Endoscopic Hemostasis is Rarely Used for Hematochezia: A Population-Based Study from the Clinical Outcomes Research Initiative National Endoscopic Database

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Abstract

Background—Data on use of endoscopic hemostasis performed during colonoscopy for hematochezia are primarily derived from expert opinion and case series from tertiary care settings.

Objective—To characterize patients with hematochezia who underwent in-patient colonoscopy and compare those who received endoscopic hemostasis with those who did not receive endoscopic hemostasis.

Design—Retrospective analysis

Setting—Clinical Outcomes Research Initiative (CORI) National Endoscopic Database 2002 – 2008

Patients—Adults with hematochezia

Interventions—None

Main Outcome Measurements—Demographics, co-morbidity, practice setting, adverse events, and colonoscopy procedural characteristics and findings.

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Results—We identified 3,151 persons who underwent in-patient colonoscopy for hematochezia. Endoscopic hemostasis was performed in 144 patients (4.6%). Of those who received endoscopic hemostasis, the majority were male (60.3%), White (83.3%), older (mean age 70.9 ± 12.3 years), had a low risk ASA Score (53.9%), and underwent colonoscopy in a community setting (67.4%). The hemostasis-receiving cohort was significantly more likely to be White (83.3% vs. 71.0%, p=0.02), have more co-morbidities (ASA Score III and IV 46.2% vs. 36.0%, p=0.04), and have the cecum reached (95.8% vs. 87.7%, p=0.003). Those receiving hemostasis were significantly more likely to have an endoscopic diagnosis of AVM's (32.6% vs. 2.6%) p=0.0001or solitary ulcer (8.3% vs. 2.1%), p<0.0001.

Limitations—Retrospective database analysis.

Conclusions—Less than five percent of persons presenting with hematochezia and undergoing inpatient colonoscopy received endoscopic hemostasis. These findings differ from published tertiary care setting data. These data provide new insights on in-patient colonoscopy performed primarily in a community practice setting for patients with hematochezia.

Introduction

Acute, overt lower gastrointestinal bleeding (LGIB), manifested as hematochezia, often leads to hospital admission [1–5]. Common causes of acute LGIB include colonic diverticulosis, vascular ectasias, ischemic colitis, colorectal polyps and neoplasms, inflammatory bowel disease, anorectal conditions, and postpolypectomy bleeding [2, 4–5].

Similar to esophagogastroduodenoscopy for acute upper GI bleeding, colonoscopy is the preferred initial examination in the diagnosis and possible therapeutic intervention of acute hematochezia [1–7]. However, in contrast to acute upper GI bleeding, there are only limited population-based data on LGIB colonoscopy findings and endoscopic therapies. Using CORI data, we recently characterized individuals with hematochezia undergoing colonoscopy in primarily community practice [8]. Published data on endoscopic hemostasis during colonoscopy for LGIB are derived almost exclusively from expert clinical experience at tertiary care hospitals [1]. There is limited information characterizing LGIB patients evaluated by colonoscopy and endotherapies used in community practice settings, which comprise the majority of endoscopic practices in the United States. The aim of this study was to describe and compare patients with hematochezia who underwent colonoscopy and compare those who received with those who did not receive endoscopic hemostasis using population-based data, primarily from community practice. In addition, we performed age-stratified analyses comparing older patients (60 years) presenting with acute LGIB to younger LGIB patients (18 to 59 years).

Methods

Data Source – Clinical Outcomes Research Initiative – National Endoscopic Database

We used the Clinical Outcomes Research Initiative (CORI) for this population-based study. CORI was established in 1995, to study utilization and outcomes of endoscopy in diverse gastroenterology practice settings in the United States. All participating CORI endoscopy sites use a standardized computerized report generator to create all endoscopic reports and

comply with CORI quality control requirements. The sites' data files are transmitted electronically on a weekly basis to a central data repository – the National Endoscopic Database (NED) located in Portland, OR, USA.

The data that is transmitted from the local site to the National Endoscopic Database does not contain most patient or provider identifiers and qualifies as a Limited Data Set under 45 C.F.R. Section 164.514(e)(2). After completion of quality control checks, data from all sites are merged in the data repository for analysis. The data repository is checked for anomalies on a daily basis and endoscopy procedure counts are monitored on a weekly basis for atypical activity. Any noted unusual activity prompts follow-up contact by CORI staff. Multiple studies on a variety of endoscopy-related topics that have used CORI data have resulted in peer-reviewed publications [8–15]. The CORI national database was given approval by the IRB of the Oregon Health & Science University (eIRB #733) in October 2011. This present study used a limited dataset of CORI and was therefore exempted from further IRB review.

