Identifying Bleeding Etiologies by Endoscopy Affected Outcomes in 10,342 Cases With Hematochezia: CODE BLUE-J Study

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INTRODUCTION: The bleeding source of hematochezia is unknown without performing colonoscopy. We sought to identify whether colonoscopy is a risk-stratifying tool to identify etiology and predict outcomes and whether presenting symptoms can differentiate the etiologies in patients with hematochezia.

METHODS: This multicenter retrospective cohort study conducted at 49 hospitals across Japan analyzed 10,342 patients admitted for outpatient-onset acute hematochezia.
RESULTS: Patients were mostly elderly population, and 29.5% had hemodynamic instability. Computed tomography was performed in 69.1% and colonoscopy in 87.7%. Diagnostic yield of colonoscopy reached 94.9%, most frequently diverticular bleeding. Thirty-day rebleeding rates were significantly higher with diverticulosis and small bowel bleeding than with other etiologies. In-hospital mortality was significantly higher with angioectasia, malignancy, rectal ulcer, and upper gastrointestinal bleeding. Colonoscopic treatment rates were significantly higher with diverticulosis, radiation colitis, angioectasia, rectal ulcer, and postendoscopy bleeding. More interventional radiology procedures were needed for diverticulosis and small bowel bleeding. Etiologies with favorable outcomes and low procedure rates were ischemic colitis and infectious colitis. Higher rates of painless hematochezia at presentation were significantly associated with multiple diseases, such as rectal ulcer, hemorrhoids, angioectasia, radiation colitis, and diverticulosis. The same was true in cases of hematochezia with diarrhea, fever, and hemodynamic instability.

DISCUSSION: This nationwide data set of acute hematochezia highlights the importance of colonoscopy in accurately detecting bleeding etiologies that stratify patients at high or low risk of adverse outcomes and those who will likely require more procedures. Predicting different bleeding etiologies based on initial presentation would be challenging.

SUPPLEMENTARY MATERIAL accompanies this paper at http://links.lww.com/AJG/C144, http://links.lww.com/AJG/C145, http://links.lww.com/AJG/C146, http://links.lww.com/AJG/C147.

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INTRODUCTION
Acute lower gastrointestinal bleeding (ALGIB) manifests as relatively mild hematochezia but can progress to massive hemorrhage with shock (1–3). Approximately 30%–50% of adults with ALGIB will progress to severe bleeding (4–7), and bleeding episodes can frequently recur, requiring reexaminations, rehospitalizations, and repeated transfusions (1–7). ALGIB episodes have also been shown to increase the risk of subsequent thromboembolism and death, regardless of antithrombotic use (8). ALGIB, therefore, presents a significant economic burden (9). Unlike upper GIB (UGIB), which can be treated with antiacid therapy, there are no effective therapies for preventing ALGIB or its recurrence (1). As such, there is likely to be considerable variation in the management of ALGIB.

In contrast to UGIB, there have been few large studies with more than 1,000 cases with ALGIB, especially using real-world clinical data. Although a large UK study demonstrated clinical courses of ALGIB in detail, it could not accurately identify the bleeding etiology because of infrequently performed endoscopy (10). The source of bleeding in patients with hematochezia varies and mainly includes not only colorectal diseases (e.g., diverticular bleeding, ischemic colitis, and hemorrhoids) but also small bowel bleeding and UGIB. Many physicians empirically suspect etiology based on the presenting symptoms. For example, hematochezia without pain or fever could be highly suspicious of diverticular bleeding, but subsequent colonoscopy may reveal a precise diagnosis of small bowel bleeding, rectal ulcer, or colorectal angioectasia, not diverticular bleeding. The same may be true in cases of hematochezia with abdominal pain. Therefore, the accurate bleeding source of hematochezia will not be known unless colonoscopy is performed.

Patients with hematochezia are at risk of various adverse outcomes, which may be significantly affected by different bleeding etiologies identified on colonoscopy. Moreover, if the precise etiology is not known and suspected incorrectly, errors in treatment and triage may occur. For example, without endoscopy, severe UGIB can be missed and antiacid therapy will not be administered, which could result in repeated rebleeding. Without colonoscopy, inflammatory bowel disease or infectious colitis may be mistakenly suspected, leading to incorrect treatment (11). Such situations may have potentially serious consequences.

Although guidelines recommend colonoscopy as the first-line procedure for patients presenting with hematochezia, its value remains unclear, (1,3) because of the small number of endoscopy-based large cohort studies conducted to date. Therefore, we have collected data on more than 10,000 cases of acute hematochezia and comprehensively examined the bleeding etiologies identified by endoscopy. The aim of this study was to identify patients at risk for adverse outcomes based on bleeding etiology and to determine whether presenting symptoms and hemodynamic instability can predict the various bleeding etiologies.

