Early colonoscopy for acute lower GI bleeding predicts shorter hospital stay: a retrospective study of experience in a single center

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Background: Appropriate management of lower-GI hemorrhage remains controversial largely because outcomes data are lacking. It is our hypothesis that clinical factors, such as comorbidity, hemodynamic instability, and timing of colonoscopy, are associated with hospital lengths of stay.

Methods: Medical records of patients hospitalized for lower-GI hemorrhage from 1993 to 2000 were reviewed and abstracted, and a Cox regression model was constructed to explore associations between time to discharge (i.e., length of stay) and clinical parameters.

Results: A total of 565 hospitalizations for acute lower-GI hemorrhage were examined in which mean length of stay was 6.7 days. Colonoscopy was performed during 415 hospitalizations. Approximately a third of patients were discharged within 48 hours after colonoscopy. In the regression model, hemodynamic instability, higher comorbidity, performance of a tagged red blood cell nuclear scan, and surgery for hemostasis were significantly associated with a decreased likelihood of discharge. Having a colonoscopy was associated with an increased likelihood of being discharged compared with not having a colonoscopy at any given time point during hospitalization (hazard ratio 1.5: 95% CI[1.2, 1.8]). The mean lengths of stay for patients having colonoscopy within 24 hours of hospitalization was shorter than those having colonoscopy after 24 hours of hospitalization (5.4 vs. 7.2 days; p<0.008).

Conclusions: In patients with lower-GI hemorrhage, earlier colonoscopy predicted earlier hospital discharge. However, colonoscopy did not necessarily lead to expedited post-procedural discharge. Although early colonoscopy appears to shorten hospital length of stay, prospective studies of inpatient colonoscopy are needed to determine the impact of this approach on outcomes.

Acute lower-GI hemorrhage (LGIH) is a frequent indication for hospitalization. Although LGIH is self-limited in the vast majority of cases,1,2 concerns about proper diagnosis and potential for recurrent bleeding often lead to inpatient testing and interventions. Colonoscopy has long been the test of choice for patients with minor or resolved hemorrhage. Elective colonoscopy usually establishes the etiology of hemorrhage and can exclude colorectal neoplasia.

Recently, the use of urgent colonoscopy for acute LGIH has attracted substantial attention because it affords rapid diagnosis and can lead to specific therapy.3-6 However, available data suggest that therapy often is not possible and may not be effective when performed.4,7-12 Nonetheless, rapid endoscopic identification of a bleeding source, regardless of whether therapy is administered, may contribute to clinical management of recurrent hemorrhage.

Several investigators have suggested that early colonoscopy for LGIH may shorten hospital stay.13-15 Potential roles for earlier colonoscopy would include expedited diagnosis, exclusion of findings worrisome for recurrent hemorrhage, localization of a source in the event of recurrent bleeding, application of endoscopic therapy for active bleeding, and appeasement of common desires for inpatient testing. Furthermore, a recent study specifically examining timing of colonoscopy demonstrated that earlier inpatient colonoscopy was associated with earlier hospital discharge.5 The effect of early colonoscopy was attributed, primarily, to the “earlier delineation of low-risk stigmata,” akin to the cost-saving effect of early upper endoscopy for upper-GI hemorrhage.16-19

In the present study, it is our hypothesis that early colonoscopy should enhance the ability to triage patients with LGIH and thereby reduce hospital length of stay (LOS). Indeed, a reproducible association between timing of inpatient colonoscopy and LOS would have important implications for the
management of patients with LGIH. Therefore, in
this study, the records of patients hospitalized in our
institution with acute LGIH were examined to
evaluate predictors of LOS.

PATIENTS AND METHODS

The study was approved by the internal review board on
human research of our medical center and met all stan-
dards for good clinical research as outlined by the National
Institutes of Health.

Patient data

Records for patients admitted with a diagnosis of
hematochezia or LGIH were reviewed retrospectively. All
hospital discharges from July 1993 to June 2000 were
screened for discharge diagnostic codes corresponding to GI
hemorrhage. In accordance with the International Classi-
fication of Diseases, 9th revision (ICD-9), codes were
submitted for the following diagnoses: blood in stool; hemorrhage of the GI tract; benign neoplasms of the sto-
mach, duodenum, jejunum, ileum, colon, rectum, and anus;
malignant neoplasm (and secondary malignant neoplasm)
of the small intestine, colon, and rectosigmoid; all codes for
internal and external hemorrhoids; diverticulosis and
diverticulitis of small and large intestine; acute and chronic
vascular insufficiency of the intestine; all codes for ulcer-
ative colitis, proctosigmoiditis, enteroctitis, and ileocolitis;
regional enteritis of small and large intestine; other and
unspecified noninfectious gastroenteritis and colitis; anal
fissure and fistula; and angiodysplasia of the intestine.