Subjects

To optimize selection of patients with non-trivial hematochezia, we identified all patients 18 years, from January 1, 2002 to December 31, 2008, who underwent *in-patient* colonoscopy for the lone indication "hematochezia" and who had a colonoscopic diagnosis of a bleeding source other than or in addition to hemorrhoids. Moreover, we performed age-stratified analyses whereby we compared older subjects (60 years) presenting with non-trivial hematochezia who underwent *in-patient* colonoscopy for the indication hematochezia and who had a colonoscopic diagnosis of a bleeding source other than or in addition to hemorrhoids with a younger LGIB population (18 to 59 years).

Definitions

We characterized this cohort by demographics, disease co-morbidity per the American Society of Anesthesiologists' (ASA) score, gastroenterology practice setting (*a priori* defined as: "tertiary care" that included academic and VA / military practice sites vs. "community practice" that included community / HMO practices), endoscopic diagnosis, extent of colonoscopy examination, endoscopic hemostasis type, repeat colonoscopy performed, and adverse events (AE).

Statistical Analyses

Comparisons of categorical data were performed using Pearson's chi-square test of independence. In cases with small cell counts (n < 5), Fisher's exact test was used. An *a priori* determined p value of 0.05 was considered statistically significant. All analyses were performed using SAS software v. 9.2 (SAS Institute, Inc., Cary, NC). Univariate logistic regression was performed for each covariate, modeling likelihood of receiving hemostasis at the time of colonoscopy. All covariates with a univariate p-value < 0.2 were included in the full multivariate model. The parsimonious multivariate model contains only those covariates with a univariate p-value <0.2 that also retained a p-value < 0.2 in the full multivariate model.

Results

Within the study period, we identified 846,159 who underwent colonoscopy for any reason and 76,928 (9.1%) individuals who underwent colonoscopy for the lone indication "hematochezia". We further identified 3,151 (4.1%) persons who underwent in-patient colonoscopy for hematochezia and had an endoscopic diagnosis of a bleeding source other than or in addition to hemorrhoids. Endoscopic hemostasis was performed in 144 patients (4.6%), while 3,007 (95.4%) received no hemostasis. See Figure 1. Of the 144 patients who received endoscopic hemostasis, the majority were male (64.6%), White, non-Hispanic (83.3%), older (mean age 70.9 ± 12.3 years), and had a low risk ASA Score (ASA Score = I or II) (53.9%). The majority of patients receiving and not receiving hemostasis underwent colonoscopy in a community hospital setting (67.4% and 69.7% respectively). More specifically, as compared to the cohort of patients who did not receive endoscopic hemostasis, the hemostasis-receiving cohort was significantly more likely to be White (89.6% vs. 80.4% respectively, p=0.006), have more co-morbidities (ASA Score III and IV 46.2% vs. 36.0% respectively, p=0.04), and have their colonoscopy examination reach the cecum (95.8% vs. 87.7%, p=0.003). Tables 1 and 2.

Endoscopic findings reported at colonoscopy included: diverticulosis (68.1% and 70.4%), polyp / multiple polyps (40.3% and 37.9%, mean polyp size 9mm ± 7mm, polyp size range 1mm – 50mm), AVMs (32.6% and 2.6%), mucosal abnormality/colitis (20.1% and 24.5%), solitary ulcer (8.3% and 2.1%), and tumors (6.3% and 6.1%). Some patients had more than one endoscopic diagnosis reported. In the hemostasis-receiving cohort, the endoscopic diagnosis at colonoscopy was significantly more likely to be AVMs (32.6% vs. 2.6%) or solitary ulcer (8.3% vs. 2.1%), p<0.0001 and p=0.0001 respectively. Table 2.

In the 144 patients receiving endoscopic hemostasis, specific endoscopic therapies included: injection 47 (32.6%), bipolar coagulation 44 (30.6%), argon plasma coagulation 42 (29.2%), clips 16 (11.1%), heater probe 6 (4.2%), "other" 4 (2.8%), and band ligation 3 (2.1%). Some patients received more than one one type of endoscopic hemostasis. Table 3. In the overall cohort, there were 85 patients (2.7%) who underwent repeat colonoscopy within 3 days of their index examination, of which 50 (1.6%) underwent repeat colonoscopy within one day. The vast majority, 77/85 (90.6%) underwent repeat colonoscopy for the listed indication "hematochezia". A total of 6 / 135 (17.4%) patients received hemostasis at the time of repeat colonoscopy. In the patients who at index colonoscopy received hemostasis (n=144), one had a repeat colonoscopy within 1 day and two patients had a repeat colonoscopy within 3 days, all for the indication "hematochezia". Of the three patients who underwent repeat colonoscopy, 1 received repeat hemostasis using injection therapy.

