

# Hospital Care for Low-Risk Patients With Acute, Nonvariceal Upper GI Hemorrhage: A Comparison of Neighboring Community and Tertiary Care Centers

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**OBJECTIVES:** The proportion of patients admitted to the hospital with acute upper GI hemorrhage (UGIH) who are at low risk for adverse outcomes may be substantial. The process of care for this low risk population likely varies across practice settings but has not been extensively studied. Use of the Rockall Risk score, a simple validated scoring index that predicts outcomes in UGIH, may help to identify these low risk patients.

**METHODS:** We evaluated and compared the incidence of low risk UGIH admissions, adverse outcomes, and level of healthcare resource use in a community hospital (SMH) and a neighboring tertiary care university hospital (CHS). Cases of UGIH were identified from administrative databases during 1997 and 1998. Medical record data were abstracted in a standardized manner. Cases were defined as low risk on the basis of Rockall risk scores of  $\leq 2$ .

**RESULTS:** The low risk study groups consisted of 49 of 187 (26%) SMH cases and 53/175 (30%) CHS cases ( $p = 0.40$ ). Rebleeding was uncommon (6% at SMH; 4% at CHS) ( $p = 0.64$ ). No deaths occurred; 71% at SMH *versus* 49% at CHS were admitted to a monitored bed ( $p = 0.04$ ); and 92% at SMH *versus* 57% at CHS were prescribed *i.v.* H<sub>2</sub> blockers for the acute bleeding event ( $p < 0.001$ ). Low risk patients had a mean hospital length of stay of 3.3 + 2.4 days at SMH *versus* 2.6 + 2.1 days at CHS ( $p = 0.15$ ).

**CONCLUSIONS:** In this study, the proportion of acute, low risk, nonvariceal, upper GI hemorrhage admissions to neighboring community and tertiary care medical centers

was high, whereas adverse clinical outcomes in this group of patients was low. Use of healthcare resources seemed to be greater in the community hospital. This observed variation in the process of care for populations with similar disease severity and outcomes suggests an opportunity for evidence-based interventions aimed at improving the efficiency of care. (Am J Gastroenterol 2002;97:2271–2278. © 2002 by Am. Coll. of Gastroenterology)

## INTRODUCTION

Acute upper GI hemorrhage (UGIH) is a prevalent, clinically significant, and expensive healthcare problem in the United States. The annual incidence of acute UGIH has been estimated to be 100–150 cases per 100,000 adults, translating into more than 350,000 hospital admissions per year (1, 2). Although data on costs and associated healthcare resource use are limited for UGIH, direct medical costs for in-hospital care are estimated to be several thousand dollars per admission, or more than 2.5 billion dollars annually (3–7). Because the incidence of UGIH increases with age, this medical problem is expected to increase as the U.S. population ages over the next several decades.

Evidence suggests that patients admitted with acute UGIH can be accurately stratified according to their risk of subsequent adverse outcome (rebleeding or death) using clinical and endoscopic criteria (8–29). The proportion of all patients presenting to hospital with acute, nonvariceal UGIH who are considered to be at low risk for adverse outcomes (*i.e.*, less than 5% rebleeding and less than 1% mortality) ranges from 20% to 70% in published reports (8–18). Evidence further indicates that these low risk patients are usually admitted to hospital for inpatient care,

**Table 1.** Rockall Risk Score

Variable	Points			
	0	1	2	3
Age (yr)	<60	60–79	>80	
Shock		Pulse rate > 100 (beats/min)	Systolic blood pressure < 100 (mm Hg)	
Comorbidity			Any other major comorbidity	Renal failure, liver failure, or disseminated malignancy
Diagnosis	Mallory-Weiss lesions or no lesion observed and no stigmata of recent hemorrhage	All other diagnoses: peptic ulcer, varices, erosive disease, esophagitis	Malignancy of upper GI tract	
Stigmata of recent hemorrhage	No stigmata or dark spot in ulcer base		Blood in upper GI tract, adherent clot, visible or spurting vessel	

