

Comparison of Time to Endoscopy and Outcome Between Weekend/Weekday Hospital Admissions in Patients with Upper GI Hemorrhage

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ABSTRACT

Objective: Recent findings suggest that time to endoscopy is prolonged in patients admitted on the weekend with upper gastrointestinal hemorrhage (UGIH), which may result in increased adverse outcomes. This study was designed to determine if these findings hold true for a community gastroenterology practice.

Methods: This retrospective study reviewed patients admitted to a community teaching hospital from January 1, 2008, through October 31, 2008 with the primary diagnosis of UGIH. UGIH was further defined as acute variceal hemorrhage (AVH) or non-variceal hemorrhage (NVUGIH). The primary groups were based on weekend vs weekday admission. Time to endoscopy, adverse outcomes, presenting symptom, and length of stay were analyzed.

Results: One hundred seventy-four patients were included (50 weekend; 124 weekday). Most patients (94.25%) received upper endoscopy within 24 hours of admission. Mean time to endoscopy was shorter for weekend admission compared to weekday (7.52 hours vs 10.82 hours; $P=0.012$) for the entire group. No statistically significant difference was detected in AVH patients (6.37 hours vs 4.37 hours; $P=0.09$), but a difference was observed in the NVUGIH group (7.65 hours vs 11.45 hours, $P=0.015$). Adverse outcomes were not associated with weekend admission ($P=0.583$). There was no difference in mean length of stay (3.08 days vs 3.85 days; $P=0.131$) or mean units of blood transfused (2.44 units vs 2.07 units, $P=0.417$) between admission groups.

Conclusions: Patients admitted to this community teaching hospital with UGIH on the weekend did not experience delayed endoscopy, increased adverse outcomes, or longer length of stay compared to those admitted on a weekday. The previously reported “weekend effect” was not observed. In fact, patients admitted with NVUGIH on the weekend received upper endoscopy earlier than patients admitted during the week.

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INTRODUCTION

Upper gastrointestinal hemorrhage (UGIH) remains a common presenting problem to hospitals around the world, with an estimated annual incidence of 45 to 172 per 100,000 people.¹⁻⁴ The vast majority of these patients ultimately are hospitalized.⁵ Timing of upper endoscopy in patients presenting with symptoms of UGIH has been well studied. It is now common practice to perform early endoscopy (within the first 24 hours). Early endoscopy has been proven to shorten length of stay (LOS), increase efficiency of care, lower rates of surgery and reduce the need for blood transfusions.⁶⁻¹⁰

Substantial evidence in the literature associates weekend admission with increased mortality and other adverse outcomes for a variety of medical conditions.¹¹⁻¹³ This so-called “weekend effect” recently has been shown to hold true for patients presenting with UGIH.¹²⁻¹⁴ Time to endoscopy also has been shown to be prolonged in patients admitted on the weekend with UGIH.^{12,13} As previous

studies have shown, delayed endoscopy may result in increased adverse outcomes.⁶⁻¹⁰

This study was designed to determine if patients admitted to this community-based teaching institution on the weekend experienced the “weekend effect.”

METHODS

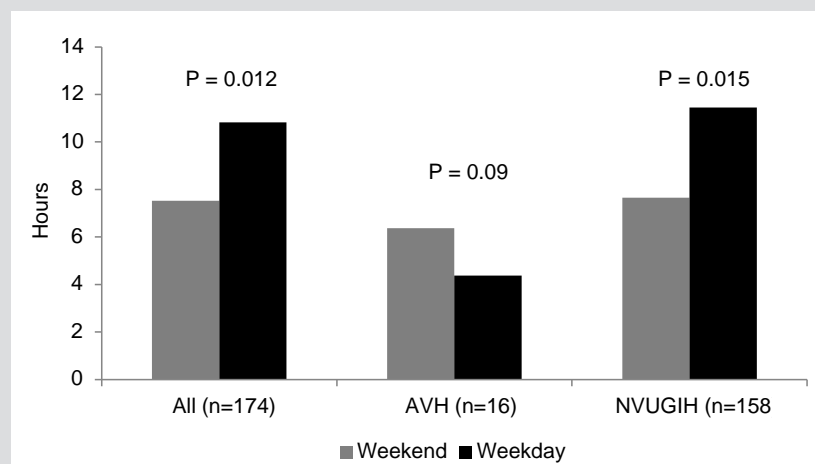
This study was a retrospective review of patients admitted to a community teaching hospital from January 1, 2008 through