METHODS
Study design, setting, and participants
We conducted this multicenter retrospective cohort study in 49 hospitals across Japan. To collect real-world clinical data, we sought the participation of gastroenterology physicians who were directly involved in the treatment of hematochezia. In total, 49 hospitals located in 25 prefectures, from Okinawa in the south to Aomori in the north, agreed to participate. Representative physicians at each hospital agreed to participate in this detailed investigation of clinical data for patients with acute hematochezia. The study was named the CODE BLUE-J Study (COlonic DiVerticular Bleeding Leaders Update Evidence from multicenter Japanese Study). The ethics committees and institutional review boards approved conducting this study using the opt-out method in all participating hospitals (see Supplementary Table 1, Supplementary Digital Content 4, http://links.lww.com/AJG/C147). Patients and/or the members of the public were not involved in the design, conduct, reporting, or dissemination plan of this research. The case enrollment period at each institution ended at roughly 2019, with a target period of at least 1 year and at least 100
cases per institution, which was decided at several meetings based on the consensus of the participating institutions. The median enrollment period for the 49 participating institutions was 63 months (interquartile range [IQR], 40–78), and the median number of patients enrolled was 131 (IQR, 88–205) per institution (see Supplementary Table 1, Supplementary Digital Content 4, http://links.lww.com/AJG/C147). The median number of patients with acute hematochezia who were urgently hospitalized per month was estimated as 2.4 cases (IQR, 1.9–4.0). There was variability between facilities in this number of registrations because of the number of hospital beds, and the setting of the emergency medical care system included both university hospitals and emergency hospitals (see Supplementary Table 1, Supplementary Digital Content 4).

We selected patients who presented with hematochezia within 24 hours and were urgently hospitalized for bleeding treatment management between January 2010 and December 2019 and included patients aged ≥20 years at the onset of hematochezia regardless of the presence of tarry stools, diarrhea, abdominal pain, or fever. Symptom-based subjects in our study included patients with hematochezia with small bowel bleeding and UGIB and ALGIB defined as colorectal bleeding. The research office reviewed the data of each patient in detail, including the date of onset of symptoms, date of hospitalization, and date of examination, and confirmed the data several times with the representatives of each facility. As a result, the following patients were excluded because they were not considered to be acute, not for bleeding control purposes, or not of outpatient origin: patients with bleeding that had stopped for more than 24 hours, patients admitted for anemia investigation, and patients with in-hospital onset of hematochezia. Data for a total of 11,035 patients were collected and rigorously reevaluated by the secretariat’s institution (Tokyo Medical University). After 693 patients were excluded, this left with 10,342 patients emergently admitted with outpatient-onset of acute, continuous, or frequent hematochezia for evaluation.

Data collection
Before data collection started, we held 3 research meetings with representatives from the 49 participating hospitals to discuss the content and definition of the survey items. At these meetings, it was agreed to aim for registration of at least 100 cases from each institution. The survey items were prepared using Excel sheets (8). Cause of death was also determined based on findings from death certificates and review of the medical findings. Date of occurrence of outcomes were evaluated and consisted of 23 items, including rebleeding, thromboembolism, and mortality (see Supplementary Table 2, Supplementary Digital Content 4, http://links.lww.com/AJG/C144). Small bowel endoscopy and upper GI endoscopy were performed based on symptoms and test results in line with the policies of each participating institution. Definitive diverticular bleeding was based on colonoscopic visualization of diverticulum with SRH (3,13). Presumptive diverticular bleeding was based on the following: very little possibility of bleeding source other than colonic diverticulum by colonoscopy with other imaging tests, such as CT, small bowel endoscopy (capsule or balloon endoscopy), or upper gastrointestinal (GI) endoscopy (see Supplementary Figure 1, Supplementary Digital Content 1, http://links.lww.com/AJG/C144). Final diagnosis was made mainly based on findings from the initial and second endoscopies and after excluding other diseases by combining colonoscopy with other imaging tests, such as CT, magnetic resonance imaging, coronary angiography, ventilation-perfusion scans, ultrasonography, or electrocardiography (8). Date and cause of death were ascertained from death certificates and review of the medical record (8). Cause of death was also determined based on findings from laboratory tests, multiple imaging modalities, or autopsy (8). Secondary outcomes were needed for blood transfusion during hospitalization and length of hospital stay.

Variables and outcomes
In total, 219 survey items on clinical data during hospitalization and after discharge were assessed (see Supplementary Table 2, Supplementary Digital Content 4, http://links.lww.com/AJG/C147). Baseline characteristics consisted of 75 items, including presenting symptoms, vital signs, blood sample data, history, comorbidities, and medication use within 30 days of admission (see Supplementary Table 2, Supplementary Digital Content 4, http://links.lww.com/AJG/C147). Nineteen comorbidities were evaluated using the Charlson Comorbidity Index (CCI) (12), which is widely used and has been validated for use in GIB research (6,8,10). Data on the comorbidities of hypertension and dyslipidemia, which are not included in the CCI, were also collected. Information that was recorded during hospitalization was collected for computed tomography (CT) and endoscopic diagnosis consisting of 80 items (e.g., stigma of recent hemorrhage [SRH] on endoscopy and etiology of bleeding). We also evaluated 41 items concerning procedures, such as type of endoscopic treatment, interventional radiology (IVR), and surgery (see Supplementary Table 2, Supplementary Digital Content 4, http://links.lww.com/AJG/C147). Because patients may have undergone 2 different or identical procedures during hospitalization because of events occurring between examination and treatment, we evaluated the procedure items twice.