Patients are assigned point values for each of five clinical (age, shock, comorbidity) and endoscopic (diagnosis, stigmata of recent hemorrhage) variables. The Rockall score is equal to the sum of the points assigned. Scores can range from 0 to 11 points. Patients with Rockall scores of  $\leq 2$  are at low risk for adverse outcomes.

often to an ICU or monitored care setting, and can have prolonged hospital stays at high cost without documented benefit in outcomes (8, 10, 13, 20, 28). Thus, this low risk patient group presents an opportunity to improve the quality and efficiency of current healthcare delivery.

The Rockall risk score is a simple, validated predictive index that may serve as a useful clinical decision tool for assessing the risk of subsequent adverse outcomes in patients with acute UGIH (12–15). It was initially developed to adjust mortality data for disease severity when comparing the quality of care provided to patients with UGIH among hospitals in the United Kingdom (12, 13). The Rockall score is calculated from routine clinical and endoscopic variables (see Table 1) and ranges from 0 to 11 points. Patients with a Rockall score of  $\leq 2$  are considered to be at low risk for developing adverse outcomes and may be appropriate for early hospital discharge or for discharge directly from the emergency department with subsequent outpatient management (14, 15).

We have previously reported on the process and outcomes of care for such low risk patients at a tertiary care university hospital (30). However, there are few data assessing the process and outcomes of care for low risk, acute, nonvariceal UGIH patients admitted to community hospitals in the United States (10, 15, 31, 32). Moreover, no previous study has evaluated and compared the process and outcomes of care specifically for low risk UGIH patients between different practice settings.

We therefore hypothesized that in a community-based hospital setting, a significantly greater proportion of patients admitted with UGIH would be considered at low risk for adverse outcomes, and that healthcare resource use for this group would be equal to or less intensive than that in a similar cohort of low risk patients admitted to a neighboring tertiary care university hospital. Therefore, the aims of this study were to evaluate and compare the following: 1) inci-

dence of Rockall low risk admissions to a community hospital and neighboring tertiary care university hospital during calendar years 1997 and 1998; 2) incidence of adverse outcomes in these low risk cohorts, and 3) level of healthcare resource use as a measure of the process of care.

## MATERIALS AND METHODS

Santa Monica—University of California Los Angeles (UCLA) Medical Center (SMH) is a nonprofit, community hospital located in Santa Monica, CA. SMH has 164 (66%) general ward beds and 85 (34%) intensive care or monitored beds, for a total of 249 licensed adult beds. SMH has a fully accredited residency training program in Family Medicine. Patients with UGIH are admitted either to a primary care physician (*e.g.*, an internist or family practitioner) with a gastroenterologist serving as a consultant, or directly to one of several private practice gastroenterologists who then serves a dual role as the primary and specialty physician for the admission.

UCLA—Center for the Health Sciences (CHS) is a tertiary care university hospital, located approximately 4 miles east of SMH. Of the 482 adult beds at CHS, 164 (34%) are intensive care or monitored beds; the remaining two thirds (318) are nonmonitored beds. CHS has accredited training programs in Internal Medicine, Family Medicine, Emergency Medicine, and Gastroenterology. Attending gastroenterologists from the CURE: Digestive Diseases Research Center Hemostasis Research Group are available 24 h/day at CHS for the evaluation and treatment of patients with GI hemorrhage. In usual practice at CHS, patients with acute UGIH are admitted to the care of an Internal Medicine or Family Medicine primary care team (UCLA house staff) with gastroenterologists serving as consultants. There is no dedicated inpatient gastroenterology service at CHS. Some internal medicine physicians have admitting privileges at

both facilities. However, the gastroenterologists at each facility do not follow patients at the other hospital. Moreover, the CURE Hemostasis Research Group does not evaluate and treat patients with GI hemorrhage at SMH.

