BRIEF ARTICLE

Weekend and nighttime effect on the prognosis of peptic ulcer bleeding

Young Hoon Youn, Yong Jin Park, Jae Hak Kim, Tae Joo Jeon, Jae Hee Cho, Hyojin Park

Young Hoon Youn, Yong Jin Park, Hyojin Park, Department of Internal Medicine, Gangnam Severance Hospital, Yonsei University College of Medicine, Seoul 135-720, South Korea
Jae Hak Kim, Department of Internal Medicine, Dongguk University Ilsan Hospital, Dongguk University College of Medicine, Gyeonggi-do 410-773, South Korea
Tae Joo Jeon, Department of Internal Medicine, Inje University Sanggye Paik Hospital, Inje University College of Medicine, Seoul 139-707, South Korea
Jae Hee Cho, Department of Internal Medicine, Kwandong University Myungji Hospital, Kwandong University College of Medicine, Gyeonggi-do 412-270, South Korea
Author contributions: Youn YH and Park YJ contributed equally to this work; Youn YH and Park YJ analyzed the data and wrote the paper; Kim JH, Jeon TJ and Cho JH retrieved clinical information from each center; Park H designed the research, and Youn YH finally approved the version to be published.
Correspondence to: **Young Hoon Youn, MD,** Department of Internal Medicine, Gangnam Severance Hospital, Yonsei University College of Medicine, 712 Eonjuro, Gangnam-Gu, Seoul 135-720, South Korea. dryoun@yuhs.ac
Telephone: +82-2-20193453   Fax: +82-2-34633882
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Abstract

AIM: To evaluate whether weekend or nighttime admission affects prognosis of peptic ulcer bleeding despite early endoscopy.

METHODS: Retrospective data collection from four referral centers, all of which had a formal out-of-hours emergency endoscopy service, even at weekends. A total of 388 patients with bleeding peptic ulcers who were admitted via the emergency room between January 2007 and December 2009 were enrolled. Analyzed parameters included time from patients' arrival until endoscopy, mortality, rebleeding, need for surgery and length of hospital stay.

RESULTS: The weekday and weekend admission groups comprised 326 and 62 patients, respectively. There were no significant differences in baseline characteristics between the two groups, except for younger age in the weekend group. Most patients (97%) had undergone early endoscopy, which resulted in a low mortality rate regardless of point of presentation (1.8% overall *vs* 1.6% on the weekend). The only outcome that was worse in the weekend group was a higher rate of rebleeding (12% *vs* 21%, *P* = 0.030). However, multivariate analysis revealed nighttime admission and a high Rockall score ($\geq$ 6) as significant independent risk factors for rebleeding, rather than weekend admission.

CONCLUSION: Early endoscopy for peptic ulcer bleeding can prevent the weekend effect, and nighttime admission was identified as a novel risk factor for rebleeding, namely the nighttime effect.

INTRODUCTION

Upper gastrointestinal bleeding (UGIB) is a common medical emergency and timely endoscopy plays an im-

portant role in hemostasis. UGIB is also a significant healthcare problem in the United States, with an annual hospitalization rate of approximately 150 per 100000 individuals and an overall mortality rate of 6% to 7%[1-4]. In South Korea, the incidence of UGIB has been reported to be 1 per 1000 individuals with a mortality rate of 5% to 10%, however, the mortality rate has decreased recently due to advances in endoscopy[5,6].

It has been suggested that patients with UGIB who are admitted on weekends have lower rates of early endoscopy, higher mortality, and more frequently undergo surgery[7]. Previous studies reported that outcomes are worse on weekends due to lack of availability of staff and services, which is collectively referred to as the "weekend effect"[8]. Nahon *et al*[9] suggested that early endoscopy could prevent the weekend effect and reduce mortality. However, Shaheen *et al*[10] claimed that the weekend effect did not diminish even after adjusting data for the timing of endoscopy. Studies on the prognosis of UGIB on weekends have shown different results from numerous research centers, leaving the weekend effect on UGIB controversial[7-10].

