

## Impact of day of admission on mortality and other outcomes in upper GI hemorrhage: a nationwide analysis

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**Background:** Studies have reached varying conclusions regarding the association between day of admission and outcomes in patients with upper GI hemorrhage (UGIH).

**Objectives:** To evaluate whether important outcomes in UGIH, including in-hospital mortality, differ between patients admitted on weekends versus weekdays.

**Design and Setting:** Retrospective cohort study by using the 2009 Nationwide Inpatient Sample.

**Patients:** Patients were included if they were adults with a principal diagnosis of acute UGIH. Patients admitted between midnight Friday and midnight Sunday were classified as weekend admissions.

**Main Outcome Measurements:** In-hospital mortality, in-hospital endoscopy, endoscopic therapy, length of stay, and total hospitalization charges.

**Results:** The study included 199,008 patients with nonvariceal UGIH and 3251 patients with variceal UGIH. Compared with patients admitted on weekdays, patients with nonvariceal UGIH admitted on weekends had similar adjusted in-hospital mortality rates (odds ratio [OR] 1.11; 95% confidence interval [CI], 0.93–1.30), endoscopic therapy rates (OR 0.98; 95% CI, 0.92–1.04), and length of stay ( $P = .09$ ), but had lower early endoscopy rates (within 24 hours) (OR 0.64; 95% CI, 0.60–0.67), lower in-hospital endoscopy rates (OR 0.84; 95% CI, 0.78–0.91), and higher hospitalization charges (mean increase, \$1558;  $P = .01$ ). Patients with variceal UGIH admitted on weekends and weekdays did not differ in any of these outcomes.

**Limitations:** Retrospective data, administrative database.

**Conclusions:** Compared with patients admitted on weekdays, patients with nonvariceal UGIH admitted on weekends had similar mortality rates and lengths of stay, but lower endoscopy rates and higher hospitalization charges. Patients with variceal GI hemorrhage had similar outcomes regardless of day of admission. (Gastrointest Endosc 2014;80:228–35.)

## BACKGROUND

Day of admission has been shown to be an important predictor of clinically important outcomes such as mortality in patients admitted with various medical or surgical conditions, with weekend admission being associated with worse outcomes.<sup>1–3</sup> However, whether this association

exists in upper GI hemorrhage (UGIH) is controversial. Theoretically, outcomes may be worse for patients with UGIH admitted on weekends compared with weekdays because endoscopy suites are often closed on weekends. This can result in delays in endoscopy performance, decreased availability or absence of experienced support staff, and more variability in endoscopist expertise. In

*Abbreviations:* CI, confidence interval; ICD-9-CM, International Classification of Diseases, 9th Revision, Clinical Modification; NIS, Nationwide Inpatient Sample; OR, odds ratio; UGIH, upper GI hemorrhage.

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addition, there is evidence that patients presenting on weekends with UGIH might be sicker compared with those presenting on weekdays.<sup>4</sup>

From 1988 to 2010, multiple reports from the United States and Europe addressed the association between day of admission and UGIH mortality as well as other outcomes. Many studies<sup>1,3,5-8</sup> did not find a difference in mortality rates, although some<sup>4,9-11</sup> demonstrated an increase in mortality among patients admitted on weekends. One possible explanation for the differences is that authors have used different methods for identifying patients for study inclusion. As an example, 2 recent nationally representative studies reached opposite conclusions.<sup>6,9</sup> One used an administrative database based on the International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM) codes,<sup>9</sup> whereas the other used a registry in which variables were coded directly from patients' charts.<sup>6</sup> In addition, differences in health-care delivery systems among countries may account for some of the differences among international studies.

The aim of this study was to use a large U.S. population-based database and stringent ICD-9-CM codes for UGIH (nonvariceal and variceal UGIH) to examine the effect of day of admission on in-hospital mortality rates, early and in-hospital endoscopy rates, endoscopic therapy rates, hospital length of stay, and total hospitalization charges.

## METHODS

### Study design and database description

This was a retrospective cohort study of adult patients hospitalized in 2009 with UGIH in acute-care hospitals across the United States. Patients were selected from the Nationwide Inpatient Sample (NIS) database. This database was created and is maintained by the Agency for Healthcare Research and Quality. It is the largest publically available all-payer inpatient database in the United States. It was designed as a stratified probability sample to be representative of all nonfederal acute care hospitals nationwide. Hospitals are stratified according to ownership/control, bed size, teaching status, urban/rural location, and geographic region. A 20% probability sample of all hospitals within each stratum is then collected. All discharges from these hospitals are recorded and then weighted to ensure that they are nationally representative. In 2009, the NIS included 1050 hospitals in 44 states.

The NIS contains both patient- and hospital-level information. As many as 25 discharge diagnoses and 15 procedures are recorded for each patient by using the ICD-9-CM. The NIS has been used to provide reliable estimates of the burden of GI diseases.<sup>12,13</sup>

### Study patients

The ICD-9-CM system does not have a unified code for UGIH. Previously published studies identified ICD-9-CM

### Take-home Message

- Unlike previous reports, we found that day of admission does not affect in-hospital upper GI hemorrhage mortality.
- Endoscopy rates are lower for patients with nonvariceal hemorrhage admitted on weekends. Day of admission does not affect variceal hemorrhage outcomes.

codes capable of reliably identifying patients with UGIH.<sup>9,14-16</sup> Only patients with a principal ICD-9-CM diagnosis specific for UGIH were included in the study. The specific ICD-9-CM codes that were included are listed in the [Appendix](#) (available online at [www.giejournal.org](http://www.giejournal.org)). Patients with a discharge code specific for hemorrhage of the GI tract without further indications of the bleeding site (578.9, 285.1, or 578.1) had to have another ICD-9-CM code that suggested a possible source of blood loss from the upper GI tract to be included in the study ([Appendix](#)). Patients were excluded if they were younger than 18 years of age or if the admission was elective rather than urgent or emergent. Patients were subdivided into variceal and nonvariceal UGIH based on ICD-9-CM codes. The Institutional Review Board of Partners HealthCare approved this study.

### Study variables

Length of hospital stay and total hospitalization charges were provided within the NIS for each hospitalization. Endoscopic procedures were identified using the ICD-9-CM procedure codes ([Appendix](#)). Admissions that occurred between 12:00 AM Monday and 11:59 PM Friday were classified as weekday admissions and those that occurred between 12:00 AM Saturday to 11:59 PM Sunday were classified as weekend admissions, a definition that has been used in previous UGIH studies.<sup>1-3,6,9-11</sup> Time from admission to a procedure is reported in days in the NIS. Therefore, an upper endoscopy was considered done within 24 hours of admission if the time from admission to endoscopy was 0 or 1 day. Potential confounders were age, sex, race/ethnicity, median yearly income in the patient's zip code, patient's comorbidities (Deyo adaptation of the Charlson Comorbidity Index for administrative data),<sup>17</sup> hospital location (rural or urban), geographic region (Northeast, Midwest, West, or South), hospital teaching status, and hospital bed size.

### Outcomes

The primary outcome was in-hospital mortality, which was provided within the NIS for each discharge. Secondary outcomes were the proportion of admissions in which an in-hospital endoscopy, early endoscopy (within 24 hours of admission), or endoscopic therapy was performed, length of hospital stay, and total admission charges. Length of hospital stay and total hospitalization charges were also

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