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Identifying Bleeding Etiologies by Endoscopy

Statistical methods
Descriptive statistics, reported as number and percentage or as median and IQR, were used to describe patient characteristics, procedures, and clinical outcomes. To compare clinical data between 2 groups, we used the χ² test or Fisher exact test for categorical variables, as appropriate. P values less than 0.05 were considered significant. All statistical analysis was performed using STATA version 14 software (StataCorp, College Station, TX).

RESULTS
Baseline characteristics
The median number of ambulances available at the 49 participating hospitals was 5,859, and 24/7 colonoscopy was available in all institutions (Table 1). Median patient age was 74 years, and 61.1% were male. Approximately half of the patients were current drinkers (46.3%) or current or ever smokers (48.8%). Almost one-third had hemodynamic instability (29.5%). All patients presented with hematochezia, and some had additional symptoms of abdominal pain (16.1%), fever (6.4%), and diarrhea (9.9%). Thirty percentage of patients had a history of ALGB. More than half of patients had a CCI ≥ 1 (60.1%), and the most common comorbidities were hypertension (56.5%), dyslipidemia (27.3%), and diabetes (18.7%). Median laboratory values for white blood cells, hemoglobin, and albumin were 7,150/μL, 11.4 g/dL, and 3.7 g/dL, respectively. At presentation, 11.4% of patients were on nonsteroidal antiinflammatory drugs, 20.0% on low-dose aspirin, 9.8% on thienopyridine, 6.8% on warfarin, 6.0% on direct oral anticoagulants, 2.7% on acetaminophen, and 5.6% on corticosteroids. In addition, 6.1% was on dual antiplatelet therapy.

Identification of SRH and bleeding etiology by CT and endoscopy
Abdominal or pelvic CT was performed in 69.1% of all cases (Table 2). The ascending colon (10.4%) was most commonly identified by extravasation on CT, more than twice as often as the sigmoid colon (4.3%). Initial colonoscopy was performed in 87.7% of all cases. SRH was identified on endoscopy in 30.9% of cases, followed by active bleeding in 16.4%, adherent clots in 9.2%, and visible vessels in 5.9%. Similar to CT extravasation, the ascending colon (12.9%) was the most frequent site where SRH was identified, again almost twice as often as the sigmoid colon (7.0%). Overall, 59.2% of patients (6,177/10,342) underwent both endoscopy and CT for further investigation of the source of bleeding, and only 2.4% (244/10,342) did not undergo any imaging tests such as colonoscopy and CT (see Supplementary Figure 1, Supplementary Digital Content 1, http://links.lww.com/AJG/C144).

The diagnostic yield of the initial and second colonoscopies reached 94.9%, and 22 bleeding source categories, covering 48 diseases, were identified (Table 2). The most common final diagnosis was colonic diverticular bleeding (63.6%), followed by ischemic colitis (9.1%), postendoscopic bleeding (4.5%), and rectal ulcer (2.5%). Bleeding sources other than the colon, rectum, and anus were also evident, including small bowel bleeding (2.4%) and UGIB (1.5%). When the rates of the different etiologies were compared between the 2 time phases (2010–14 and 2015–19), there was no significant difference in the rate of SRH identification, unknown cases, or final diagnoses except for angioectasia, postendoscopic bleeding, and small bowel bleeding (see Supplementary Figure 3, Supplementary Digital Content 3, http://links.lww.com/AJG/C146).

Endoscopic treatment and other procedures
Multiple procedures or devices were often used to identify the source of bleeding in perendoscopic management, including bowel preparation with polyethylene glycol in 66.4% of patients, enema in 19.1%, endoscopic cap in 72.1%, and water-jet scope in 77.0% (Table 3). Endoscopic treatment was performed in 30.7% of patients undergoing endoscopy, mostly clipping (63.8%), followed by band ligation (24.2%), coagulation (8.2%), snare ligation (3.9%), and hypertonic saline-epinephrine injection (1.8%). The success rate of endoscopic therapy was 95.7%, and failure of hemostasis occurred in the remaining 4.4% of cases. When initial endoscopic treatment failed, clipping (63.6%) was the most commonly used follow-up technique. Identified postcolonoscopy complications were 0.1% perforation and 0.04% diverticulitis (Table 3).

An IVR procedure was performed in 1.4% of cases and surgery in 1.0%. Secondary endoscopic therapy was performed in 39.5% of patients undergoing repeat colonoscopy (see Supplementary Table 4, Supplementary Digital Content 4, http://links.lww.com/AJG/C147). The treatment rate for rebleeding was conservative therapy in 53.1% of cases, endoscopic therapy in 40.6%, IVR in 3.6%, and surgery in 1.7% (see Supplementary Table 4, Supplementary Digital Content 4, http://links.lww.com/AJG/C147). The IVR and surgical procedure rates were significantly higher for second rebleeding episodes than for first rebleeding episodes (P < 0.01). Overall, the procedure rates during hospitalization were 32.7% for endoscopic treatment, 2.1% for IVR, and 1.4% for surgery (Table 3).