At both facilities, initial decisions regarding patient need for admission, level of care at admission, and medical treatment are made jointly by the emergency department staff and the primary team. The primary team makes final decisions regarding time of discharge. Neither the facility or its providers (including the CURE Hemostasis Research Group) has ever systematically used the Rockall score (or any similar standardized score) as a clinical decision tool either to stratify individual patient risk for adverse outcomes or to determine need for inpatient *versus* outpatient management of acute UGIH.

This is a historical cohort study using existing medical record data. The UCLA Offices for the Protection of Research Subjects approved this study. Potential cases were identified via electronic search of an administrative database containing data on all consecutive adult patients (>18 yr of age) admitted to SMH and CHS during calendar years 1997 and 1998. These years were chosen as they followed the publication and dissemination of several papers demonstrating the safety of early discharge for low risk UGIH patients (10, 13, 18). The following ICD-9-CM codes for primary discharge diagnosis were used to identify potential cases: 530.10, 530.11 (esophagitis with or without mention of hemorrhage); 530.70 (Mallory-Weiss syndrome); 530.82 (esophageal hemorrhage); 531.xx (gastric ulcer); 532.xx (duodenal ulcer), 533.xx (peptic ulcer); 534.xx (gastrojejunal ulcer); 535.xx (gastritis or duodenitis); 537.83 (angiomas of stomach or duodenum); 578.00 (hematemesis); 578.10 (melena); and 578.90 (hemorrhage of the GI tract, unspecified). The accuracy of these diagnostic codes in identifying patients with UGIH has previously been established (33).

Medical record data for all potential cases were abstracted by two investigators (T.O. and D.C.) using a standardized data collection form. Data abstractors were blinded with respect to the study's purpose and Rockall score calculation. Data were collected from three distinct time periods associated with the bleeding episode: the periadmission period (within 24 h of the documented time of hospital admission), the hospital course, and the 30-day period immediately after hospital discharge (as documented in the patient's medical record).

Data collected from the periadmission period included: demographic information, time and site of initial evaluation for UGIH, clinical presentation, initial vital signs, level of consciousness, character of nasogastric tube lavage, presence of comorbid conditions (as explicitly defined by the Charlson comorbidity index) (34), use of selected medications on admission, initial laboratory test results, and level of care at admission (intensive care unit bed, monitored bed, or nonmonitored bed).

Data collected from the hospital course included: use of

*i.v.* histamine-type 2 receptor antagonists (*i.v.* H2RA), time of endoscopy, place of endoscopy, endoscopic diagnosis, endoscopic stigmata of recent hemorrhage, repeat endoscopy before hospital discharge for evaluation of bleeding, units of packed red blood cells transfused before and after initial endoscopy, surgery performed for bleeding, death, time of discharge, and disposition at discharge (home, skilled nursing facility, other hospital). Data collected for the 30-day period after hospital discharge included readmission to the hospital or death (for any reason, or specifically because of recurrent GI bleeding) as recorded in the medical record.

Rockall scores were calculated for each case based on points assigned for each of three clinical and two endoscopic variables (Table 1). The clinical variables were age at time of presentation, shock based on initial vital signs, and comorbidity based on the presence of comorbid conditions. The endoscopic variables were endoscopic diagnosis and stigmata of recent hemorrhage based on the initial endoscopic examination. The Rockall score was equal to the sum of the points assigned. Cases with Rockall scores  $\leq 2$  points were considered low risk for subsequent adverse outcomes (rebleeding and death) related to UGIH (12–15).

For the purposes of this study, we created a variable named "Rebleed" to assess the outcomes of care. "Rebleed" was defined by any of the following events: repeat endoscopy before hospital discharge, surgery for control of UGIH, readmission to the hospital within 30 days of discharge because of UGIH, or death. Data on transfusion of packed red blood cells after completion of initial endoscopy were also collected as an additional marker of adverse outcome. The level of healthcare resource use was estimated using the following measures of the process of care: level of care at admission, use of *i.v.* H2RA, and hospital length of stay.