This issue might have regional and socio-organizational differences, and it is possible that the weekend effect depends on the specific situation and medical environment, such as the availability of emergency endoscopy services on the weekends. The majority of tertiary referral hospitals in South Korea have formal out-of-hours emergency endoscopy for UGIB. We sought to determine whether the weekend effect still influences the outcomes of peptic ulcer bleeding patients in hospitals that offer out-of-hours emergency endoscopy for UGIB, even on weekends. The primary aim of this study was to investigate the difference in prognosis between weekend and weekday admissions for peptic ulcer bleeding at referral hospitals in South Korea. In addition to the weekend effect, we also evaluated whether nighttime admission affected the prognosis of peptic ulcer bleeding.

MATERIALS AND METHODS

Patients
Data was retrospectively collected from an endoscopic database of four referral training hospitals in South Korea. A total of 388 consecutive patients, who were admitted for peptic ulcer bleeding *via* the emergency room (ER) between January 2007 and December 2009, were enrolled. All subjects had endoscopically confirmed peptic ulcer bleeding.

Patient data were collected from medical records, which were reviewed by endoscopists who were blinded to the aim of this study. The Institutional Review Board of Gangnam Severance Hospital approved this study.

We excluded patients with variceal bleeding, Mallory-Weiss tear, lower gastrointestinal bleeding, or bleeding from malignant ulcers. Peptic ulcers without stigma of recent bleeding (Forrest Ⅲ[11]) were also excluded due to the obscure source of bleeding.

Endoscopy procedure
All four hospitals that participated in this study were referral training centers in urban areas and have formal out-of-hours emergency endoscopy services. In these centers, at least one endoscopist is scheduled to be on duty for emergency calls for endoscopy, regardless of time and day, even on weekends or at night. Endoscopy is generally conducted as soon as possible in patients with suspected UGIB. However, we do not have a night shift; therefore, one of the day shift endoscopists has to be on duty at night when on emergency call. All on-duty endoscopists can handle the available endoscopic hemostatic procedures. All endoscopic hemostatic procedures were performed using the same protocol set by the guidelines of the Korean Society of Gastroenterology[12]. Hemostatic procedures were carried out on Forrest Ⅰa to Ⅱb peptic ulcers[11].

The levels of experience of endoscopists who performed endoscopic hemostasis in UGIB varied slightly among the four centers according to their policies. In one institution, senior instructors were responsible for both daytime and nighttime endoscopic hemostasis, while hospital staff took charge of hemostatic interventions in both daytime and nighttime in the other three institutions. Thus, for a given institution, available expertise remained generally constant day and night.

Definitions
The weekend group was defined as patients who presented to the ER from Friday midnight to Sunday midnight, and the remaining patients were categorized as the weekday group. The nighttime group was defined as patients who presented to the ER between 18:00 and 8:00 the next day. Endoscopy was classified as "early" if the procedure was performed within 24 h[13]. Active bleeding indicated spurting or oozing, which was based on classification from Ⅰa to Ⅰb according to endoscopic findings[11]. Rebleeding was defined as bleeding within 2 wk that required secondary hemostasis or was associated with hematemesis; melena with overt decrease in hemoglobin over 2 mg/dL; status requiring blood transfusion; shock (systolic blood pressure < 90 mmHg); or endoscopic findings of recent bleeding, such as spurting, oozing, or adherent clot[14,15].

Parameters and endpoints
Parameters were chosen only for characteristics representative of bleeding, and were classified into baseline characteristics and treatment outcomes; the following intergroup comparisons were made: weekday *vs* weekend and daytime *vs* nighttime. The baseline parameters were age; disease type; endoscopic findings, including Forrest class; Rockall score[16,17]; and Charlson score. The Charlson score is a system for the classification of severity that uses recorded data on a patient's diagnosis to assign a weight to morbidity, thereby predicting a patient's risk of death. To calculate the Charlson score, we included age factor in the comorbidity score, which is called the Charl-

son age comorbidity index (CACI)[18]. As treatment outcome parameters, the primary endpoints were mortality rate, rebleeding, length of stay, and the need for surgery or embolization.