Unplanned events (4.9% vs 1.6%, p=0.011) and serious adverse events (2.1% vs 0.1%, p=0.009) were significantly higher in the hemostasis-receving cohort (p=0.009). There were no perforations or deaths in the hemostasis-receiving cohort, yet one patient had a perforation at colonoscopy in the non-hemostasis cohort. Table 2.

Age-Stratified Analyses

There were n=2,316 patients 60 years of age (60–69 years 26.9%, 70–79 years 35.2%, and 80 years 37.9%) who underwent in-patient colonoscopy for hematochezia and had a colonoscopic diagnosis of a bleeding source other than or in addition to hemorrhoids. Endoscopic hemostasis was performed in only 112 (4.8%) of those patients, while 2,204 patients (95.2%) did not receive endoscopic hemostasis. In both cohorts, the majority were male (65.2% and 54.5%), White, non-Hispanic (87.5% and 76.2%, p=0.006), and with mean ages 76.2 ± 7.6 years and 76.5 ± 8.9 years, respectively. Most patients underwent colonoscopy in a community hospital setting (66.1% and 73.9%) and had a low risk ASA Score (ASA Score = I or II) (45.6% and 54.3%). Endoscopic findings included: diverticulosis (72.3% and 79%), polyp/multiple polyps (42.9% and 40.6%), angiodysplasia (32.1% and 2.9%), mucosal abnormality/colitis (20.5% and 21.1%), tumor (7.1% and 6.5%), and solitary ulcer (6.3% and 1.6%) in the therapy performed and not performed groups respectively. In both cohorts, colonoscopy reached the cecum most of the time (95.5% and 87.3%, p=0.003), Tables 4 and 5. Endotherapies included: injection 37 (33.0%), argon plasma coagulation 35 (31.3%), bipolar coagulation 32 (28.6%), clips 14 (12.5%), heater probe 4 (3.6%), other 3 (2.7%), and band ligation 1 (0.9%). There were 43 (1.9%) and 70 (3.0%) patients who underwent repeat colonocopy within one or three days respectively, of their index examination. A total of 4 of 113 (3.5%) patients received hemostasis during repeat colonoscopy. Serious adverse events were uncommon, and only included bleeding in n=3 (2.7%) of the hemostasis-receiving group.

This older age cohort stratified by receipt of endoscopic hemostasis, differed significantly with regard to a number of endpoints. Specifically, the hemostasis-receiving cohort had significantly more males (p=0.03), Whites, non-Hispanic (p=0.014), colonoscopies that reached the cecum (95.5% vs. 87.3%, p=0.009), and serious AEs (2.7% vs 0.1%, p=0.002). Endoscopic diagnosis was significantly more often AVMs and solitary ulcer, p<0.0001 and p=0.004, respectively. Tables 4–5

Predictors of Endoscopic Hemostasis

Using logistic regression analysis, we also evaluated for predictors of receiving endoscopic hemostasis (e.g., age, gender, ASA class, site type, cecum reached, unplanned event, endoscopic finding), using receipt of endoscopic hemostasis as the dependent variable. We found the odds of receiving endoscopic hemostasis were 18.6 times higher (95% CI 12.1–28.6 p<0.0001) when angiodysplasia and 5.8 times higher (95% CI 2.9–11.5 p<0.0001) when solitary ulcer was the endoscopic diagnosis at colonoscopy. We also found that the odds of receiving hemostasis were 3.7 times higher when there was an unplanned event and 3.0 times (95% CI 1.1–8.4 p=0.03) higher when the cecum was reached. Table 6.

Discussion

In this population-based, study, using the CORI National Endoscopic Database, we describe and compare patients with hematochezia who underwent colonoscopy and received endoscopic hemostasis with those who did not receive endoscopic hemostasis. To optimize selection of patients with non-trivial *hematochezia*, we limited our analyses to those adult

patients who underwent *in-patient* colonoscopy for the lone indication "hematochezia" and had a colonoscopic diagnosis of a bleeding source other than or in addition to hemorrhoids. In addition, we performed age-stratified analyses comparing older patients (60 years) presenting with acute LGIB to younger LGIB patients.