For the 16,976 admissions with these discharge dia-
agnoses, computerized patient charts (Browser Software,
version 3.80; Duke University Medical Center Information
Systems, Durham, N.C.) were reviewed to identify patients
admitted for a primary diagnosis of hematochezia. In-
cluded were all patients with hematochezia, defined as at
least one episode of red or maroon blood per rectum or
ostomy occurring within the 24 hours before admission.
Patients were excluded for the following reasons: absence
of any computerized admission or discharge notes, age less
than 18 years, signs or symptoms of upper-GI hemorrhage
(black stool, hematemesis, or blood on nasogastric lavage),
suspected acute colitis (obvious flare of known inflamma-
tory bowel disease or abdominal pain out of proportion to
hematochezia), transfer from another hospital, or a pri-
mary admission diagnosis other than LGIH.

For patients meeting all inclusion criteria, clinical data
pertaining to initial presentation, inpatient evaluation,
and hospital course were abstracted, including comorbid-
ities, medications, symptoms and their duration, initial
vital signs, physical examination findings, laboratory test
results, etiology of hemorrhage, transfusions, surgeries,
LOS, and recurrent bleeding within 3 months. Hemody-
namic instability was defined as either a resting heart rate
over 100 beats per minute; resting systolic blood pressure
below 90 mm Hg; or evidence of end-organ compromise,
specifically lightheadedness, syncope, chest pain, or dys-
pnea at the time of hospitalization. The use of aspirin, other
non-steroidal anti-inflammatory drugs (NSAID), or anti-
coagulants was based on documented history and included
any usage during the prior month. The etiology of hemorr-
ghage was based on the opinion of the gastroenter-
ologist attending the patient. For patients who underwent
colonoscopy, time from presentation to procedure and from
procedure to discharge were calculated. In some patients,
upper endoscopy also may have been performed at the time
of planned colonoscopy, per endoscopist discretion.
Re-
current bleeding was defined as any known episode of
hematochezia within 3 months of the index hospital
discharge. (Patients were not contacted for follow-up
information. It was hoped that because nearly all patients
were admitted from the emergency room, presumably most
resided in the local area and would return to our institu-
tion in the event of clinically significant bleeding.)

Some patients were hospitalized more than once for
hematochezia. In these patients, whether an etiology of
bleeding was known a priori, the rehospitalization implied
that observation with potential intervention was deemed
necessary. Therefore, these hospitalizations were assumed
to be independent observations for the purposes of data
analysis.

A single investigator (N.S.) reviewed all charts and
patient data to ensure uniformity of data collection. Specific
diagnoses were taken as those according to each clinician
assessment at the time of discharge or death.

Statistical analysis

Hospital admission was the unit of analysis for all
calculations. The level of statistical significance was set
a priori at 0.05. All analyses were performed by using
statistical software (PC-SAS, Version 8.2 for Windows; SAS
Institute, Cary, N.C.). A Cox regression model was con-
structed to determine clinical predictors of time to hospital
discharge. Explanatory variables considered in-
cluded: age; gender; duration of bleeding symptoms before
presentation; modified Charlson comorbidity index20 (<3,
≥3); hemodynamic instability at presentation (yes, no); use
of aspirin, NSAIDs or coumadin/lovenox (yes, no); surgery
required for hemostasis (yes, no); tagged red blood cell
scanning (TRBCS) (yes, no); angiography (yes, no); and
colonoscopy status (yes, no). Colonoscopy status was a time-
dependent variable. All other explanatory variables were
time independent. The model was reduced by using step-
wise backward elimination.21,22 The proportional hazard
assumption for the time-independent covariates was verified
graphically, as described by Cantor.23 Because the
definitive analyses were from the Cox proportional
hazards regression model conducted in a multivariate
setting, there is no need to correct significance levels for the
multiple testing of data arising from individual admissions.
The Student t test was used to compare the LOS of patients
who had colonoscopy within 24 hours with those who had
colonoscopy after 24 hours.

RESULTS

Study cohort characteristics

After screening all hospitalizations for LGIH
for inclusion and exclusion criteria, 697 inpatient
Charts were identified for further review, of which 39 were unavailable. Upon further examination, another 93 patient admissions were excluded based on the criteria mentioned. A total of 565 hospitalizations (488 patients) for hematochezia between July 1993 and June 2000 met all criteria. The demographics and clinical characteristics of the study population are presented in Table 1. Over 95% of patients were admitted from the emergency department, and the remainder were admitted directly from physicians’ offices within our institution. Approximately half of the patients were women; the mean age of the cohort was 67 years. The mean modified Charlson comorbidity score was 5.2. Colonoscopy was performed during 415 hospitalizations for LGIH, TRBCS in 165 hospitalizations, angiography in 67, and surgery for persistent bleeding in 27. Of the patients who had TRBCS, 126 also had colonoscopy (106 had TRBCS before colonoscopy). Colonoscopy led to a specific diagnosis in 89.2% of cases. There was one major colonoscopic complication, a cecal perforation that resulted when biopsy specimens were obtained from an ulcer. The mean LOS for all patients was 6.7 days. Seventeen patients died during hospitalization, although none died directly of GI hemorrhage. In 52 patients, accounting for 70 admissions, LGIH recurred within 3 months.

