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PATIENT SAFETY NETWORK

The Weekend Effect

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Introduction

Anyone who has spent time in a hospital as a patient or staff member may recognize that the availability of services and personnel can vary depending on the time of day or day of the week. Researchers have attempted to determine whether these temporal differences in care result in adverse outcomes for patients who are admitted to the hospital outside of typical business hours. In particular, an extensive body of research has examined the *weekend effect*—the purportedly increased risk of adverse outcomes for patients who are admitted to the hospital on weekends. The question of whether the weekend effect exists has important patient safety and policy implications, given the financial implications of staffing hospital services at a consistent level 7 days per week. In particular, the United Kingdom's National Health Service (NHS) has prioritized efforts to provide more consistent 7-day services, including increasing weekend staffing by junior doctors. This action was so controversial that it resulted in a general strike by these doctors in 2016—the first strike by physicians in the history of the NHS.

Despite many years of research, the patient safety implications of the weekend effect remain somewhat controversial. This Annual Perspective will summarize the state of research on the weekend effect and highlight advances in the evidence base for the weekend effect that were published in 2017.

Does the Weekend Effect Exist?

A seminal 2001 study was among the first to document the weekend effect on a large scale. This study analyzed nearly 4 million consecutive hospital admissions in Ontario, Canada, over a 10-year period, and found that 23 of the 100 most frequent causes of death were associated with higher mortality when those patients were admitted on a weekend. In the intervening years, many studies have examined the weekend effect for a variety of diseases. While the effect is not found consistently, the bulk of the evidence does support the 2001 study's principal finding: for many common conditions, patients admitted on the weekend are at increased risk of death and serious complications. A 2017 meta-analysis included 97 studies comparing mortality between weekend and weekday admissions, with most included studies defining

weekend admissions as occurring between midnight on Friday and midnight on Sunday. The review found that weekend admissions were associated with a 19% relative increase in mortality compared to weekday admissions across a variety of diagnoses. The specific diagnoses for which the weekend effect has been documented include acute coronary syndrome, stroke, pulmonary embolism, and selected surgical conditions. It therefore appears that clinical outcomes are worse for patients who are admitted on the weekend. However, controversy continues regarding the reasons why the weekend effect might occur.

Explaining the Weekend Effect

There are three potential mechanisms for the weekend effect:

- *Lower levels of hospital staffing or staffing by relatively less experienced staff on weekends may result in inadequate assessment of patients or monitoring for complications.* This could worsen outcomes for a broad range of patients. In this case, ensuring that hospitals are consistently staffed at the same level 7 days a week could improve patient outcomes.
- *Reduced or delayed access to specialized diagnostics or therapeutics (particularly invasive procedures) on weekends could delay diagnosis or treatment of time-sensitive conditions, potentially resulting in worsened outcomes for specific high-risk conditions.* In this case, hospitals could improve outcomes by ensuring that personnel and services are available at all times for patients with conditions associated with a high risk or mortality or morbidity.
- *Patients who present to the hospital on weekends may have a condition of greater severity or multiple conditions than those presenting on weekdays, resulting in worse outcomes regardless of appropriate staffing levels and access to interventions.* In this case, changing staffing patterns or implementing 7-day access to specific services would not affect patient outcomes. Interventions to improve outcomes would need to focus on ensuring early access to care for patients who are acutely ill.

Despite many years of research, it remains unclear which of these mechanisms explains the weekend effect. A 2014 study sought to determine the contribution of health care system and patient factors to the greater risk of weekend mortality by analyzing daily mortality rates for the 7-day period following weekend admission. For certain diagnoses (for example, acute coronary syndrome), the risk of death was elevated during the first 48 hours after weekend admission but declined thereafter, implying that mortality improved once hospitals returned to full staffing. However, patients with other diagnoses (for example, complications of cancer) continued to have elevated mortality risk for the full 7 days after weekend admission, suggesting that these patients experienced excess mortality primarily because they were more severely ill at the time of presentation. Other diagnoses, such as stroke, showed a mixed pattern of system and patient factors.