The use of endoscopic hemostasis during colonoscopy for acute LGIB are derived almost exclusively from expert clinical experience at tertiary care hospitals [1]. In contrast to acute upper GI bleeding, there are almost no population-based data that evaluates the use of endoscopic hemostasis in patients presenting with hematochezia. The published reports that do exist are prospective or retrospective cases series that describe the use of a specific hemostasis modality in a specific subgroup of patients delivered almost exclusively by experts. For example, Jensen and colleagues reported on the endoscopic treatment of diverticular hemorrhage [16]. In that prospective case series, all 10 (100%) patients received endoscopic hemostasis for definitive diverticular hemorrhage using dilute epinephrine injection ± bipolar coagulation. No rebleeding was reported in any patient in the subsequent 30 day follow up period. Green et al reported, as part of a randomized trial comparing urgent vs standard colonoscopy in patients presenting with acute lower GI bleeding, that 17/50 (34%) of those undergoing urgent colonoscopy received endoscopic hemostasis for an identified colonic source of bleeding [17]. More recently, in a retrospective case series, Kaltenbach and colleagues reported on the safety and efficacy of endoscopic clipping for severe diverticular bleeding in 64 patients at two separate VA hospitals [18]. As compared to such published reports from tertiary care centers, we found only a minority of patients (4.6%) received endoscopic hemostasis. This is likely due to this present study being a "snap-shot" of population-based data from primarily community practice gastroenterology sites. In this present study, we found that that in the patients receiving endoscopic hemostasis, the majority were White, non-Hispanic men who were older in age, and had a low risk ASA Score. More than two-thirds of patients, both those receiving and not receiving hemostasis, underwent colonoscopy in a community hospital setting.

In this present study, we also found that the hemostasis-receiving cohort was significantly more likely to be White, have more co-morbidities per ASA score, and have their colonoscopy exam reach the cecum. We also found that those patients receiving endoscopic hemostasis had an endoscopic diagnosis at colonoscopy that was significantly more likely to be AVMs or solitary ulcer. Kanwal and colleagues previously reported on the role of endoscopic hemostasis for patients with hematochezia who underwent urgent colonoscopy and found to have a rectal ulcer with major stigmata (e.g., active bleeding, non-bleeding visible vessel, or adherent clot) [19]. Endoscopic hemostasis was performed in 12/23 (52.2%) such patients. Primary hemostasis was achieved in all patients, but 5/12 (41.7%) rebled and four patients died secondary to co-morbid medical conditions [19]. The most common endoscopic hemostasis therapies used in this present study were injection, bipolar coagulation, and argon plasma coagulation. We also found that unplanned events and serious adverse events were significantly higher in the hemostasis-receving cohort.

In the age-stratified analyses, we found similar findings. Endoscopic hemostasis was performed in only 4.8% of patients over age 60 years. The majority of older patients receiving endoscopic hemostasis were White, non-Hispanic males who had a low risk ASA

score and underwent colonoscopy in a community hospital setting. As compared to older patients who did not receive endoscopic hemostasis, the hemostasis-receiving cohort had significantly more White, non-Hispanic males, colonoscopies that reached the cecum, and had more serious AEs.

In analyzing potential clinical predictors of receiving endoscopic hemostasis, we found the odds of receiving endoscopic hemostasis were significantly higher when an endoscopic diagnosis of angiodysplasia or solitary ulcer was made at colonoscopy. We also found that the odds of receiving hemostasis were significantly more likely when there was an unplanned event and when the cecum was reached.

There are a number of strengths to this study. We used the CORI National Endoscopic Database as the primary data source. CORI uses standardized and strict quality control measures for all of its data. The endoscopic data in CORI are derived from a variety of GI practice type settings, with highly varied patient demographics, and the majority of CORI sites are community based providing a real world view of endoscopic practice. Moreover, CORI has been used as the primary endoscopic data source for multiple previously published studies [9–15]. This includes CORI data that we evaluated on patients presenting with non-variceal upper GI hemorrhage and more recently on patients presenting with severe hematochezia [8,13,14]. However, this present study has several limitations. The CORI endoscopic report is the sole source of data in this study. Therefore, clinical information (patient-level data) beyond the endoscopic report is limited, including clinical correlation with the severity of the hemtaochezia (e.g., hypotension, anemia, transfusion requirements), medication use, exact timing of colonoscopy, adequacy of colon preparation, or other diagnostic studies (e.g., radiographic, nuclear medicine, angiographic) which may have been performed before or after colonoscopy. In addition, due to limitations of the CORI database, we do not know that the reported endoscopic findings "definitively" confirm the underlying etiology of the hematochezia. The information in the CORI database represents the input of the physician that performs the endoscopy and thus the use of check box notation and free text is variable. Additionally, analysis of follow-up data in CORI is limited. Although in this present study we showed that a small minority of patients underwent repeat colonoscopy within one to three days of their index colonoscopy, colonoscopic examinations that may have been performed for recurrent hematochezia at non-CORI participating sites are not captured in our data and analysis. As a result, our repeat colonocopy data may be an "at least" figure as some patients may have sought care at a non-CORI participating site and thus would not have been captured. In our study, lower gastrointestinal hemorrhage was diagnosed based on the endoscopist's suspicion to proceed with colonoscopy based on the patient's presenting symptoms, physical exam, and laboratory data. Our study used repeat colonoscopy within one and three days of index colonoscopy as a surrogate marker for recurrent hematochezia. Repeat colonoscopy may have had nothing to do with recurrent hematochezia and may only indicate some other reason for a "second look" examination (e.g., an incomplete exam, or poor / mediocre prep at index colonoscopy). Thus, given the retrospective nature of this study, we cannot discern the true indication for repeat colonoscopy. Finally, CORI sites are not necessarily a random sample of GI practices in the US and are susceptible to site selection bias. In addition, any observed differences between "academic" sites and "community" sites are observations