Statistical analysis

Data was analyzed using the Statistical Package for the Social Sciences (SPSS, 18.0 Inc, Chicago, United States) software with the assistance of the Yonsei University Statistical Consulting Center. Sensitivity and specificity were calculated with 95% confidence intervals and P values less than 0.05 were regarded as significant. According to the 95% confidence interval, we present data as the mean ± SE. The comparison of categorical variables between the two groups was carried out using the χ^2 test. A logistic regression model was used to analyze the effect of categorical variables and adjust for potential confounders. The comparison of continuous variables between the two groups was carried out by t-test. A linear regression model was used to analyze the effect of continuous variables and adjust for potential confounders.

RESULTS

Baseline patient characteristics

The weekday group included 326 patients and the weekend group comprised 62 patients. There were no significant intergroup differences in demographics, except for age (Table 1). The mean age of the weekend group was younger than the weekday group by 5 years (60.7 ± 0.85 years in the weekday group *vs* 55.7 ± 2.10 years in the weekend group, $P = 0.023$). The ages in both groups had normal distributions; the weekday showed skewness and kurtosis values of -0191 and -0.627, respectively, and the skewness and kurtosis values of the weekend group were -0.83 and -0.760, respectively. All outcome analysis was age-adjusted because age is an important confounding factor for treatment outcomes, including mortality. In order to adjust for age, linear regression was used for continuous variables and logistic regression was used for categorical variables. However, there were no significant differences between the two groups in the patterns and sites of bleeding, Rockall scores, Charlson scores, or comorbidities (Table 1).

Endoscopic procedure

Endoscopic therapy was performed in patients with Forrest I a to II b ulcers, and the following hemostatic tools were frequently used: argon plasma coagulation, hemoclipping, and epinephrine injection as a combination therapy (43%) or monotherapy (57%). However, there was no significant discrepancy between the weekday and weekend groups in hemostatic tool usage, and rebleeding rate did not differ with regard to the applied hemostatic method (from 11% to 19%).

The endoscopists who performed the endoscopic hemostasis could be divided into two groups (instructors and hospital staff) according to the level of experience.

Table 1 Baseline characteristics and treatment outcomes of the weekday and weekend groups n (%)

Factors	Weekday	Weekend	P value
Number of patients	326 (84.0)	62 (16.0)	
Age (yr)	60.7 ± 0.8	55.7 ± 2.1	0.023
Male	250 (76.7)	47 (75.8)	NS
Gastric ulcer	221 (68.1)	43 (69.4)	NS
Duodenal ulcer	104 (31.9)	19 (30.6)	NS
Active bleeding (Forrest I a, I b)	119 (36.5)	18 (29.0)	NS
Rockall score	5.0 ± 0.0	4.7 ± 0.2	NS
Charlson score	3.4 ± 0.1	3.1 ± 0.3	NS
Comorbidity	123 (37.7)	26 (41.9)	NS
Endoscopic hemostasis	309 (94.8)	57 (91.9)	NS
Time to endoscopy (min)	338.9 ± 24.9	306.8 ± 45.6	NS
Rebleeding	39 (12)	13 (21)	0.030
Angiographic embolization	4 (1.2)	1 (1.6)	NS
Surgery	3 (0.9)	1 (1.6)	NS
Length of stay (d)	8.5 ± 0.3	6.2 ± 0.5	0.009
Mortality	6 (1.8)	1 (1.6)	NS

NS: Not significant.