Table 1. Study Cohort Demographics

	Weekend % (n = 50)	Weekday % (n = 124)	P value
Age (mean years± SD)	69.8 ± 15.5	70.4 ± 14.3	0.805
Men	60.0 (30)	61.29 (76)	0.875
AVH	10.0 (5)	8.87 (11)	0.779
Presenting vital signs/labs			
SBP (mean± SD)	121.7 ± 27.5	122.83 ± 25.3	0.788
Hgb (mean± SD)	9.5 ± 2.3	9.6 ± 2.5	0.809
HR (mean± SD)	85.1 ± 20.7	85.4 ± 16.8	0.933
Presenting symptom			0.464
ABLA	4.0 (2)	4.84 (6)	
Hematemesis	26.0 (13)	16.13 (20)	
Melena	58.0 (29)	68.55 (85)	
MH	12 (6)	10.48 (13)	
INR reversal	30.0 (15)	29.84 (37)	0.983

Abbreviations: SD, standard deviation; AVH, acute variceal hemorrhage; SPB, systolic blood pressure mmHg; Hgb, hemoglobin g/dl; HR, heart rate beats/min; ABLA, acute blood loss anemia; MH, melena and hematemesis.

Figure 1. Comparison of Time to Endoscopy by Weekend or Weekday Admission and Type of Upper Gastrointestinal Hemorrhage



Abbreviations: AVH, acute variceal hemorrhage; NVUGIH, non-variceal upper gastrointestinal hemorrhage.

October 31, 2008 and was approved by the Institutional Review Board. The primary study sample was obtained using International Classification of Diseases 9th Version, Clinical Modification (ICD-9-CM) codes. Patients hospitalized with a primary diagnosis of acute blood loss anemia (ABLA; 285.1) secondary to UGIH, bleeding peptic ulcer (531.0, 531.4, 531.6, 535.01, 535.11, 531.41, 531.51, and 578.9) and/or symptoms of UGIH; hematemesis (578.0) or melena/blood in stool (578.1) were identified. Patients without UGIH as the primary indication for admission were excluded from the study. Since time to upper endoscopy was a study variable, patients who elected not to have upper endoscopy (n = 14) were excluded.

The primary study groups were based on day of admission (weekend vs weekday). Weekend admission was defined as from Friday at 17:00 through Sunday at midnight. For these two cohorts, the primary comparative measures were time to endoscopy and adverse outcomes, defined as inpatient death or death within 30 days of admission attributable to UGIH, need for emergent surgical intervention, need for blood transfusion, or need for repeat inpatient upper endoscopy. Time of upper endoscopy was defined as the time sedation medications were initiated.

Other factors compared between the study groups included LOS, presenting symptom, age, sex, time of admission, admitting vital signs, and hemoglobin concentration, as well as the need for INR reversal prior to upper endoscopy. Presenting symptom was defined as ABLA, hematemesis (H), and/or melena (M).

In addition, the study sample was divided into 2 categories based on etiology of UGIH, that is, acute variceal hemorrhage (AVH) and non-variceal upper gastrointestinal hemorrhage (NVUGIH) and the proportion of these were compared between the primary study groups. Subgroup analysis on the AVH and NVUGIH was done as well.

This institution is a community-based referral center that serves a 19-county area. On average, 13,400 patients are admitted annually. It is a teaching hospital, which is defined as having an AMA-approved residency program. This institution has internal medicine, transitional and general surgical residencies, but no gastroenterology fellowship. The gastroenterology department is a pure consultative service with 7 full-time practicing gastroenterologists and a fully trained support staff. All 7 endoscopists practice solely at this institution. Endoscopy is available around the clock, with 1 endoscopist covering the weekend. This institution follows the consensus recommendations for managing patients with NVUGIH as published in the *Annals of Internal Medicine* in 2003¹⁵, including early risk stratification for bleeding and rebleeding; however, proto-

cols such as the Blatchford¹⁶ or Rockall¹⁷ risk scoring systems are not routinely used. Early risk stratification is determined clinically.

Statistical Analysis

Simple descriptive statistics, such as means, standard deviations, percentages, and frequencies were calculated. Categorical variables were compared with χ^2 -tests; if 25% or more of cells had expected values less than 5, the Fisher exact test was used. For comparing continuous variables between study groups, two-tailed *t* tests (choice dependent upon equality of variances) were used. *P* values <0.05 were considered statistically significant. All analysis was performed using SAS software.¹⁸

RESULTS

One hundred seventy-four patients met the inclusion criteria for UGIH and underwent upper endoscopy during their admission. The mean age of the study population was 70 ± 14.6 years, with men outnumbering women 106 to 68. A large proportion (*n*=158; 91%) of the sample was found to have NVUGIH as the etiology of their UGIH. During the week 124 (71%) patients were admitted and 50 (29%) were admitted over the weekend. Presenting symptom, hemoglobin, vital signs, sex, age, need for INR reversal, and proportion of AVH were not significantly different between the weekend and weekday groups (all *P*>0.05) (Table 1).