Clinical outcomes
In-hospital rebleeding was identified in 15.2% of patients: 10.8% had 1 episode and 4.4% had 2 episodes (Table 4). After discharge, rebleeding occurred in 25.6% of patients: 22.9% had 1–4 episodes, 1.7% had 5–9 episodes, and 1.0% had ≥10 episodes. Thromboembolic events occurred in 0.6% of patients, including acute coronary syndrome in 0.2%, cerebrovascular disease in 0.3%, and pulmonary embolism/deep vein thrombosis in 0.2%. In-hospital mortality was 0.9%, mainly due to worsening comorbidities and nonbleeding-related causes. Only 13% of deaths were directly related to GI bleeding. Out-of-hospital mortality was 6.8% during a median follow-up of 239 days after discharge. Blood transfusion was needed in 29.8% of patients, with a median number of 4 units transfused. The median length of stay was 7 days.

Association of bleeding etiologies with adverse outcomes and need for a procedure
The proportions of adverse outcomes and need for a procedure differed according to bleeding etiology (Table 5). Etiologies that were more likely to have adverse outcomes included diverticular bleeding, malignancy, angioectasia, rectal ulcer, small bowel bleeding, and UGIB. By contrast, etiologies with relatively
Table 1. Characteristics of patients admitted for outpatient-onset acute hematochezia

| Variable                        | Value       | Data available for analysis | Missing values |
|---------------------------------|-------------|----------------------------|---------------|
| Outpatient onset                | 10,342 (100)| 10,342                     | 0             |
| Ambulances at facility          | 5,859 (3,854–9,246) | 49                         | 0             |
| 24/7 colonoscopy access         | 49 (100)    | 49                         | 0             |
| Age (yr)                        | 74 (63–82)  | 10,342                     | 0             |
| Age ≥60 yr                      | 8,327 (80.5)| 10,342                     | 0             |
| Male sex                        | 6,317 (61.1)| 10,342                     | 0             |
| Blood type, O                   | 3,312 (33.7)| 9,841                      | 501 (4.8)     |
| Blood type, A                   | 3,644 (37.0)| 9,841                      | 501 (4.8)     |
| Blood type, B                   | 2,021 (20.5)| 9,841                      | 501 (4.8)     |
| Blood type, AB                  | 864 (8.8)   | 9,841                      | 501 (4.8)     |
| Height (cm)                     | 160 (152–167)| 9,789                     | 553 (5.3)     |
| Body weight (kg)                | 57.3 (48.9–66.4)| 9,921                     | 421 (4.1)     |
| Body mass index                 | 22.5 (20.1–24.9)| 9,715                     | 627 (6.1)     |
| Body mass index >25             | 2,381 (24.5)| 9,715                      | 627 (6.1)     |
| Alcohol, current drinker        | 4,130 (46.3)| 8,918                      | 1,424 (13.8)  |
| Smoking, never                  | 4,702 (51.2)| 9,179                      | 1,163 (11.2)  |
| Smoking, current                | 1,661 (18.1)| 9,179                      | 1,163 (11.2)  |
| Smoking, ever                   | 2,816 (30.7)| 9,179                      | 1,163 (11.2)  |
| Performance status 1            | 8,976 (87.8)| 10,220                     | 122 (1.2)     |
| Performance status 2            | 694 (6.8)   | 10,220                     | 122 (1.2)     |
| Performance status 3            | 304 (3.0)   | 10,220                     | 122 (1.2)     |
| Performance status 4            | 244 (2.4)   | 10,220                     | 122 (1.2)     |
| Blood pressure (mm Hg)          | 127 (111–145)| 10,161                     | 181 (1.8)     |
| Heart rate (/min)               | 83 (73–96)  | 10,140                     | 202 (2)       |
| Syncope/loss of consciousness   | 668 (6.5)   | 10,324                     | 18 (0.2)      |
| Hemodynamic instabilitya        | 3,046 (29.5)| 10,342                     | 0             |
| Abdominal pain                  | 1,664 (16.1)| 10,323                     | 19 (0.2)      |
| Fever                           | 660 (6.4)   | 10,320                     | 22 (0.2)      |
| Diarrhea                        | 1,016 (9.9) | 10,307                     | 35 (0.3)      |
| Hematochezia                    | 10,342 (100)| 10,342                     | 0             |
| Tarry stools                    | 593 (5.8)   | 10,321                     | 21 (0.2)      |
| Hemoglobin (g/dL)               | 11.4 (9.3–13.1)| 10,334                    | 8 (0.1)       |
| Hemoglobin ≤7.0 g/dL            | 798 (7.7)   | 10,342                     | 0             |
| White blood cells (µL)          | 7,150 (5,600–9,300)| 10,335                    | 7 (0.1)       |