Cases were included if they were adult patients ( $\geq 18$  yr of age) admitted to SMH or CHS during calendar years 1997 or 1998, with any of the previously mentioned ICD-9-CM codes who underwent diagnostic upper endoscopy. For the purposes of analysis, cases were excluded if they did not undergo diagnostic endoscopy, developed bleeding while in-hospital, as these patients were already hospitalized and would not be considered low risk, were transferred to SMH or CHS from another hospital, or bled from a lower GI source.

The SAS software program (SAS Institute, Cary, NC) was used for data management and analysis. Missing or inconsistent data were addressed by a series of checks and corrections. First, the principal investigators (G.D., I.G.) performed manual checks of the completed data abstraction forms. Second, the data manager (G.A.) performed manual checks during data entry. Third, an automated check was performed after data entry had been completed for each subject file. Missing or inconsistent data were brought to the attention of the principal investigators (G.D., I.G.) and resolved by joint review of the medical record. Means were

**Table 2.** Risk Stratification and Demographics of SMH and CHS Patients

	SMH	CHS	<i>p</i> Value
N by Rockall score			
≤2	49 (26%)	53 (30%)	0.40
3-5	93 (50%)	88 (50%)	1.0
>5	45 (24)	34 (20%)	0.36
N (total)	187	175	
Age by Rockall score*			
≤2	50 ± 17	48 ± 16	0.60
3-5	73 ± 15	66 ± 18	0.005
>5	79 ± 12	71 ± 11	0.004
Age (overall)*	67 ± 21	62 ± 19	0.02
% Male	101 (54%)	95 (54%)	0.84
NSAID/ASA use	103 (55%)	81 (46%)	0.08

\* Values are given in years as mean ± SD.

compared between the two sites using the Student's *t* test and proportions were compared using *z* statistic significance tests in comparing two independent proportions. A two-sided *p* value of < 0.05 was considered to be statistically significant.

## RESULTS

At SMH, a total of 281 potential cases were identified. Nine charts (3%) could not be obtained. Of the cases, 85 of 272 (31%) were excluded for the following reasons: no endoscopy was performed in 58 of 85 (68%), bleeding began in-hospital or the patient was transferred from an outside hospital in 12 of 85 (14%), the patient had a lower GI source of bleeding in 14 of 85 (17%), or the patient had bleeding from esophageal varices in one of 85 (1%). The remaining 187 cases admitted to SMH during calendar years 1997 and 1998 with acute, nonvariceal UGIH evaluated with upper endoscopy were analyzed.

**Table 3.** Clinical Characteristics of Study Patients

	SMH (n = 187)	CHS (n = 175)	<i>p</i> Value
Altered mental status			
Yes	77 (41%)	36 (21%)	<0.001
No	106 (57%)	139 (79%)	<0.001
Not specified	4 (2%)	0 (0%)	
Clinical presentation			
Hematemesis only	31 (17%)	37 (21%)	0.2
Melena only	67 (36%)	62 (35%)	0.7
Hematochezia only	9 (5%)	6 (3%)	0.5
Hematemesis/hematochezia	0	1 (1%)	0.3
Hematemesis/melena	36 (19%)	24 (14%)	0.2
Melena/hematochezia	7 (4%)	7 (4%)	0.7
H/H/M*	1 (1%)	7 (4%)	0.02
no H/H/M*	36 (19%)	31 (18%)	0.7
NG Aspirate			
Bloody	21 (11%)	20 (11%)	0.7
"Coffee grounds"	49 (26%)	36 (21%)	0.2
Clear	40 (22%)	45 (26%)	0.4
Not done	77 (41%)	74 (42%)	0.7

\* Hematemesis/hematochezia/melena.