Among a total 388 subjects, 67% (260 patients) of endoscopic hemostases were performed by hospital staff and the other 33% (128 patients) were performed by instructors. However, there was no significant difference in the level of experience between the weekday and weekend group, and between the daytime and nighttime group (proportion of procedures by hospital staff was 68% in the weekday group *vs* 59% in the weekend group, $P = 0.14$; 69% in the daytime group *vs* 58% in the nighttime group, $P = 0.11$). Also the rate of rebleeding was not different between the two groups (instructors and hospital staff).

Most patients (97%) underwent early endoscopy regardless of weekend or nighttime admission. Overall, the mean time interval between presentation to the ER and endoscopy was 333.8 ± 22.2 min. The time to endoscopy was slightly shorter in the weekend group, although the difference was not significant (338.9 ± 24.9 min in the weekday group *vs* 306.8 ± 45.6 min in the weekend group, $P = 0.56$) (Table 1). However, when time to endoscopy was compared between the daytime group and the nighttime group, it was significantly shorter in the nighttime group (352.9 ± 26.3 min in the daytime group *vs* 255.0 ± 30.0 min in the nighttime group, $P = 0.016$) (Table 2).

Treatment outcomes

Mortality: The overall mortality rate was only 1.8% (7/388). The subgroup that had high Rockall scores ($\geq$ 6) included 146 patients, and their mortality rate was 4.1% (6/146). There was no significant difference in mortality between the weekday and weekend groups (1.8% in the weekday group *vs* 1.6% in the weekend group, $P = 0.902$) (Table 1). In addition, the mortality rate did not differ between the daytime and nighttime groups (1.9% in the daytime group *vs* 1.3% in the nighttime group, $P = 0.757$) (Table 2). All deaths occurred in patients with comorbidities, who had significantly higher CACI (7.0 ± 0.7) and Rockall scores (7.6 ± 0.6) than surviving patients ($P <$

Table 2 Baseline characteristics and treatment outcomes of the daytime and nighttime groups *n* (%)

Factors	Daytime	Nighttime	*P* value
Number of patients	312 (80)	76 (20)	
Age (yr)	60.3 ± 0.9	57.9 ± 1.7	NS
Male	238 (76.2)	59 (77.6)	NS
Gastric ulcer	209 (66.9)	57 (75.0)	NS
Duodenal ulcer	103 (33.0)	19 (25.0)	NS
Active bleeding (Forrest I a, I b)	111 (35.5)	26 (34.2)	NS
Rockall score	4.9 ± 0.1	4.9 ± 0.2	NS
Charlson score	3.5 ± 0.1	3.1 ± 0.3	NS
Comorbidity	119 (38.1)	30 (39.5)	NS
Time to endoscopy (min)	352.9 ± 26.3	255.0 ± 30.0	0.016
Rebleeding	36 (11.5)	16 (21.1)	0.018
Angiographic embolization	3 (0.9)	2 (2.6)	NS
Surgery	4 (1.2)	0 (0.0)	NS
Length of stay (d)	8.3 ± 0.3	7.3 ± 0.5	NS
Mortality	6 (1.9)	1 (1.3)	NS

NS: Not significant.

Table 3 Significant risk factors for mortality

Risk factor	Alive (*n* = 381)	Dead (*n* = 7)	*P* value
Comorbidity rate (%)	37.3	100.0	0.001
Age (yr)	59.7 ± 0.8	72.1 ± 5.3	0.037
Charlson score	3.3 ± 0.1	7.0 ± 0.7	< 0.001
Rockall score	4.9 ± 0.1	7.6 ± 0.6	< 0.001

0.001). The significant risk factors for mortality were age, comorbidity, Rockall score, and Charlson score (Table 3).