Table 1. (continued)

| Variable                        | Value       | Data available for analysis | Missing values |
|---------------------------------|-------------|----------------------------|---------------|
| Platelet count (µL)             | 20.8 (16.8–25.3)| 10,331                    | 11 (0.1)      |
| Albumin (g/dL)                  | 3.7 (3.3–4.1)| 9,857                      | 485 (4.7)     |
| PT-INR                          | 1.0 (1.0–1.0)| 9,012                      | 1,330 (12.9)  |
| Hematocrit (%)                  | 34.2 (28.4–39)| 10,322                    | 20 (0.2)      |
| Blood urea nitrogen (mg/dL)     | 19.0 (14.7–25.0)| 10,273                    | 69 (0.7)      |
| Creatinine (mg/dL)              | 0.8 (0.7–1.1)| 10,269                     | 73 (0.7)      |
| C-reactive protein (mg/dL)      | 0.2 (0.1–0.5)| 10,067                     | 275 (2.7)     |
| History of bowel resection      | 752 (7.3)   | 10,340                     | 2 (0.01)      |
| History of chemotherapy         | 338 (3.3)   | 10,319                     | 23 (0.2)      |
| History of radiation therapy    | 241 (2.3)   | 10,325                     | 17 (0.2)      |
| History of LGIB                 | 3,090 (30.0)| 10,342                     | 0             |
| History of angioectasia         | 72 (0.7)    | 10,341                     | 1 (0.01)      |
| History of IBD                  | 233 (2.3)   | 10,341                     | 1 (0.01)      |
| History of diverticular bleeding| 2,603 (25.2)| 10,334                     | 8 (0.1)       |
| History of ischemic colitis     | 223 (2.2)   | 10,341                     | 1 (0.01)      |
| CCI, 0                          | 4,124 (39.9)| 10,342                     | 0             |
| CCI, 1                          | 2,431 (23.5)| 10,342                     | 0             |
| CCI, ≥2                         | 3,787 (36.6)| 10,342                     | 0             |
| Diabetes mellitus, uncomplicated| 1,933 (18.7)| 10,342                     | 0             |
| Diabetes mellitus, end-organ damage | 350 (3.4)| 10,342                     | 0             |
| Hemiplegia                      | 278 (2.7)   | 10,334                     | 8 (0.1)       |
| Cerebrovascular accident or TIA | 1,475 (14.3)| 10,340                     | 2 (0.02)      |
| COPD                            | 315 (3.1)   | 10,342                     | 0             |
| Dementia                        | 565 (5.5)   | 10,334                     | 8 (0.1)       |
| Connective tissue disease       | 418 (4.0)   | 10,342                     | 0             |
| Myocardial infarction           | 1,660 (16.1)| 10,342                     | 0             |
| Chronic heart failure           | 854 (8.3)   | 10,340                     | 2 (0.02)      |
| Peptic ulcer disease            | 726 (7.0)   | 10,342                     | 0             |
| Moderate chronic kidney disease | 1,479 (14.3)| 10,340                     | 2 (0.02)      |
| Severe chronic kidney disease   | 326 (3.2)   | 10,342                     | 0             |
favorable outcomes were ischemic colitis, infectious colitis, inflammatory bowel disease, and postendoscopy bleeding. Regarding adverse outcomes, 30-day rebleeding rates were significantly higher in patients with diverticular bleeding and small bowel bleeding and lower in those with ischemic colitis, malignancy, infectious colitis, inflammatory bowel disease, hemorrhoids, postendoscopy bleeding, and unknown cases compared with other etiologies. Thromboembolism rates were higher with malignancy and UGIB than with other etiologies.

In-hospital mortality rates were significantly higher with angioectasia, malignancy, rectal ulcer, UGIB, and unknown cases and lower in with diverticulosis and ischemic colitis compared with other etiologies.

Among the procedures required, need for transfusion was significantly higher with diverticular bleeding, malignancy, angioectasia, rectal ulcer, small bowel bleeding, UGIB, and unknown cases but lower in with the various types of colitis and postendoscopy bleeding compared with other etiologies. Need for endoscopic treatment was significantly higher with diverticular bleeding, radiation colitis, angioectasia, rectal ulcer, and postendoscopy bleeding but lower with malignancy, other types of colitis, hemorrhoids, and small bowel bleeding compared with other etiologies. The rate of need for surgery was significantly higher with malignancy, hemorrhoids, and small bowel bleeding but lower with diverticular bleeding compared with other etiologies. Need for IVR procedure was significantly greater with diverticular bleeding and small bowel bleeding but lower with ischemic colitis and postendoscopy bleeding compared with other etiologies.

Results of association between rebleeding and mortality risk and each etiology in a logistic regression model remain unchanged after survival curve analysis with the Cox proportional hazard regression model (see Supplementary Table 5, Supplementary Digital Content 4, http://links.lww.com/AJG/C147).