**Table 4.** Endoscopic Diagnoses of SMH and CHS Patients

	SMH	CHS
Endoscopic diagnosis		
Gastric ulcer	49 (26%)	40 (23%)
Duodenal ulcer	38 (20%)	23 (13%)
Gastroduodenopathy	36 (19%)	14 (8%)
None	28 (15%)	23 (13%)
Mallory-Weiss tear	9 (5%)	15 (9%)
Esophagitis	7 (4%)	23 (13%)
Other	7 (4%)	3 (2%)
Gastroduodenal erosions	7 (4%)	23 (13%)
Angiomata	6 (3%)	11 (6%)

At CHS, 294 potential cases were identified. Of the cases, 118 of 294 (40%) were excluded for the following reasons: no endoscopy was performed in 90 of 118 (76%), bleeding began while in-hospital or patient was transferred from an outside hospital in 22 of 118 (19%), or the patient had a lower GI source of bleeding in six of 118 (5%). Therefore, 175 cases admitted to CHS during calendar years 1997 and 1998 with acute, nonvariceal UGIH evaluated with upper endoscopy were analyzed.

Demographic characteristics of the patients included as cases are shown in Table 2. Clinical characteristics of the patients are shown in Table 3. Overall, the distribution of endoscopic diagnoses was similar to that in other reported series of acute, nonvariceal UGIH with peptic ulcer disease being the most common diagnosis at both facilities (see Table 4) (7-11).

A smaller proportion of all nonvariceal UGIH admissions to SMH had Rockall scores of ≤2: 49 of 187 (26%) versus 53 of 175 (30%) at CHS, *p* = 0.40. As shown in Table 5, no cases with Rockall scores ≤2 died, either in-hospital or within 30 days of hospital discharge. Only three of 49 (6%) of SMH cases and two of 53 (4%) of CHS cases with Rockall scores ≤2 met our definition of rebleeding, *p* = 0.64.

The most common adverse outcome for low risk patients was transfusion of packed red blood cells after the time of initial endoscopy, which occurred in nine of 49 (18%) of SMH cases versus two of 53 (4%) of CHS cases (*p* = 0.02). However, only one of the nine SMH cases and none of the CHS cases had actual clinical evidence of rebleeding such as

**Table 5.** Adverse Outcomes of SMH and CHS Low Risk Patients

	SMH (n = 49)	CHS (n = 53)	<i>p</i> Value
Adverse outcomes			
PRBC transfusion	9 (18%)	2 (4%)	0.02
Rebleed*	3 (6%)	2 (4%)	0.64
Death	0	0	

PRBC = packed red blood cell transfusion (given after initial endoscopy).

\* Rebleed is defined as need for repeat endoscopy before discharge, surgery, readmission to hospital within 30 days of discharge for UGIH, or death due to rebleeding.

**Table 6.** Resource Use by SMH and CHS Low Risk Patients

	SMH (n = 49)	CHS (n = 53)	p Value
Resource use			
Hospital LOS (mean days)	3.3 + 2.4	2.6 + 2.1	0.15
ICU or monitored bed*	35 (71%)	26 (49%)	0.04
Use of <i>i.v.</i> H2RA†	45 (92%)	30 (57%)	<0.001

ICU = intensive care unit; LOS = length of stay.

\* Level of care at admission.

† *i.v.* H2RA = *i.v.* histamine 2 receptor antagonist used during hospitalization.

a fall in Hct, change in vital signs, recurrent hematemesis, or fresh melena documented in the medical record.

As shown in Table 6, SMH cases with Rockall scores  $\leq 2$  tended to have longer hospital stays than CHS cases, with a mean hospital length of stay (LOS) of 3.3 + 2.4 days (median = 3, range = 1–13 days), *versus* 2.6 + 2.1 days (median = 2, range = 1–11 days),  $p = 0.15$ . SMH cases with Rockall scores  $\leq 2$  were also significantly more likely to be admitted to an ICU or monitored bed, 35 of 49 (71%) *versus* 26 of 53 (49%),  $p = 0.04$ . SMH cases were also significantly more likely to receive *i.v.* H2RAs for the acute bleeding event, 45 of 49 (92%) *versus* 30/53 (57%) at CHS  $p < 0.001$ .