based upon stratification by CORI site type and are not direct comparisons between sites. Thus, the ability to draw firm conclusions regarding any differences is limited. Despite these limitations, the CORI database remains unique in that it provides us with insight into how "real-life" colonoscopy and endoscopic hemostasis are being practiced in the United States. The large number of patients and colonoscopies permits observation of management trends in clinical situations outside traditional tertiary care centers and therefore, the CORI database is a powerful tool for generating future research studies.

In conclusion, less than five percent of persons presenting with non-trivial hematochezia and undergoing colonoscopy in GI community practice appear to receive endoscopic hemostasis. These findings differ from data published from tertiary care centers. This observed difference may be due to several reasons including more selected patient populations seen at tertiary care centers, presence of gastroenterology fellows in training who are learning endoscopic hemostasis techniques, and a higher likelihood of there being endoscopic hemostasis study protocols at tertiary care centers that would treat patients with hematochezia. These present data provide new information on colonoscopy performed for patients with hematochezia evaluated primarily in community practice. Additional population-based studies in hematochezia are warranted as well as evidence-based guidelines to better guide diagnosis and management of these patients.

Acknowledgments

Glossary

LGIB	lower gastrointestinal bleeding
CORI	clinical outcomes research initiative
NED	national endoscopic database
OR	Oregon
USA	United States of America
ASA	American Society of Anesthesiologists
GI	gastrointestinal
AVM	arterio-venous malformation
IRB	institutional review board
VA	veterans affairs
HMO	health maintenance organization
NC	north carolina

References

1. Strate LL, Naumann CR. The role of colonoscopy and radiological prcedures in the management of acute lower intestinal bleeding. Clin Gastroenterol Hepatol. 2010; 8:333–43. [PubMed: 20036757]

2. Arroja B, Cremers I, Ramos R, et al. Acute lower gastrointestinal bleeding management in Portugal: a multicentric prospective 1-year survey. Eur J Gastroenterol Hepatol. 2011; 23:317–22. [PubMed: 21394032]

3. Laine L, Shah A. Randomized trial of urgent vs. elective colonoscopy in patients hospitalized with lower GI bleeding. Am J Gastroenterol. 2010; 105:2636–4. [PubMed: 20648004]

4. Barnert J, Messmann H, Medscape. Diagnosis and management of lower gastrointestinal bleeding. Nat Rev Gastroenterol Hepatol. 2009; 6:637–46. [PubMed: 19881516]

5. Chait MM. Lower gastrointestinal bleeding in the elderly. World J Gastrointest Endosc. 2010; 2:147–54. [PubMed: 21160742]

6. Strate LL, Ayanian JZ, Kotler G, et al. Risk factors for mortality in lower intestinal bleeding. Clin Gastroenterol Hepatol. 2008; 6:1004–10. [PubMed: 18558513]

7. Rockey DC. Lower gastrointestinal bleeding. Gastroenterology. 2006; 130:165–71. [PubMed: 16401479]

8. Gralnek IM, Ron-Tal Fisher O, Holub JL, et al. The role of colonoscopy in evaluating hematochezia – a population-based study in a large consortium of endoscopy practices. Gastrointest Endosc. 2013; 77:410–8. [PubMed: 23294756]

9. Lieberman DA, Holub J, Eisen G, et al. Utilization of colonoscopy in the United States: results from a national consortium. Gastrointest Endosc. 2005; 62:875–883. [PubMed: 16301030]

10. Lieberman DA, Holub J, Eisen G, et al. Prevalence of polyps greater than 9 mm in a consortium of diverse clinical practice settings in the United States. Clin Gastroenterol Hepatol. 2005; 3:798–805. [PubMed: 16234009]

