-to-patient staffing ratio of 1:1 for those patients requiring mechanical ventilation or for those deemed critically ill. In the article, it is stated that in Australasian ICUs, medical but not nurse staffing ratios, are often reduced during out-of-office time periods. In total, 1 388 557 ICU admissions were studied between January 2006 and December 2016. Compared with in-office hours admission, out-of-office hours admissions had an increased hospital length of stay by 2.9 (14.1 vs 11.2) days and a higher risk of in hospital death (2.5% vs 1.4%). These differences

remained after adjusting for available risk factors. With multivariate analysis, weekend admissions were found to be associated with both longer hospital length of stay and higher mortality than were weekday out-of-office hours admissions. The authors suggest that the results should assist healthcare policy makers to modify the timing of major planned surgery to optimise both overall healthcare and also individual patient outcomes. Secondly, they question the assumption that increased staffing and monitoring available in the ICU mitigates the problems of out-of-office hours admissions to a standard surgical ward.

The authors acknowledge that they have not identified the causes of the increases in hospital length of stay and mortality. They also suggest that the reasons are likely to be complex and multifactorial. There may be patient and healthcare delivery procedural factors. Other studies have shown that patients admitted to ICU outside of 'normal' working daytime hours have increased postoperative complications including returns to theatre for further surgery, acute coronary syndromes, thromboembolism, and pneumonia.<sup>8,9</sup>

Morgan and colleagues<sup>7</sup> also report increases in ICU length of stay of 5.2 h and hospital length of stay of 2.9 days in those admitted out-of-hours.<sup>7</sup> One possibility for this difference may be variations in ward care after ICU discharge that occurs depending on time of discharge. This may be compounded because patients admitted to ICU late in the evening stays on the ICU an average of 5 h longer. This will probably mean that these patients are discharged to the ward in the evening, which again may be a suboptimal time. Median ICU length of stay was 26 h in the in-office hours group compared with 30 h in the out-of-office hours group, which could well mean that this latter group were discharged to the standard surgical ward also out-of-office hours.

Others have reported an increase in mortality and complications in those patients discharged from ICU out-of-office hours. Gantner and colleagues<sup>10</sup> looked at this in the same ANZICS database with data collected between 2005 and 2012. Mortality was 6.4% vs 3.6% in those discharged during office hours. Of particular concern is their conclusion that 'despite widespread dissemination of this evidence there has not been a reduction in the numbers of out-of-hours discharges from ICU'. In many national ICU audits, discharge from ICU outside certain times is now considered to be a quality of care indicator. However, this time window does not at present include the entire weekend. The current UK standard is that all discharges from ICU should be between 07:00 and 21:59—but again this is not just from Monday to Friday inclusive.<sup>11</sup> Many others use the shorter timeframe of 08:00–19:59.

This is a large database study in terms of patient numbers. The differences in outcome highlighted in this paper are statistically significant and important. An understanding of why the differences occur may give us a clue as to how care may be improved. Is the increased length of ICU stay a reflection of the lack of active management during out-of-office hours? Regarding the excess mortality in those admitted out-of-office hours, I would suggest that the next step should be a more detailed examination of what happens on the standard surgical ward once these patients are discharged from ICU. What is not clear from the current study is

exactly at what times the patients are being discharged from ICU; to what sort of unit they are being discharged; what is the medical and nursing cover available on these hospital wards; what happens to the patients post-ICU discharge in terms of complications; and where do the patients actually die—is it on the ward or are they readmitted to ICU? Perhaps with such knowledge a more seamless provision of care can be provided for all ICU patients.

## Declaration of interest

The author is a Board Member of the BJA.

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