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Day of hospital admission and effect on outcomes: the weekend effect in acute gallstone pancreatitis



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ABSTRACT

Background: The aim of our study was to evaluate outcomes in patients who are admitted on weekend compared with those admitted on a weekday for acute gallstone pancreatitis. **Methods:** We performed a 3-y (2010–2012) analysis of the Nationwide Inpatient Sample database. Patients with acute gallstone pancreatitis who underwent endoscopic retrograde cholangiopancreatography (ERCP) were included and were divided into two groups: admission on the weekend *versus* the weekday. Primary outcome measures were time to ERCP, adverse events, and mortality. Secondary outcome measures were hospital length of stay and total cost.

Results: A total of 5803 patients with acute gallstone pancreatitis who underwent ERCP were included in our study; of which 22.6% were admitted on the weekend, whereas 77.4% were admitted on a weekday. Mean age was 57 ± 18 y and 57.1% were female. Within 24 h, the rate of ERCP was higher in patients admitted on the weekday compared with those admitted on the weekend (40% *versus* 24%; $P < 0.001$). Similarly, by 48 h, the rate of ERCP was higher in the weekday group (69% *versus* 49%, $P < 0.001$). Patients admitted over the weekends had higher complications rate ($P = 0.03$), hospital length of stay ($P < 0.001$), and the total cost of hospitalization ($P < 0.001$) compared with the weekday group with no difference in in-hospital mortality.

Conclusions: Patients admitted on weekends for acute gallstone pancreatitis experience a delay in getting ERCP and have higher complications, prolonged hospital stay, and increased hospital costs compared with those admitted on weekdays.

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Introduction

A growing literature points to the “weekend effect,” that is, patients admitted to medical or surgical service on weekends have worse outcomes than those admitted on weekdays.¹

This effect was first observed in patients with myocardial infarction.² Subsequently, numerous other studies from various disciplines demonstrated a similar effect in the case of pulmonary embolism, labor and delivery, intracranial hemorrhage, acute fibrillation, and acute kidney injury.^{3–7}

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Although many of these studies primarily focused on mortality rates, a weekend admission can impact various aspects of patient care, such as increased complications, prolonged hospital stays, higher hospital costs, and poor quality care that can include a delayed definitive endoscopy for a gastrointestinal hemorrhage and a prolonged waiting time.^{4,8-19} In addition, a study of 351 million patients discharged from hospitals in the United States shows that a weekend admission is also associated with an increased likelihood of developing a hospital-acquired condition for which the resulting health care costs are not reimbursed by the Centers for Medicare and Medicaid.²⁰

Studies of the weekend effect on surgical patients have consistently demonstrated substandard outcomes for emergent and elective operations on the weekend.^{14,21-23} For instance, a study by Goldstein *et al.*¹¹ demonstrated the weekend effect in pediatric surgery. They found that patients undergoing a weekend procedure were more likely to develop a procedure-related complication, receive a blood transfusion, and had higher odds of dying compared with those admitted on weekdays. This phenomenon is even more problematic in the case of urgent procedures as well as those that require multidisciplinary management and resources. Nonetheless, little is known about the weekend effect on patients with acute gallstone pancreatitis whose care requires collaboration between the surgeon, nursing staff, anesthesiologist, and gastroenterologist. The aim of our study was to evaluate the outcomes in patients who are admitted on weekend compared with those admitted on a weekday for acute gallstone pancreatitis. We hypothesized that patients admitted on weekends for acute gallstone pancreatitis experience a delay in getting endoscopic retrograde cholangiopancreatography (ERCP) and have worse outcomes compared with patients admitted on the weekdays.

Methods

Data source

We performed a 3-y (2010-2012) retrospective analysis of the Nationwide Inpatient Sample (NIS) database. NIS is the largest public database maintained by the Healthcare Cost and Utilization Project containing information from more than 4000 hospitals and 7 million in-hospital admissions across 44 states in the United States. The database is a 20% stratified sample of all hospital admissions. NIS contains information about patient demographics, admission profile, state codes, admission months, discharge diagnosis, procedure codes, hospital charges, and discharge time. The present study was deemed exempt from the Institutional Review Board approval as it is a publically available administrative database and contains deidentified data.

Inclusion and exclusion criteria

We included all adult patients diagnosed with acute gallstone pancreatitis who underwent ERCP. We excluded all patients who were transferred from other facilities. We identified

patients with pancreatitis from the NIS database using the Ninth Revision of the International Classification of Diseases diagnosis codes (ICD-9 diagnosis code: 577) and patients with biliary disease (ICD-9 diagnosis codes: 574, 575.0, 575.1, and 576). These patients were narrowed down to who underwent ERCP (ICD-9 procedure codes: 51.10, 51.11, 51.84, 51.85, 51.88, and 52.93). Patients with elective admission were also excluded from the analysis.

Data points and definitions

The following data points were collected from the database: patients' demographics (age, race, and gender), mode of presentation (elective versus nonelective), insurance status, teaching status of the hospital, location of the hospital (urban versus rural), weekend admission, all-patient-refined diagnosis-related groups, severity of illness, complications, length of stay, and total hospital charges, which were defined as the prices a hospital sets for its services.

Patient stratification

Patients were stratified into two groups: those who were admitted on the weekend versus those admitted on a weekday. Each hospitalization in the NIS database is designated by a distinct variable as a weekday (Monday-Friday) or weekend (Saturday-Sunday) hospitalization based on the date of admission. Admission on weekend and weekdays was defined using this variable. The NIS database does not allow identification of specific admission days.

Outcome measures

Our primary outcome measures were time to ERCP, in-hospital complications, and in-hospital mortality. Secondary outcome measures were hospital length of stay and total cost. We defined in-hospital complications as infectious [urinary tract infections (ICD-9 code: 599.0) and sepsis (ICD-9 codes: 995.91 and 995.92)]; pulmonary [pneumonia (ICD-9 codes: 480.0-480.9, 481, 482.0-482.9, 483.0-483.8, 485-487, and 507) and respiratory dysfunction (ICD-9 codes: 518.51-518.53 and 518.81)]; renal [acute renal failure (ICD-9 codes: 584.5-584.9 and 593.9)]; cerebrovascular [stroke (ICD-9 code: 434.91)]; and procedure-related [post-ERCP hemorrhage (ICD-9 codes: 998.11, 909.3, and V58.89)]. We also performed a subanalysis based on the hospital type and size.

The Elixhauser comorbidity index was used to identify and adjust for comorbidities in the analysis. The Elixhauser comorbidity index is well established and validated in predicting the in-patient mortality in the previous study.²⁴ The NIS database contains 29 AHRQ comorbidity measures used by the Elixhauser *et al.*²⁵ We used the comorbidity software created by the Healthcare Cost and Utilization Project for the creation and analysis of these comorbidities.

Missing data analysis

Missing data for vitals and injury parameters were treated as missing at random. Multiple imputations were performed using a missing value analysis technique to account for the

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