11. Harewood GC, Lieberman DA. Colonoscopy practice patterns since introduction of medicare coverage for average-risk screening. Clin Gastroenterol Hepatol. 2004; 2:72–77. [PubMed: 15017635]

12. Lieberman D, Fennerty MB, Morris CD, et al. Endoscopic evaluation of patients with dyspepsia: results from the national endoscopic data repository. Gastroenterology. 2004; 127:1067–1075. [PubMed: 15480985]

13. Enestvedt BK, Gralnek IM, Mattek N, et al. Endoscopic therapy for peptic ulcer hemorrhage: practice variations in a multi-center U.S. consortium. Dig Dis Sci. 2010; 55:2568–76. [PubMed: 20585979]

14. Enestvedt BK, Gralnek IM, Mattek N, et al. An evaluation of endoscopic indications and findings related to non-variceal upper gastrointestinal hemorrhage in a large multi-center consortium. Gastrointest Endosc. 2008; 67:422–29. [PubMed: 18206878]

15. Lieberman DA, Holub JL, Moravec MD, et al. Prevalence of colon polyps detected by colonoscopy screening in ssymptomatic Black and White patients. JAMA. 2008; 300:1417–22. [PubMed: 18812532]

16. Jensen DM, Machicado G, Jutabha RJ, et al. Urgent colonoscopy for the diagnosis and treatment of severe diverticular hemorrhage. N Engl J Med. 2000; 342:78–82. [PubMed: 10631275]

17. Green BT, Rockey DC, Portwood G, et al. Urgent colonoscopy for evaluation and management of acute lower gastrointestinal hemorrhage: a randomized controlled trial. Am J Gastroenterol. 2005; 100:2395–2402. [PubMed: 16279891]

18. Kaltenbach T, Watson R, Shah J, et al. Colonoscopy with clipping is useful in the diagnosis and treatment of diverticular bleeding. Clin Gastroenterol Hepatol. 2012; 10:131–7. [PubMed: 22056302]

19. Kanwal F, Dulai G, Jensen DM, et al. Major stigmata of recent hemorrhage on rectal ulcers in patients with severe hematochezia: endoscopic diagnosis, treatment, and outcomes. Gastrointest Endosc. 2003; 57:462–8. [PubMed: 12665754]

- Less than 5% of persons presenting with severe hematochezia and undergoing inpatient colonoscopy appear to receive endoscopic hemostasis.

- The hemostasis-receiving cohort was significantly more likely to be White, have more co-morbidities, and have the cecum reached. Those receiving hemostasis had an endoscopic diagnosis significantly more likely to be arteriovenous malformations or solitary ulcers.

846,159
Individuals who underwent
colonoscopy for any reason during
the study period

76,928 (9.1%)
Individuals who underwent
colonoscopy for the lone indication
"hematochezia"

3,151 (4.1%)
Individuals who underwent
in-patient colonoscopy and had an
colonoscopic diagnosis of bleed
source other than or in addition to
hemorrhoids

73,777 (95.9%)
Individuals who underwent
in-patient colonoscopy and had no
colonoscopic diagnosis of bleed
source or only likely bleed source
was thought to be hemorrhoids