Association of bleeding etiologies with symptoms and hemodynamic instability

Differences in the proportions of elderly patients and male patients were noted between the etiologies (Table 6). At presentation, higher rates of painless hematochezia were significantly associated with multiple diseases, such as diverticular bleeding, rectal ulcer, hemorrhoids, angioectasia, and radiation colitis. The same was true in cases of hematochezia with diarrhea and fever. Diverticular bleeding and UGIB were associated with a significantly higher rate of hemodynamic instability compared with other etiologies, whereas ischemic colitis was associated with a lower rate.

DISCUSSION

We have accumulated an unprecedentedly large data set for 10,342 patients emergently admitted for outpatient-onset of acute hematochezia, which contains information on baseline characteristics (Table 1), etiologies (Table 2), interventions (Table 3), and clinical outcomes (Table 4). With endoscopy, we could reach a high diagnostic yield of 94.9%, enabling one-third of all cases to be treated endoscopically (Table 3), which is a much higher rate than that reported in previous studies (6,10,14). Notably, confirmation of the bleeding etiology allowed patients at risk for adverse outcomes to be identified (Table 5). Some of the bleeding etiologies had the same presenting symptoms and hemodynamic instability (Table 6), indicating that prediction of etiology based on initial presentation would be challenging. These findings highlight the importance of performing endoscopy in patients with acute hematochezia (1,3).

Only 5% of etiologies remained unknown in this study (Table 2), which is lower than the respective rates of 9%, 23%, and 18% reported in the United States (6), the United Kingdom (10), and Spain (15). Making an accurate diagnosis in patients with hematochezia is of importance because unknown cases are at high risk of death and transfusion use (Table 5). One of the
### Table 2. Examinations and bleeding etiologies

| Factor | Value | Data available for analysis | Missing values |
|--------|-------|-----------------------------|----------------|
| Abdominal or pelvic CT | 7,149 (69.1) | 10,342 | 0 |
| Contrast-enhanced CT | 5,240 (73.3) | 7,149 | 0 |
| Urgent CT | 6,968 (97.5) | 7,149 | 0 |
| Time to CT scan (hr) | 1 (1–2) | 7,149 | 0 |
| Extravasation on CT | 1,151 (22.0) | 5,240 | 0 |
| Extravasation at jejunum | 7 (0.1) | 5,240 | 0 |
| Extravasation at ileum | 57 (1.1) | 5,240 | 0 |
| Extravasation at cecum | 53 (1.0) | 5,240 | 0 |
| Extravasation at ascending colon | 547 (10.4) | 5,240 | 0 |
| Extravasation at transverse colon | 83 (1.6) | 5,240 | 0 |
| Extravasation at descending colon | 138 (2.6) | 5,240 | 0 |
| Extravasation at sigmoid colon | 224 (4.3) | 5,240 | 0 |
| Extravasation at rectum | 49 (0.9) | 5,240 | 0 |
| Extravasation in upper GI tract | 1 (0.02) | 5,240 | 0 |
| Colonic diverticular bleeding on CT | 1,846 (25.8) | 7,149 | 0 |
| Enterocolitis on CT | 953 (13.3) | 7,149 | 0 |
| Tumor lesion on CT | 90 (1.3) | 7,149 | 0 |
| Other diagnosis on CT | 190 (2.7) | 7,149 | 0 |
| Initial colonoscopic examination | 9,066 (87.7) | 10,342 | 0 |
| Time to first colonoscopy (hr) | 16 (4–32) | 9,066 | 0 |
| SRH on initial endoscopy | 2,801 (30.9) | 9,066 | 0 |
| SRH, active bleeding | 1,489 (16.4) | 9,066 | 0 |
| SRH, visible vessel | 535 (5.9) | 9,066 | 0 |
| SRH, adherent clot | 829 (9.1) | 9,066 | 0 |
| Location of SRH, cecum | 163 (1.8) | 9,066 | 0 |
| Location of SRH, ascending colon | 1,166 (12.9) | 9,066 | 0 |
| Location of SRH, transverse colon | 262 (2.9) | 9,066 | 0 |
| Location of SRH, descending colon | 182 (2.0) | 9,066 | 0 |
| Location of SRH, sigmoid colon | 630 (7.0) | 9,066 | 0 |
| Location of SRH, rectum | 349 (3.9) | 9,066 | 0 |
| Location of SRH, jejunum | 5 (0.06) | 9,066 | 0 |
| Location of SRH, ileum | 94 (1.0) | 9,066 | 0 |
| Location of SRH, upper GI tract | 1 (0.01) | 9,066 | 0 |
| Second colonoscopic examination | 1,992 (19.2) | 10,342 | 0 |
Table 2. (continued)

| Factor                               | Value | Data available for analysis | Missing values |
|--------------------------------------|-------|-----------------------------|----------------|
| Unknown etiology                     | 526 (5.1) | 10,342                      | 0              |
| Missing data                         | 0     | 10,342                      | 0              |

Data are presented as n (%).