### Etiology of hemorrhage

The causes of LGIH for the entire study population and for those hospitalizations during which patients underwent colonoscopy are shown in Table 2. Diverticular bleeding was the most common cause of hemorrhage (this diagnosis was made when diverticula were identified positively in the absence of another obvious source of bleeding). Of patients with identified diagnoses, hemorrhoids and anal fissures, colonic neoplasm, and ischemic colitis also were common. Causes of LGIH described as “other” included radiation colitis (12 cases), solitary rectal ulcer (3 cases), colitis and ulcers of unclear origin (3 cases), pouchitis (1 case), small-bowel tumor (1 case), ileal pouch varices (1 case), and Dieulafoy’s lesion (1 case). The etiology of LGIH was unclear in 129 patients, most of whom did not undergo colonoscopy.

### Mechanism of hemostasis and recurrent bleeding events

During 504 hospitalizations (89.2%), bleeding stopped spontaneously. Endoscopic therapy was used in 42 patients with hemostasis achieved in 21 (50%). Arteriography was performed in 67 and arteriographic therapy in 13 (19%), with hemostasis obtained in 9. Forty-seven patients underwent surgery, 31 of whom had surgery for persistent bleeding. Operations also included 4 inpatient hemorrhoidectomies and 11 tumor resections. Of the 27 operations for active bleeding, 19 were performed in patients who previously underwent angiography, and 11 in patients who had undergone colonoscopy, 4 of whom had attempts at endoscopic therapy (each for diverticular bleeding). Hemostasis was achieved in 17 patients via arteriography or surgery without prior colonoscopy. In these 17 patients, the mean LOS was 9.4 days and mean blood-transfusion requirement was 9.2 units.
Bleeding recurred within 3 months in 70 hospitalizations (12.4%). The frequency of recurrent bleeding was higher in patients who did not undergo colonoscopy (19.3%) than in patients who did undergo colonoscopy (9.9%). In 3 patients, bleeding recurred after endoscopic therapy and, in 4, after operation for hemostasis. No patient had recurrent bleeding after successful arteriographic therapy.

**Time to first colonoscopy and from colonoscopy to discharge**

The time from presentation to first colonoscopy is shown in Table 3. Only 18 patients underwent colonoscopy within 12 hours of presentation, and 125 patients underwent colonoscopy within the first 24 hours of hospitalization. Another 169 patients had colonoscopy between 24 and 48 hours after admission. The mean LOS for those having colonoscopy within 24 hours of hospitalization, 5.4 days, was significantly shorter than for those undergoing colonoscopy after the first 24 hours of hospitalization, 7.2 days \((p<0.008)\). Of the 21 patients in whom hemostasis was achieved via colonoscopic therapy, 8 had colonoscopy within 24 hours of admission and 17 (81%) had colonoscopy within 48 hours. These 17 patients had a mean LOS of 4.9 days and a mean blood-transfusion requirement of 3.2 units.

Time from colonoscopy to discharge is shown in Table 4. Of 415 patients who underwent colonoscopy, 43 (10.4%) were discharged within the following 24 hours. Fifty-three percent of patients were discharged within 3 days of colonoscopy, and 75% were discharged within 5 days after colonoscopy (Table 4).

**Regression model for time to discharge**

As described, a Cox regression model was created to examine predictors of time to hospital discharge (Table 5). Of the potential predictor variables examined in this model, 5 had a significant independent association with LOS: surgical intervention for hemostasis (yes, no), performance of a TRBCS (yes, no), Charlson comorbidity index (<3, ≥3), hemodynamic instability on presentation (yes, no), and colonoscopy status (time-dependent variable; yes, no). Thus, the only procedural factor associated with accelerated discharge was colonoscopy. An alternate model, treating TRBC status as a time-dependent variable, resulted in the same hazard ratios.

**DISCUSSION**

Few data are available that help clinicians decide when and how to use colonoscopy in the setting of LGIH. Management decisions are, therefore, often based on resource availability and personal preferences. Nevertheless, because of concerns for malignancy, uncertainty regarding the potential for recurrent bleeding without a clear diagnosis, and the widespread availability of colonoscopy, most patients admitted for LGIH undergo colonoscopy while hospitalized. From both management and economic standpoints, it is important to understand the overall impact of endoscopy for patients presenting with acute LGIH.

