

## EDITORIAL COMMENT

# Demystifying the Weekend Effect

## What We Can Do to Avoid Deadly Weekends\*



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In this issue of *JACC: Asia*, Takahashi et al<sup>1</sup> compared in-hospital mortality of patients with acute type A aortic dissection (aTAAD) admitted either on a weekday or on a weekend in 2 sequential cohorts from a large registry database covering the greater Tokyo region. Hospital performance and 30-day survival in 30 centers were significantly worse on weekends in the first year of the Tokyo Acute Aortic Super-network (TAAS). Once the TAAS system was smoothly operational beyond the second year, in-hospital mortality on weekends reduced by 40% over the following 3 years and was similar to mortality on weekdays.

These compelling findings may add an important piece to the puzzle of demystifying the so-called weekend effect and draw attention to potential confounders of surgical outcomes in patients with aTAAD.

Over the observation period, the in-hospital mortality of patients admitted on weekends reflected a decreasing trend from 37.2% in 2011 (cohort I) to 15.5% to 22.2% in 2013 to 2015 (cohort II) with successful implementation of the TAAS system; surgical in-hospital mortality of 21.7% in 2011 dropped to 9.5% in 2013 to 2015 when TAAS had been successfully implemented and adopted. TAAS had started operation in November 2010, aiming to provide a transfer platform to allocate patients with aTAAD to best care in the greater Tokyo region. Although a weekend

disadvantage was still seen at the time of inception, this effect disappeared after smooth operation of TAAS, with no mortality difference between weekend and weekday admissions. This regional network accelerated the aortic service and allocation and improved surgical outcomes. Moreover, even overall mortality showed a declining trend, possibly related to more frequent transfer to high-volume centers. There was no difference between weekday and weekend in transferring to high-volume centers in the first year (62.3% vs 64.2%) but a significantly increasing referral rate in the following 3 years of the established network supported by the following observations.

First, the percentage of patients with nighttime admission was higher (48.6%) with TAAS in place than in the year of inception (40.1%), indicating less delay in patient admission. Second, with TAAS in full operation (cohort II), the interfacility transfer to high-volume centers improved from 42.3% to 52.1% on weekends, whereas transfers during the week remained similarly frequent with 53.4% in cohort I and 55.8% in cohort II. In other words, the TAAS system helped to allocate critical patients better on weekends, further neutralizing the weekend effect. Third, with TAAS in place, the percentage of patients transferred to high-volume centers was actually higher, with 63.7% on weekends compared with weekdays. On aggregate, although it is unlikely that individual surgical skills have improved from 1 year to another, communication within an effective referral network has obviously improved patient allocation. That is, a well-organized regional allocation system for patients in dire need for expert surgery and skillful aftercare is instrumental to improve survival of patients with aTAAD, regardless of the day of the week. Why should the risk of death from aortic dissection on weekends be higher than on a weekday?

Although some of the components of the weekend effect have been demystified, other factors continue to be debated.<sup>2</sup> Older studies have highlighted that the weekend itself carries an independent risk of

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additional 17% to 32% in-hospital mortality in patients with aTAAD.<sup>3,4</sup> Potential reasons may be understaffing, substantial diagnostic delays, and unavailability of skilled surgeons on weekends. More recent data from the NORCAAD (Nordic Consortium for Acute Type A Aortic Dissection) registry and from the IRAD (International Registry of Aortic Dissection) failed to demonstrate a mortality disadvantage on weekends and between “on-time” and “off-time”, probably because dedicated specialized hospitals have contributed to those registries with an established 24/7 service for aortic care including surgery or swift referral to surgery.<sup>5,6</sup> This recent evolution toward specialized aortic centers connected to regional allocation systems and networks is probably the most important reason to neutralize the injustice of the weekend effect. It appears important to allocate cases with aTAAD to high-volume aortic centers rather than to low-volume cardiac surgery departments.<sup>7</sup> The proficiency of a surgical team, complexity and urgency of surgery, severity of comorbidities, and post-operative care all contribute to surgical outcomes, which is addressed best in high-volume centers. Other proxies around the weekend effect are not yet demystified. First, weekend staffing or service reduction has been discussed, but recent literature does not show any relationship between weekend senior medical staffing (consultant) and patient outcomes<sup>8</sup> as long as a dedicated care team can be mobilized. Aortic dissection care is teamwork pre-, intra-, and post-operatively. Conversely, systemic shortage of staff including radiologists and nurses on weekends or holidays may cause significant delay in diagnosing, transferring, and bedside care with negative impact on surgical outcomes and should be avoided at all costs.<sup>9</sup>

Second, the variation of national and regional allocation systems for acute care may be another explanation for the weekend effect. In contrast to findings in the Tokyo region with TAAS in place,<sup>1</sup> a nationwide retrospective analysis including 25,641 patients with aTAAD all over Japan demonstrated a

clear weekend effect, with in-hospital mortality to be higher by 20% in Sunday and holiday admissions compared with weekday admissions.<sup>10</sup> Furthermore, a recent meta-analysis found that the mortality was higher in weekend admission both in the United States and Europe, but not in the United Kingdom, suggesting a potential impact of the regional organization of the National Healthcare system.<sup>11</sup> Third, there is observational evidence that patients admitted on weekends are sicker or at advanced stages of their conditions, both in acute aortic syndrome and acute coronary syndrome.<sup>12,13</sup> This may account for higher mortality and morbidity in patients admitted on weekends. Again, a dedicated system with proper allocation of patients to specialized care, such as an aortic center in case of aortic dissection, may help to mitigate any excess mortality related to weekend admission.

In summary, acute aortic syndrome (in particular, Stanford type A dissection) requires prompt referral to highly specialized centers for aortic care. The management should ensure rapid diagnosis, swift interfacility or intrafacility transfer to a dedicated aortic team. A well-organized network of regional centers with centralized coordination providing 24/7 service is likely to avoid delay, provide standardized management pathways, and minimize logistic and staffing issues that may have caused a weekend effect in the past.<sup>7</sup> We owe our patients the best possible care in all life-threatening scenarios, even on a well-deserved weekend.

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