144 (4.6%)
Received endoscopic hemostasis

3,007 (95.4%)
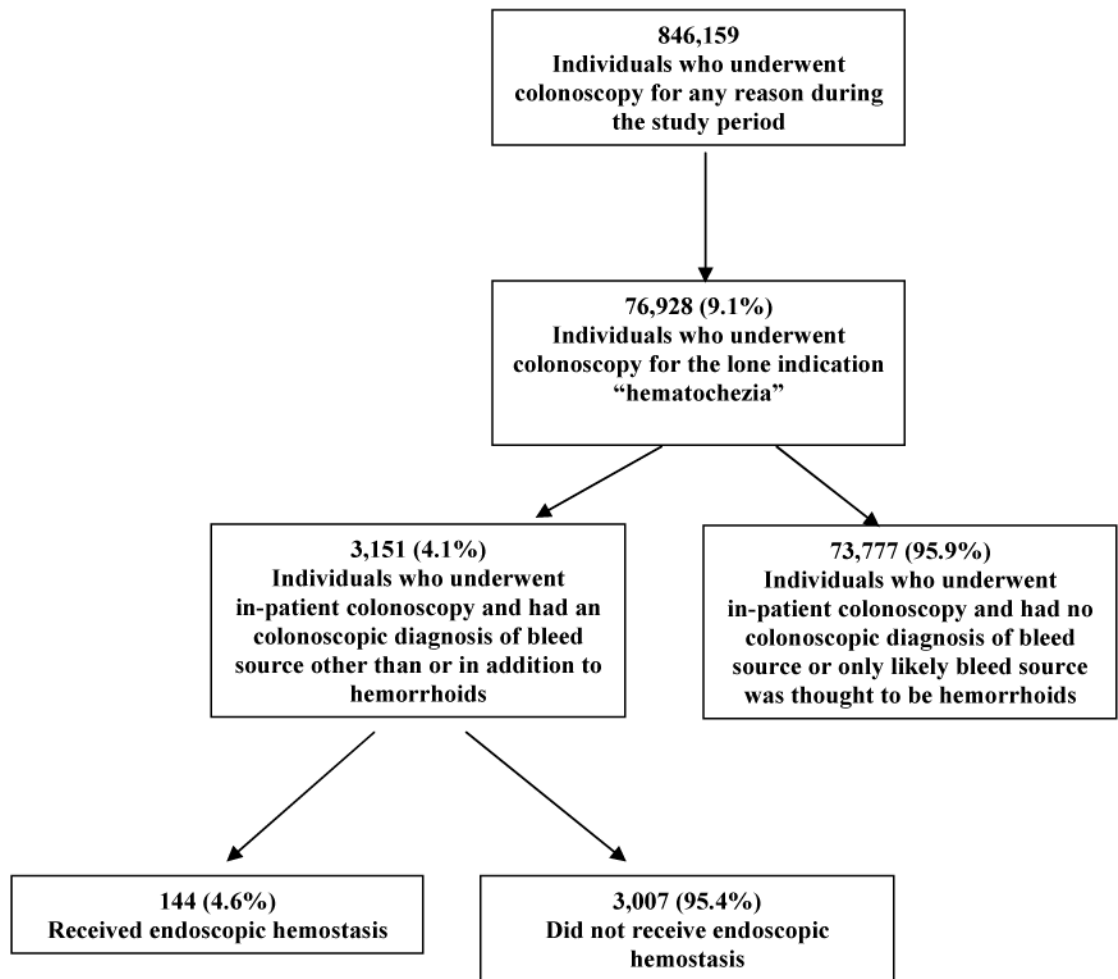**Did not receive endoscopic**
hemostasis

Figure 1.
Flow Diagram

Table 1

Cohort Demographics Stratified by Endoscopic Therapy

	Hemostasis Performed N=144	No Hemostasis N=3,007	p-value
Age group (n, %)			0.3
< 50 years	8 (5.6)	324 (10.8)	
50 – 59 years	24 (16.7)	479 (15.9)	
60 – 69 years	28 (19.4)	595 (19.8)	
70 – 79 years	44 (30.6)	771 (25.6)	
80 years	40 (27.8)	838 (27.9)	
Gender (n, %)			0.12
Female	51 (35.4)	1,264 (42.0)	
Male	93 (64.6)	1,743 (58.0)	
Race/Ethnicity (n, %)			0.02
White, non-Hispanic	120 (83.3)	2,134 (71.0)	
Black, non-Hispanic	9 (6.3)	476 (15.8)	
Asian/Pacific Islander, non-Hispanic	1 (0.7)	48 (1.6)	
American Indian, non-Hispanic	3 (2.1)	45 (1.5)	
Multi-Racial, non-Hispanic	0 (0.0)	1 (0.0)	
Hispanic	11 (7.6)	298 (9.9)	
Unknown/Missing	0 (0.0)	5 (0.2)	
ASA Score (n, %)			0.04
I	7 (4.9)	344 (11.4)	
II	63 (43.8)	1,395 (46.4)	
III	53 (36.8)	895 (29.8)	
IV	7 (4.9)	82 (2.7)	
V	0 (0.0)	0 (0.0)	
Unknown	14 (9.7)	291 (9.7)	
ASA Score (n, %)			0.02
I and II	70 (53.9)	1,739 (64.0)	
III and IV	60 (46.2)	977 (36.0)	

Table 2

Procedure Characteristics and Colonoscopy Findings Stratified by Endoscopic Therapy