Colonoscopy status (i.e., having a colonoscopy earlier in the hospitalization) was the only procedural factor found in the present study to predict shorter LOS. This association might reflect a causal relationship related to more efficient patient management. For example, improvement in patient management could include provision of a diagnosis, stratification of the risk of recurrent bleeding,
delivery of endoscopic therapy, acquisition of preoperative data (i.e., presence of right- vs. left-sided diverticulosis), and/or reassurance for physician and patient that colorectal cancer is absent. The contribution of colonoscopy in advancing care is likely to vary from patient to patient. However, in other patients, colonoscopy may have been merely a marker for low severity of bleeding or early spontaneous hemostasis. Stable, non-bleeding patients may have been deemed more suitable for early colonoscopy that served only the purpose of reassurance and did not affect LOS, because, indeed, few patients went home soon after the procedure. Yet, because some patients will have recurrent bleeding or harbor neoplastic disease, early colonoscopy in these patients still may be beneficial. Furthermore, for some of these patients with less significant bleeding, colonoscopic findings may have altered lifestyle or medical regimens (such as the use of anticoagulants), so as to help reduce the chance of early or late recurrence of bleeding.

Our study sample likely reflects that seen in most community and referral hospitals. The vast majority of patients were admitted through the emergency room (this also implies that most patients with postdischarge recurrence of bleeding would return to our hospital). The distribution of the etiologies of bleeding and the rate of spontaneous hemostasis were similar to those of other series. The present study included all patients hospitalized for hematochezia believed to be of lower-GI origin by using the discharge ICD-9 codes for a wide array of etiologies. The exclusion in the present study of patients with obvious colitis is important because the potential therapeutic options differ from those with hematochezia of uncertain etiology.

A limitation of the present study is that it is a retrospective evaluation of patients managed outside of any protocol or guidelines. The results are subject to bias as a result of the management style of individual physicians as well as local tendencies. For instance, it had been common practice in our hospital for patients with perceived active LGIH to undergo TRBCS and then angiography if the former demonstrates active bleeding. Patients with slower, intermittent, or resolved hemorrhage tend to undergo inpatient elective colonoscopy. This practice is reflected in our results, because performance of TRBCS predicted a decreased likelihood of discharge. In addition, the rates of recurrent bleeding may be artificially low because some patients may have presented to other institutions with recurrent bleeding events, although the majority of these patients resided in the local area and received their medical care at our center. Lastly, most patients had neither active bleeding nor obvious stigmata of bleeding at colonoscopy. An effort was made to be critical in the assignments of bleeding etiology, but it was necessary to depend greatly on the impressions of the gastroenterologist(s) involved with each case.

Strate and Syngal found an association between earlier timing of colonoscopy and shorter LOS in patients hospitalized for LGIH. Forty-eight percent of their patients underwent colonoscopy within 24 hours, as opposed to only 30% in the present study. Further, their patients, on average, appear to have had less severe bleeding and less comorbidity. Twenty-five percent of their patients had more than 2 units of blood transfused, hemodynamic instability was observed in less than 34%, mean LOS was 2.6 days, and only 41% had a comorbidity score of greater than 2; in contrast, 68% of our patients exhibited hemodynamic instability, mean LOS was 6.7 days, and 84% had a comorbidity score of greater than 2. The difference in bleeding severity may be partially because of the exclusion in the present study of cases of obvious colitis and/or inclusion of upper-GI hemorrhage presenting only as hematochezia. Despite these differences in study populations, multivariable regression modeling concurred on the relationship between colonoscopy timing with hospital discharge. Further, in the study by Strate and Syngal, the early endoscopic delineation of low-risk stigmata might have served to triage patients for early discharge. However, because only 32% of patients in the present study went home within 2 days of colonoscopy, identification of low-risk stigmata is likely to be only one of several factors impacting the management of sicker, hospitalized patients.

In summary, the present study demonstrated that early colonoscopy was a predictor of decreased length of hospital stay for patients admitted for LGIH, even though endoscopic treatment rarely was attempted and usually was unsuccessful. Unexpectedly, fewer than a third of patients who underwent colonoscopy were discharged within 48 hours of the procedure, despite spontaneous hemostasis in nearly 90%. These results suggest that colonoscopy results were only one factor used by practitioners in planning patient management. In patients hospitalized for LGIH, earlier colonoscopy does allow for diagnosis, occasional therapy and management planning, and contributes to shorter LOS. However, for the many patients with apparent self-limited bleeding, whether colonoscopy independently impacts other outcomes, such as transfusion requirement and need for other interventions, is unknown. Determining the utility of colonoscopy in these patients would require a randomized controlled trial with strict management protocols.
REFERENCES