Two studies published in 2017 advanced our knowledge of the mechanisms for the weekend effect. A study conducted at four hospitals in the United Kingdom included multiple specific markers of patients' illness severity and hospital workload in order to further elucidate the contribution of patient and health care system factors to the weekend effect. The investigators found that higher mortality associated with being admitted to the hospital during weekends could largely be explained by severity of patient illness, and none of these workload intensity measures was associated with increased mortality. Another UK study used hospital administrative and emergency services data to examine outcomes among more than 3 million

emergency admissions. The investigators found that when using traditional risk adjustment (which relies on clinical information about diagnoses and comorbidities documented during hospitalization), mortality rates were increased for patients arriving over the weekend. However, patients who arrived at the hospital by ambulance appeared to account for most of the increased mortality—again implying that illness severity accounts for much of the weekend effect. These studies provide important insights into the mechanisms of the weekend effect. However, given the differences in systems of care between the UK and United States, studies examining these questions using US data will be useful. Further studies that examine the weekend effect in specific settings of care—for example, comparing urban versus rural hospitals, or whether vulnerable populations are particularly at risk for worsened weekend outcomes—will also add to the scientific evidence base in this area.

This study also highlights the methodologic challenges in studying temporal variations in care. Most studies of the weekend effect rely on hospital-based administrative data. Such data, which is collected mostly for billing purposes, contain clinical information on diagnoses, tests, and treatments and can be very useful for research. However, these data may lack the clinical detail necessary to determine illness severity, a crucial issue in attempting to quantify the relative contributions of the mechanisms by which the weekend effect may occur. Therefore, other data sources—such as from emergency services, as in the above study, and electronic health care data—may be necessary in order to truly distinguish the contributions of patient and health care system factors to the weekend effect.

Implications of the Weekend Effect

The weekend effect is a complex patient safety issue, and despite 15 years of research, many controversies remain. A 2017 commentary pointed out that research has yet to answer several central questions about the weekend effect. First, the magnitude of the weekend effect remains unclear and likely varies widely across different diagnoses and practice settings. Second, the assumption that decreased staffing on weekends accounts for the weekend effect has not been empirically proven. In fact, the few studies that explicitly examined the association between physician staffing and weekend outcomes have found no correlation. Third, the weekend effect is not the only source of temporal variation in care. The "weekend effect" itself may be an oversimplification, as some studies have found diurnal (variation by time of day at which patients were admitted) and day-of-the-week (variation by the day on which patients were admitted, independent of weekend versus weekday) patterns of variation in care quality and outcomes.

Finally, the weekend effect's implications for policymakers have yet to be fully defined. While it is tempting to assume that patient care could be improved through 7-day staffing of hospitals or increasing access to specialized therapeutics at off hours, these measures are likely to be insufficient. Consider an elderly patient with cancer who is on a fixed income, requires transportation assistance to attend medical appointments, whose relatives work full time, and whose oncologist is not in clinic on Fridays. If she develops an acute illness on Thursday evening, she may have to wait until Saturday to go to the emergency department—by which time she will likely be more severely ill than if transportation and access to care had been readily available on Friday. Preventing the weekend effect for this patient will require measures that are not usually thought of as within the hospital's purview, but are becoming increasingly prominent as, driven by payment reform, health care organizations begin to embrace a population health

perspective.

Summary

In summary, research published in 2017 confirms that hospital admission over a weekend confers a slight increase in mortality. However, some of this association reflects an increase in illness severity among patients who present to the hospital on weekends. In addition, simply having more specialists available on the weekend does not seem to eliminate the effect. Thus, while the reality of the weekend effect remains, the multiple mechanisms that contribute to it and the methodological complexity of research in this area make it difficult to determine causal factors and propose specific solutions. As with other patient safety challenges, policymakers will need to avoid reflexive approaches to addressing this issue, recognizing its complexity and the need to consider both patient and health system factors that might give rise to the increased mortality associated with weekend admissions to hospital.