Rebleeding: The level of experience did not affect the rate of rebleeding (16% in procedures by instructors *vs* 14% by hospital staff, *P* = 0.39) in our study. Age-adjusted analysis revealed a significantly higher rebleeding rate in the weekend group (12% in the weekday group *vs* 21% in the weekend group, *P* = 0.030) (Table 1). In addition, despite earlier endoscopy, the rate of rebleeding was also higher in the nighttime group, which we called the nighttime effect, than in the daytime group (11.5% in the daytime group *vs* 21.1% in the nighttime group, *P* = 0.018) (Table 2). When the rebleeding rate was compared between the four subgroups that were divided by weekday/weekend and daytime/nighttime, the highest rebleeding rate, which reached up to one third of the patients, was noted in the weekend-nighttime group (11.4% in the weekday daytime, 15.1% in the weekday nighttime, 12.8% in the weekend daytime, and 34.8% in the weekend nighttime, *P* = 0.040) (Table 4).

Multivariate logistic regression was used to analyze potential factors that affected the in-hospital rebleeding rate. The significant independent risk factors for rebleeding were a high Rockall score ($\geq$ 6) and nighttime rather than weekend admission (Table 5). Therefore, statistically, the risk factor associated with rebleeding was not weekend but nighttime admission.

Length of stay: Age-adjusted analysis revealed a shorter

length of stay in the weekend group (8.5 d in weekday *vs* 6.2 d in weekend, *P* = 0.009). However, linear regression analysis revealed that the length of stay was not associated with age or weekend admission, but was strongly associated with the type of comorbidity, which correlated well with the CACI. The length of stay increased in proportion to the increase in the CACI.

DISCUSSION

In this multicenter study, our treatment outcomes were generally favorable. The overall mortality rate due to peptic ulcer bleeding was only 1.8%, which is lower than previous studies that had reported mortality of 6% to 7%[1-3]. In addition, the need for surgery and angiographic embolization was also low, at 1% and 1.2%, respectively. These outcomes, including mortality, might have been significantly affected by the severity of disease and comorbidities. However, mortality in the subgroup whose Rockall score was above 6 was also only 4.1% in our study (6/146), and mortality was only 0.3% in patients with Rockall scores under 6 (1/388); thus, our low mortality was not due to a milder presentation of bleeding. Such favorable outcomes should result from timely endoscopic hemostasis and appropriate intensive care. We provided early endoscopy within 24 h in most patients (97%), even for weekend and nighttime admissions. The mean time to endoscopy was only 333.8 ± 22.2 min overall. Therefore, we suggest that early intervention could reduce the mortality of peptic ulcer bleeding to 1.8%.

Regarding the so-called weekend effect, our study demonstrated no weekend effect on mortality, need for surgery, angiographic embolization, or length of stay. In fact, the patients in the weekend group showed favorable outcomes comparable to those of the weekday group. We expected to nullify the weekend effect since all four participating hospitals were teaching referral hospitals with well-organized duty systems and formal out-of-hours emergency endoscopy services, which allowed early endoscopy at any time of any day. Contrary to our expectations, the time interval between presentation to the ER and endoscopy was shorter for weekend and nighttime admissions. The reasons for shorter time to endoscopy at night and on weekends might be longer waiting time during weekdays due to previously appointed outpatients, and fewer traffic jams at night and on weekends in urban settings.

However, a higher rebleeding rate was noted in the weekend group, and it is possible that the weekend effect might exist in spite of early endoscopy. In multivariate logistic regression analysis, weekend presentation was not a significant risk factor for rebleeding, but nighttime presentation and a high Rockall score were independent risk factors for rebleeding. Therefore, statistically, the risk factor associated with rebleeding was not weekend but nighttime admission. The rebleeding rate in the weekday-nighttime group was also higher than weekday-daytime group, although the difference was not statistically sig-

Table 4 Subgroup analysis according to daytime and nighttime groups *n* (%)