At SMH, 71% of all cases and 75% of the low risk population had endoscopy within 24 h of hospital admission; similarly, at CHS, 70% of all cases and 72% of those with Rockall scores of  $\leq 2$  had endoscopy within 24 h of hospital admission. In all, two of 53 (4%) of CHS low risk cases and five of 49 (10%) of SMH low risk cases had endoscopy performed at the bedside. All of the CHS low risk cases, and 94% of the SMH low risk cases were discharged from hospital directly to home. The remaining three SMH low risk patients were discharged from the hospital to a skilled nursing facility.

## DISCUSSION

This study evaluates and compares the process and outcomes of care provided to low risk patients admitted with acute, nonvariceal UGIH at a community hospital and a neighboring tertiary care university hospital. We hypothesized that a greater proportion of the community hospital cohort would be low risk cases, as defined by a Rockall score of  $\leq 2$ . Our data suggest otherwise, in that fewer community hospital cases (26% *vs* 30%) were considered to be low risk by the Rockall score. The Rockall score accurately identified a substantial percentage of all acute, nonvariceal, UGIH admissions that were at low risk for adverse outcomes in two very different practice settings. Overall, there were no deaths and an incidence of rebleeding of 4% to 6%. These findings are consistent with Rockall's initial findings (12, 13), as well as those from a recent Canadian study (35).

We further hypothesized that in the community hospital setting, there would be less resource use than within the

tertiary care university hospital. In contrast, our data demonstrate that a significantly greater proportion of low risk community hospital cases were admitted to an ICU or monitored bed, although there was no statistically significant difference in hospital length of stay between practice settings. The low rate of morbidity and mortality in both practice settings suggests that downgrading the site of initial admission for these low risk patients with early discharge may conserve healthcare resources without compromising patient safety. This is further put into perspective when one takes into consideration that, at least in 1995, the daily charge for an ICU bed at CHS was more than double that of a nonmonitored bed (\$940 *vs* \$400) (3). Admitting low risk patients to a nonmonitored bed or potentially treating them in the outpatient setting would be ideal, but would be considered safe only if endoscopy could occur soon after initial presentation. At both facilities, approximately 70% of all patients underwent endoscopy within 24 h of presentation. Observation in the emergency department until endoscopic evaluation is completed has been advocated and implemented by others within the context of research protocols (17). However, this may not be a realistic option in busy emergency departments where space is at a premium.

A second area where excess resource use was observed was in the prescribing of *i.v.* H2RAs to treat acute UGIH. *In vitro* studies have suggested that increasing gastric pH to  $>6$  might help to stabilize blood clots (36). However, *i.v.* H2RAs cannot maintain this degree of acid suppression, clinical trials have argued against their utility for patients presenting with acute UGIH (37), and a recent study has suggested that 80% of all hospital orders for *i.v.* H2RAs are inappropriate (38). Moreover, when including preparation and administration costs, *i.v.* H2RAs are quite costly when compared to other forms of acid suppression, including oral proton pump inhibitors. In this present study, we found that the use of *i.v.* H2RAs was significantly higher (nearly twice as common, 92% *vs* 57%) in the community hospital as in the tertiary care university hospital.

Evidence suggests that the outcomes of treatment for many common medical conditions may be better in academic as compared to community hospitals (39, 40). Within the field of gastroenterology, investigators have similarly shown that academic centers may fare better than community hospitals in regard to measures of the process of care in UGIH, such as the appropriate use of endoscopic therapy (32). Although we did not detect any clinically meaningful differences in the clinical outcomes of care, this study suggests that there may be differences in the process of care provided to patients with acute UGIH between academic and community hospitals. These observed differences may have implications for an important nonclinical outcome, *i.e.*, resource use.