	Hemostasis Performed N=144	No Hemostasis N=3,007	p-value
Site Type (n, %)			0.71
Community/HMO	97 (67.4)	2,095 (69.7)	
Academic	19 (13.2)	407 (13.5)	
VA/Military	28 (19.4)	505 (16.8)	
Depth of Exam (n, %)			
Cecum	138 (95.8)	2,636 (87.7)	0.003
Unplanned Events (n, %)			
Any Unplanned Event	7 (4.9)	47 (1.6)	0.011
Cardiopulmonary Unplanned Event	4 (2.8)	44 (1.5)	0.28
Serious Adverse Event	3 (2.1)	3 (0.1)	0.002
Bleed	3 (2.1)	2 (0.1)	0.0009
Perforation	0 (0.0)	1 (0.0)	
Death	0 (0.0)	0 (0.0)	
Colonoscopy Findings (n, %)			
Angiodysplasia	47 (32.6)	79 (2.6)	<0.0001
Diverticulosis	98 (68.1)	2,117 (70.4)	0.55
Mucosal Abnormality / Colitis	29 (20.1)	737 (24.5)	0.23
Polyp / Multiple Polyps	58 (40.3)	1,140 (37.9)	0.57
Solitary Ulcer	12 (8.3)	64 (2.1)	0.0001
Tumor	9 (6.3)	184 (6.1)	0.95

Table 3

Endoscopic Hemostasis Type

Therapy Type	N	% of Therapy Group (N=144)
Any Therapy	144	100.0%
Injection	47	32.6%
Bipolar Coagulation	44	30.6%
APC	42	29.2%
Clips	16	11.1%
Heater Probe	6	4.2%
Other Treatment	4	2.8%
Banding	3	2.1%

Table 4

Cohort Demographics in Older Adults Stratified by Endoscopic Therapy

	No Hemostasis N=2,204	Hemostasis Performed N=112	p-value
Age group (n, %)			0.65
60–69	595 (27.0)	28 (25.0)	
70–79	771 (35.0)	44 (39.3)	
80	838 (38.0)	40 (35.7)	
Gender (n, %)			0.03
Female	1,004 (45.6)	39 (34.8)	
Male	1,200 (54.5)	73 (65.2)	
Race/Ethnicity (n, %)			0.014
White, non-Hispanic	1,676 (76.0)	98 (87.5)	
Black, non-Hispanic	295 (13.4)	5 (4.5)	
Asian/Pacific Islander, non-Hispanic	27 (1.2)	1 (0.9)	
American Indian, non-Hispanic	21 (1.0)	3 (2.7)	
Multi-Racial, non-Hispanic	1 (0.1)	0 (0.0)	
Hispanic	180 (8.2)	5 (4.5)	
Unknown/Missing	4 (0.2)	0 (0.0)	
ASA Score (n, %)			0.17
I	179 (8.1)	5 (4.5)	
II	1,019 (46.2)	46 (41.1)	
III	707 (32.1)	45 (40.2)	
IV	69 (3.1)	6 (5.4)	
V	0 (0.0)	0 (0.0)	
Unknown	230 (10.4)	10 (8.9)	
ASA Score (n, %)			0.03
I and II	1198 (60.7)	51 (50.0)	
III and IV	776 (39.3)	51 (50.0)	

Table 5

Procedure Characteristics by Therapeutic Status in Patients 60 Years of Age

	No Hemostasis N=2,204	Hemostasis Performed N=112	p-value
Site Type (n, %)			0.14
Community/HMO	1,628 (73.9)	74 (66.1)	
Academic	246 (11.2)	14 (12.5)	
VA/Military	330 (15.0)	24 (21.4)	
Depth of Exam (n, %)			
Cecum	107 (95.5)	1,925 (87.3)	0.019
Unplanned Events (n, %)			
Any Unplanned Event	5 (4.5)	40 (1.8)	0.06
Cardiopulmonary Unplanned Event	2 (1.8)	37 (1.7)	0.71
Serious Adverse Event	3 (2.7)	3 (0.1)	0.002
Bleed	3 (2.7)	2 (0.1)	0.001
Perforation	0 (0.0)	1 (0.0)	~1.00
Death	0 (0.0)	0 (0.0)	
Colonoscopy Findings (n, %)			
Angiodysplasia	36 (32.1)	64 (2.9)	0.0001
Diverticulosis	81 (72.3)	1740 (79.0)	0.10
Mucosal Abnormality / Colitis	23 (20.5)	466 (21.1)	0.88
Polyp / Multiple Polyps	44 (39.3)	839 (38.1)	0.80
Solitary Ulcer	7 (6.3)	36 (1.6)	0.004
Tumor	8 (7.1)	144 (6.5)	0.80

Table 6

Multivariate Analysis of Predictors of Receiving Endoscopic Hemostasis

	OR [95% CI]	p-value
Angiodysplasia	18.6 [12.1–28.6]	<0.0001
Solitary Ulcer	5.8 [2.9–11.5]	<0.0001
Unplanned Event	3.7 [1.6–8.9]	0.0031
Cecum Reached	3.0 [1.1–8.4]	0.03

CI, confidence interval; OR, odds ratio

Multivariate analysis was adjusted for age, gender, and ASA class