The exact time of upper endoscopy was determined using individual procedure records. Of the study sample 164 (94.25%) received upper endoscopy within 24 hours of admission. When the time was extended to 30 hours, 173 (>99%) of the sample received upper endoscopy. Of the 10 patients who did not receive upper endoscopy within the first 24 hours, 4 (40%) required INR reversal prior to procedure (data not shown). Compared with patients admitted on a weekday, patients admitted on the weekend received upper endoscopy earlier (7.52 ± 7.02 hours vs 10.82 ± 9.26 hours; *P*=0.012). There was no significant difference in time to endoscopy for patients admitted with AVH on the weekend vs the weekday (6.37 ± 4.01 hours vs 4.37 ± 6.23 hours; *P*=0.09), although the sample size was small. A difference was detected in the NVUGIH group (7.65 ± 7.30 hours vs 11.45 ± 9.28 hours; *P*=0.015) (Figure 1). Regardless of weekend or weekday admission, patients with AVH underwent upper endoscopy earlier than patients with NVUGIH (4.99 hours vs 10.36 hours; *P*=0.002).

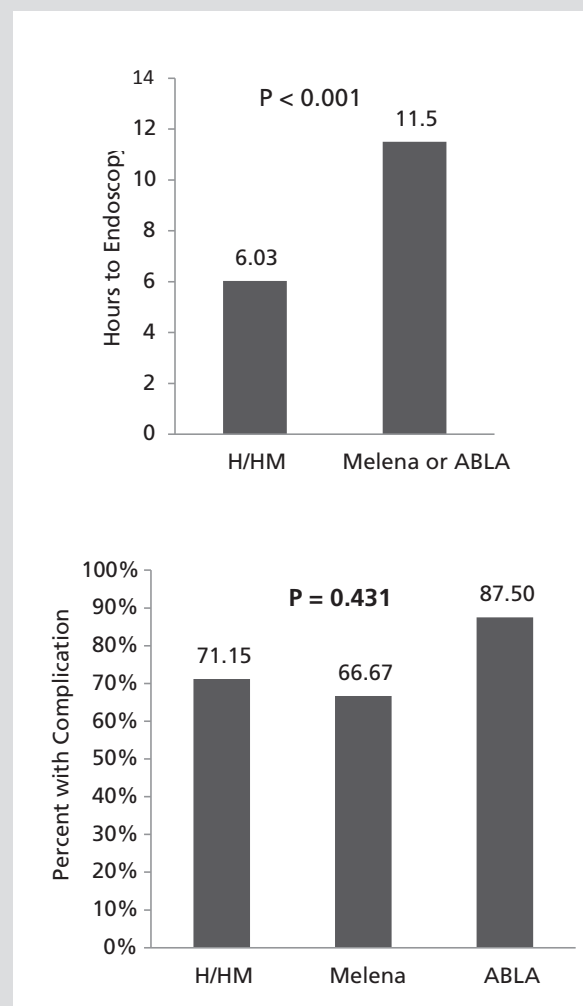
The overall rate of adverse outcomes was not associated with weekend admission (weekend: 36 of 50 [72%]; weekday: 84 of 124 [68%]; *P*=0.583). The mortality rate in this sample was low (4 of 174, 2.3%), with 1 inpatient death and 3 deaths within 30 days of admission. All 4 patients who died

Table 2. Comparison of Adverse Outcomes, Weekend vs Weekday Admission

	Weekend % (n = 50)	Weekday % (n = 124)	<i>P</i> value
Adverse outcomes	72.0 (36)	67.7 (84)	0.583
Surgery	4.0 (2)	1.6 (2)	0.325
Repeat upper endoscopy	20.0 (10)	11.3 (14)	0.132
PRBC (mean ± SD)	2.4 ± 2.8	2.1 ± 2.3	0.417
Death	0 (0)	3.2 (4)	0.580
LOS (mean ± SD)	3.1 ± 2.2	3.9 ± 4.5	0.131

Abbreviations: SD, standard deviation; PRBC, packed red blood cells in units; LOS, length of stay in days.

Figure 2. Time to Endoscopy and Complications by Presenting Symptom



Abbreviations: H/HM, hematemesis alone or both hematemesis and melena; ABLA, acute blood loss anemia.

were admitted on a weekday. Need for surgical intervention also was limited to 4 patients. No statistically significant difference in the rate of surgical interventions was noted for weekend vs weekday admissions (4.0% vs 1.61%; *P*=0.325). There was no difference in mean LOS for weekend vs weekday

admissions (3.08 days vs 3.85 days, $P=0.131$) or in the mean units of blood transfused per patient (2.44 units vs 2.07 units; $P=0.417$). There was also no statistical difference in the need for repeat upper endoscopy if admitted on the weekend vs the weekday (20% vs 11.3%; $P=0.132$) (Table 2).