	Weekday			Weekend		
	Day (*n* = 273)	Night (*n* = 53)	*P* value	Day (*n* = 39)	Night (*n* = 23)	*P* value
Age (yr)	61.0 ± 0.9	58.9 ± 1.9	NS	54.8 ± 2.6	57.1 ± 3.5	NS
Active bleeding (Forrest I a, I b)	99 (36.3)	20 (37.7)	NS	12 (31.0)	6 (26.0)	NS
Rockall score	5.0 ± 0.1	4.9 ± 0.2	NS	4.6 ± 0.3	4.8 ± 0.4	NS
Charlson score	3.5 ± 0.1	2.9 ± 0.3	NS	2.9 ± 0.4	3.6 ± 0.7	NS
Comorbidity	102 (37.4)	21 (39.6)	NS	17 (43.6)	9 (39.1)	NS
Endoscopic hemostasis	259 (94.9)	50 (94.3)	NS	36 (92.3)	21 (91.3)	NS
Time to endoscopy (min)	355.7 ± 28.9	252.3 ± 33.0	0.020	333.7 ± 63.4	261.4 ± 60.4	NS
Rebleeding	31 (11.4)	8 (15.1)	NS	5 (12.8)	8 (34.8)	0.040
Angiographic embolization	3 (1.1)	1 (1.9)	NS	0 (0)	1 (4.3)	NS
Surgery	3 (1.1)	0 (0)	NS	1 (2.6)	0 (0)	NS
Length of stay (d)	8.6 ± 0.4	7.7 ± 0.6	NS	6.1 ± 0.7	6.5 ± 0.9	NS
Mortality	6 (2.2)	0 (0)	NS	0 (0)	1 (4.3)	NS

NS: Not significant.

Table 5 Multivariate analysis for risk factors of rebleeding

Risk factor	Rebleeding rate (%)	*P* value	Odd ratio	95% confidence interval
Rockall score (⩾ 6)[1]	18	0.016	2.083	1.144-3.791
Nighttime	21	0.044	2.012	1.020-3.968
Weekend	21	0.120	1.782	0.861-3.689

[1]According to the receiver operating characteristic curve, a Rockall score of 6 points was used as the cutoff value.

nificant (weekday-daytime 11.4% *vs* weekday-nighttime 15.1%, *P* = 0.487). The weekend-daytime group showed a similar rebleeding rate to that of the weekday-daytime group, but the weekend-nighttime group had a significantly higher rebleeding rate (rebleeding rate 34.8% in the weekend nighttime group *vs* 12.8% in the weekend daytime group, *P* = 0.040). However, we cannot completely rule out a weekend effect because the rebleeding rate of the weekend-nighttime group was higher than that of the weekday-nighttime group. Thus, it is reasonable to infer that these findings represent a nighttime effect or a weekend-nighttime effect rather than a weekend effect. Therefore, we concluded that the nighttime effect represented a new risk factor for rebleeding and was more powerful on the weekend through a combination with the weekend effect. Rebleeding after endoscopic hemostasis could also be affected by various endoscopic and clinical factors, such as an active bleeding pattern, gastric location of the peptic ulcer, larger ulcer size[19-21], comorbidities[21-23] and even by the level of experience of endoscpists[24], but our finding of increased rebleeding in the nighttime group, especially the weekend nighttime group, was not associated with these factors. However, we were unable to identify specific factors that accounted for this nighttime effect; potential reasons include fatigue and decreased concentration of endoscopists at night and reduced staffing patterns of physicians, nurses, and other support staff at night. It is necessary to be more alert and particularly careful regarding hemostasis in patients with UGIB who present at night on the weekend.

Rockall scores and Charlson scores were predictors of mortality, rebleeding, and length of stay[16-18]. The Rockall score was designed to predict mortality and can also be used to predict rebleeding[16,17,25,26]. To allow for clinical application of the Rockall score and to verify our data (because we observed such a low mortality rate), we used a receiver operating characteristic (ROC) curve to determine the cut-off value predictive of mortality and rebleeding. According to the ROC curve, a Rockall score of 6 points could be chosen as the cut-off value. Rockall scores greater than six were significantly associated with rebleeding [odds ratio (OR) = 2.08] and an increased mortality (OR = 1.77) of 4.1% (6/146). Bessa *et al*[27] also reported that the Rockall score indicated a risk of mortality up to 15% if the score was above six. Our data support a Rockall score of 6 points as a critical point.