CT, computed tomography; EMR, endoscopic mucosal resection; ESD, endoscopic submucosal dissection; GI, gastrointestinal; IBD, inflammatory bowel disease; IQR, interquartile range; SRH, stigmata of recent hemorrhage; UGIB, upper gastrointestinal bleeding.

aOther tumors included malignant lymphoma (n = 2), gastrointestinal stromal tumor (n = 1), pseudomyxoma of the appendix (n = 1), and submucosal tumor of unknown origin (n = 5).

bAnal bleeding other than hemorrhoids included anal laceration or fissure (n = 10), bleeding postanal surgery (n = 1), and anal condyloma (n = 1).

cOther diagnosis included mucosal bleeding (n = 8), mucosal prolapse syndrome (n = 6), colorectal laceration (n = 4), fistula or penetration into the colorectum (n = 3), colorectal perforation (n = 2), mucosal lymphoid hyperplasia (n = 2), Kaposi sarcoma (n = 1), stoma-related bleeding (n = 2), pseudoaneurysm (n = 2), intussusception (n = 1), postoperative stenosis (n = 1), graft-vs-host disease (n = 1), hematomata (n = 2), Henoch-Schönlein purpura (n = 1), and Cronkhite-Canada syndrome (n = 1). Urgent CT was defined as CT performed within 24 hours of the hospital visit.

Reasons for the high rate of final diagnosis is the fact that imaging test-based diagnosis is well-established in Japanese hospitals (see Supplementary Figure 1, Supplementary Digital Content 1, http://links.lww.com/AJG/C144), which is also stated in the guidelines (3). Endoscopy is often conducted in Japanese hospitals; 87.7% and 19.2% of all cases underwent initial and repeated colonoscopy, respectively. Moreover, 59.2% of patients underwent both endoscopy and CT in our study, and 66% (5,981/9,064) of patients had CT performed before the colonoscopy (see Supplementary Figure 1, Supplementary Digital Content 1, http://links.lww.com/AJG/C144), which may be unique to the Japanese strategy (3). Other reasons are high use of bowel preparation before endoscopy and more frequent use of additional endoscopic devices (e.g., endoscopic cap in 73% of cases and water-jet in 77%; Table 3), all of which increase detection rates of endoscopic devices (e.g., endoscopic cap in 73% of cases and water-jet in 77%; Table 3), which is consistent with previous reports on ALGIB. We found that the rates of IVR and surgery were less than 5% (Table 3), which is similar to the rates reported for the United Kingdom (10). Both treatments were performed more frequently for second rebleeding episodes than for first rebleeding episodes, suggesting that physicians are more likely to perform endoscopy first, even if there is extravasation on CT, and to opt for IVR or surgery when there is uncontrollable bleeding, which is consistent with Japanese and US guidelines (1,3) but not with UK guidelines (2).

The Japanese and US guidelines state that the value of colonoscopy for ALGIB lies in its ability to identify the bleeding etiology and enable hemostasis if indicated (1,3). We hypothesized that colonoscopy can also affect important clinical outcomes. Regrettably, previous ALGIB studies did not evaluate the association between bleeding etiology and outcomes (4–7,22). Notably, we found that the etiologies associated with a high risk of adverse outcomes in patients with hematochezia were diverticular bleeding, malignancy, rectal ulcer, small bowel bleeding, UGIB, and unknown cases (Table 5). By contrast, the etiologies with low risk were ischemic colitis, infectious colitis, and postendoscopic bleeding. This indicates that precise identification of the bleeding etiology can stratify patients at risk for adverse outcomes, which would help physicians determine whether intensive care is needed or whether the patient can be discharged promptly after endoscopy.

In our cohort, 12.3% of the patients did not undergo colonoscopy during their hospitalization. Detailed reasons for not performing colonoscopy are unknown, but this was possibly because diagnosis was primarily based on CT with typical clinical manifestations or on past information. Supplementary Table 6 (see Supplementary Digital Content 4, http://links.lww.com/AJG/C147) summarizes that 81% of patients who did not undergo colonoscopy had CT (58% for CT angiography). Moreover, the diagnosis of patients who did not undergo colonoscopy included 10.7% unknown cases, 10.3% UGIB, and 33.6% ischemic colitis. It is likely that UGIB was suspected clinically, and upper endoscopy
was performed instead of colonoscopy, and that ischemic colitis was strongly suspected based on CT with clinical symptoms, so the physician decided colonoscopy was unnecessary. Finally, it is possible that during previous hospitalization for hematochezia management, the patient had undergone detailed imaging tests such as endoscopy and CT, and colonoscopy was deemed unnecessary for this new hospitalization. Of interest, we also found that aforementioned associations between etiology and outcome were observed.