Presenting symptom was not associated with adverse outcomes (H or HM=7 of 52 [71%]; M=76 of 114 [67%]; ABLA=7 of 8 [87%]; $P=0.431$); however, patients presenting with hematemesis averaged upper endoscopy earlier than patients presenting with melena or ABLA (6.03 hours vs 11.5 hours; $P<0.001$) (Figure 2).

DISCUSSION

This study showed that patients admitted to this community teaching hospital with UGIH on the weekend received upper endoscopy earlier than patients admitted on a weekday. This study also showed that adverse outcomes and LOS were not associated with weekend admission. These results conflict with those of 2 larger US cohort studies published in 2009.^{12,13} The previously reported “weekend effect” in those studies is not observed at this institution. In fact, this institution excelled on the weekend. There are several possible reasons for these findings. First, endoscopy is available 24 hours a day, 7 days a week. Second, the standard of practice employed by the gastroenterology department is the same regardless of the day of the week. Third, a competent support staff is available at all times. Fourth and probably most important is the ability of the emergency room physician, internist, and gastroenterologist to appropriately risk stratify patients early in their course, validating the consensus recommendations for managing patients presenting with NVUGIH. A number of European studies also have shown a lack of the “weekend effect” for patients with UGIH, including a recently published nationwide study from the United Kingdom.^{19,20} This study from a US community teaching hospital suggests that consistent outcomes can be achieved by following published guidelines, independent of admission day.

It has been shown that outcomes, including mortality and LOS, are influenced by time to upper endoscopy.⁶⁻¹⁰ It is now common practice to perform upper endoscopy within the first 24 hours of admission in patients with UGIH. A large US population-based study⁷ found the prevalence of early endoscopy to be about 72% with similar Canadian²¹ and Dutch³ studies reporting a prevalence of 76% and 78% respectively. This institution far exceeded this average with >94% of patients receiving upper endoscopy within 24 hours. Of the patients not receiving upper endoscopy within 24 hours, almost half of them required INR reversal prior to the procedure. In accordance with other studies,⁷⁻¹⁰ this institution had fewer adverse outcomes with early upper endoscopy.

Few studies have evaluated presenting symptom as a variable for time to upper endoscopy or adverse outcomes. A previous study²² determined that the presence of hematemesis was a significant predictor of death. Our study showed that presenting symptom did not correlate with increased risk of adverse outcome; however, patients presenting with hematemesis received upper endoscopy earlier than patients presenting with melena or ABLA. At this institution, presenting symptoms are used for risk stratification. Hematemesis is considered to represent a more serious underlying pathology, such as a variceal bleeding, resulting in endoscopy being performed earlier. It is possible that this practice explains why presenting symptom is not associated with increased adverse outcomes.

Hospitals that are teaching institutions do not appear to have increased adverse outcomes on the weekend;¹³ however, a higher mortality rate overall was reported in patients admitted to urban teaching hospitals (odds ratio, 1.16; 95% confidence interval, 1.06-1.26).¹² This institution is considered a medium-sized urban teaching hospital, which may have contributed to the lack of a weekend effect.

This study was limited by being a single-institution study, which could lead to a sampling bias. The population studied here may not reflect the general US population. The relatively low mortality rate may reflect the effect of early endoscopy, but it could also represent a lower acuity bleeding population. In addition, with 2 primary measures, the concern of multiple comparisons is a potential limitation; however, using a Bonferroni correction with family size of 2, the adjusted significance level of 0.025 does not change the interpretation of the conclusions on statistical significance. We also had a small sample size, which was acquired with timeliness in mind rather than formal power analysis. However, given the sample size we did have, we had about an 80% power to detect a 5-point difference on time to upper endoscopy and a 25 percentage-point difference in adverse event rates between the cohorts (assuming the Bonferroni correction stated above). The relatively low power for the proportional comparisons means there is a relatively high chance of concluding there is no difference between the cohorts when there really is one in the generalized target population. Finally, the retrospective design of this study allows for the potential of selection bias, but it does eliminate the potential for a Hawthorne effect, as well as accurately describing a genuine practice.

CONCLUSION

For patients admitted with UGIH, this community-based teaching institution performs at a highly efficient and safe manner regardless the day of the week, which does not lead to the so-called “weekend effect.” Ninety-four percent of the study population received endoscopy within 24 hours of admission,

while a large US population-based study found the average to be only 74%. Early endoscopy may contribute to fewer deaths and other adverse outcomes, including need for blood transfusions, need for surgical intervention, and need for repeat upper endoscopy.

The weekend effect may be only a small part of the equation, leading to adverse outcomes in patients presenting with UGIH, but it remains a modifiable risk factor. The practice of this institution proves that the weekend effect can be avoided in patients presenting with UGIH. Efficient and safe care should be implemented regardless of the day of admission.

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