Contrary to our expectation, length of stay was shorter in the weekend group than in the weekday group. The length of stay increased in proportion to the CACI, and linear regression analysis showed that length of stay was strongly associated with the type of comorbidity rather than weekend presentation, emphasizing the type and severity of illness.

One weak point in our data was that the mean age of the weekend group was 5 years younger than the weekday group. Through a review of the medical records, we observed that there were some weekend patients who postponed visiting the hospital due to a busy work schedule or other circumstances despite having experienced melena for several days. Younger patients are more likely to be employed, thus they are potentially more inclined to present on the weekend rather than on a weekday due to their work. Socio-environmental factors, such as employment, social status, and personal characteristics, might have an influence on visiting the hospital and could be a possible explanation for the younger age of the weekend group compared to the weekday group. However, such factors were not available in the majority of medical records due to the retrospective nature of our study, and we were unable to identify a satisfactory reason in our results. Despite this weakness, we are confident that the

age discrepancy was not a problem because all analyses of outcomes were age-adjusted.

Additional limitations of our study were that the number of deaths was too small to allow for satisfactory analysis and that our study was retrospective; however, all of the endoscopic procedures were based on the same protocol, which should overcome this weakness. In addition, our study was not a nationwide study, but we think that the results of this multicenter study are sufficient to conclude that early endoscopic intervention can lead to favorable outcomes in peptic ulcer bleeding even on weekends and at night.

In conclusion, early endoscopy for peptic ulcer bleeding could reduce mortality to 1.8% and could prevent the weekend effect on the majority of outcomes in patients with peptic ulcer bleeding. However, we identified nighttime presentation as a new risk factor for rebleeding, despite early endoscopy. The Rockall score was also a useful predictor of rebleeding, and we should take this into consideration in the prognosis of peptic ulcer bleeding. Therefore, we need to be more careful and alert at night when dealing with peptic ulcer bleeding, especially in patients who present at nighttime and those with high Rockall scores ($\geqslant$ 6).

COMMENTS

Background
Upper gastrointestinal bleeding (UGIB) is a common medical emergency and timely endoscopy plays an important role in hemostasis. The "weekend effect" which means a worse outcome in UGIB patients following weekend admission, has been suggested by previous reports, but remains controversial.

Research frontiers
Some authors have suggested a weekend effect on UGIB resulting in higher mortality and more frequent surgery. One report suggests that early endoscopy can prevent the weekend effect and reduce mortality, however, contrary results have also been reported. The issue of the weekend effect on UGIB should be whether early endoscopic hemostasis even at weekends can prevent worse outcomes.

Innovations and breakthroughs
The study analyzed various endoscopic and clinical data from 4 centers which can affect the outcome of UGIB. From their results, they can suggest that early endoscopy for peptic ulcer bleeding, even at weekends, can almost prevent the weekend effect. The most important risk factor for rebleeding was a high Rockall score, however, nighttime admission was also identified as a novel risk factor for rebleeding, namely the nighttime effect.

Applications
Although early endoscopy for peptic ulcer bleeding can prevent the weekend effect in patients with peptic ulcer bleeding, nighttime presentation and high Rockall score were significant risk factors for rebleeding. The authors need to be more careful and alert when dealing with peptic ulcer bleeding, especially in patients who present at nighttime and those with high Rockall score.

Terminology
Weekend effect: The weekend effect has previously been reported as worse outcomes in UGIB patients following weekend admission, such as higher mortality and more frequent surgery; Nighttime effect: The nighttime effect is a novel term used in the current study, which means worse outcome due to a higher rebleeding rate in patients with peptic ulcer bleeding following nighttime admission.

Peer review
This is a well-written manuscript of a retrospective multi-center study investigating the weekend and the nighttime effect on the outcomes of patients with upper GIB requiring endoscopic hemostasis. The results were clearly presented and the contents are easily comprehensible.

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