The reasons for the observed variation in process measures between practice settings are unclear, but provide an opportunity for speculation and further focused investigation. The difference in level of care at admission may be due

to the routine presence of in-hospital house staff serving as members of the primary care team for all patients admitted to CHS as opposed to SMH. SMH physicians may use higher levels of care, with its more intensive nursing coverage as a surrogate for house staff. Alternatively, this observed variation may be driven by the long-held belief of the providers (*i.e.*, primary care physician, emergency medicine physician, gastroenterologist) that patients with acute UGIH should routinely be admitted to an ICU or monitored bed. The greater use of *i.v.* H2RAs at SMH may also be due to similar provider beliefs or to a lack of awareness of the evidence that questions the utility of this therapy for episodes of acute UGIH.

This study has several limitations, largely due to its retrospective nature. Possible reasons for admission other than UGIH were not evaluated systematically. However, cases were selected according to ICD-9-CM codes showing UGIH as the primary discharge diagnosis, suggesting that UGIH was the reason for admission in most cases. Incomplete case identification may have occurred from either low risk patients being evaluated and treated as outpatients or by the use of ICD-9-CM codes for principal discharge diagnosis only. However, others have validated this method for case identification (33). Because only SMH and CHS medical record data were available for abstraction, our data on post-discharge outcomes of interest may be incomplete. However, there is no *a priori* reason to believe that most patients discharged from SMH or CHS would not return to the same facility for recurrent episodes of UGIH. In addition, the findings in this study may not be generalizable to other neighboring academic and community hospitals as most academic centers do not have a dedicated GI hemostasis team.

This study also has several noteworthy strengths. This study broadens the validity of the Rockall score to both community-based and tertiary care hospital settings in the United States. Our patient populations represent all consecutive adult admissions to a community-based and a tertiary care university hospital in the United States with appropriate principal discharge diagnoses during 1997–1998. In addition, the sample size is relatively large and includes cases with a wide spectrum of disease severity. The possibility of selection bias is thus minimized. Furthermore, both low risk UGIH cohorts were defined in an identical and standardized manner (Rockall Risk Score) and thus we believe are comparable populations. Data abstraction on adverse outcomes was performed blind to the Rockall score. The possibility of observer bias is thus minimized. Finally, multiple measures of healthcare resource use and adverse outcome were assessed. This study thus provides a relatively unbiased, detailed comparison of the intensity and outcomes of healthcare services provided to two cohorts of patients with acute, nonvariceal UGIH.

In summary, this study demonstrates that low risk patients account for a substantial proportion of all acute, nonvariceal UGIH admissions to neighboring community and tertiary

care university hospitals. Resource use was observed to be more intensive for those patients admitted to the community hospital. This variation in the process of care for patient populations with similar disease severity (as defined by Rockall Risk Score) and similar outcomes suggests a viable target for cost-effective changes in the way we currently practice medicine. Patients with low risk Rockall scores after early endoscopy may be admitted to a nonmonitored bed for brief stays or may forgo admission altogether. Prescription of *i.v.* H2RAs for acute UGIH should be discouraged. Attempting to effect change in the management of common medical problems is a difficult task. Moreover, experience has shown that lasting changes in provider behavior are not reliably brought about by simple interventions such as publication of practice guidelines, audits with feedback, or targeted changes in a single aspect of care such as early endoscopy for patients with acute UGIH (41, 42–46). Evidence-based, multifactorial interventions that target local barriers to efficient care may result in sustained improvements in the quality of care (17, 20). These data suggest that the care of low risk UGIH patients admitted to hospital may be inefficient. Future research should therefore identify both the mutable and immutable barriers and facilitators to efficient care. Institutions could then use local mutable factors as a basis for creating, implementing, and monitoring interventions to improve the quality of care delivered to patients with acute UGIH.

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