Table 3. Endoscopic and nonendoscopic procedures

| Procedure                                      | Value       | Data available for analysis | Missing values |
|------------------------------------------------|-------------|-----------------------------|----------------|
| Bowel preparation, PEG or enema                | 7,595 (83.8)| 9,066                       | 0              |
| Bowel preparation, PEG                         | 6,022 (66.4)| 9,066                       | 0              |
| Bowel preparation, enema                       | 1,731 (19.1)| 9,066                       | 0              |
| Endoscopic cap                                  | 6,537 (72.1)| 9,066                       | 0              |
| Endoscopic cap, long                           | 1,822 (20.1)| 9,066                       | 0              |
| Endoscopic cap use, short                      | 4,638 (51.2)| 9,066                       | 0              |
| Endoscopic cap, ST hood                        | 69 (0.8)    | 9,066                       | 0              |
| Endoscopic cap, other                          | 8 (0.1)     | 9,066                       | 0              |
| Water-jet scope                                | 6,971 (77.0)| 9,066                       | 0              |
| PEG in water-jet scope                         | 390 (4.3)   | 9,066                       | 0              |
| Conservative therapy after endoscopy           | 6,092 (67.2)| 9,066                       | 0              |
| Endoscopic therapy                             | 2,784 (30.7)| 9,066                       | 0              |
| Clipping                                       | 1,759 (63.8)| 2,784                       | 0              |
| Indirect                                       | 1,212 (43.5)| 2,784                       | 0              |
| Direct                                         | 547 (19.7)  | 2,784                       | 0              |
| Band ligation                                  | 674 (24.2)  | 2,784                       | 0              |
| Snare ligation                                 | 109 (3.9)   | 2,784                       | 0              |
| HSE                                            | 50 (1.8)    | 2,784                       | 0              |
| OTSC                                           | 0           | 2,784                       | 0              |
| Coagulation                                    | 228 (8.2)   | 2,784                       | 0              |
| Other endoscopic therapy⁴                      | 20 (0.7)    | 2,784                       | 0              |
| Successful endoscopic therapy                  | 2,663 (95.7)| 2,784                       | 0              |
| Failed endoscopic therapy                      | 121 (4.4)   | 2,784                       | 0              |
| Treatment for failure, clipping                | 77 (63.6)   | 121                         | 0              |
| Treatment for failure, band ligation           | 8 (6.6)     | 121                         | 0              |
| Treatment for failure, HSE                     | 14 (11.6)   | 121                         | 0              |
| Treatment for failure, OTSC                    | 1 (0.8)     | 121                         | 0              |
| Treatment for failure, coagulation             | 8 (6.6)     | 121                         | 0              |
| Treatment for failure, other therapy           | 11 (9.1)    | 121                         | 0              |
| Postendoscopy perforation                      | 11 (0.1)    | 9,066                       | 0              |
| Postendoscopy diverticulitis                   | 4 (0.04)    | 9,066                       | 0              |
| IVR                                            | 143 (1.4)   | 10,342                      | 0              |
| Surgery                                        | 101 (1.0)   | 10,342                      | 0              |
| Barium impaction therapy                       | 66 (0.6)    | 10,342                      | 0              |
| Endoscopic therapy during hospitalization      | 3,379 (32.7)| 10,342                      | 0              |
| Need for IVR during hospitalization            | 217 (2.1)   | 10,342                      | 0              |
| Need for surgery during hospitalization        | 142 (1.4)   | 10,342                      | 0              |

Data are presented as n (%). Pneumoperitoneum and endoscopic procedures were evaluated in patients who underwent endoscopy (n = 9,066).

HSE, hypertonic saline-epinephrine; IQR, interquartile range; IVR, interventional radiology; OTSC, over the scope clip; PEG, polyethylene glycol.

⁴Other endoscopic therapy included hot biopsy, polypectomy, and endoscopic mucosal resection.
in the whole cohort remain unchanged regardless of unperformed colonoscopy (see Supplementary Table 7, Supplementary Digital Content 4, http://links.lww.com/AJG/C147). If diverticular bleeding, small bowel bleeding, or UGIB is suspected based on clinical diagnosis or nonendoscopic imaging, intensive care may be required, and patients should be followed up carefully after admission.

In clinical practice, diverticular bleeding may be suspected in a patient with acute hematochezia who presents without abdominal pain and diarrhea, but our colonoscopy data revealed that lower rates of painless hematochezia at presentation were significantly associated with multiple diseases, such as rectal ulcer, hemorrhoids, angioectasia, radiation colitis, and diverticulosis (Table 6). The same was true in cases of hematochezia with diarrhea, fever, and hemodynamic instability, suggesting that predicting different bleeding etiologies based on initial presentation would be challenging. Although there was no high-quality evidence to show that hemodynamic instability is indicative of an UGIB source and warrants an upper endoscopy (1,2), our data strongly support this.

This study has some limitations. First, there are 2 large ALGIB databases with >1,000 cases: 1,198 cases in Italy (14) and 2,528 cases in the United Kingdom (10); the median age was 78, 73, and 74 years in Italy, the United Kingdom, and Japan, in that order, although comorbidity scores (CCI) of zero are 29.3%, 43.6%, and 39.9%, CCI ≥2 was 47.4%, 33.4%, and 36.6%, respectively, which was similar among the 3 countries. However, generalizability might be limited by low BMI, with a median of 22.5 in Japan. Although no information is available in the Italy and UK databases, a study in the United States (23), reported that approximately 20% of participants had a BMI ≥30, compared with only 9.6% (988/10,342) in our study. Second, it had a retrospective design, which resulted in some missing values for baseline characteristics, which is potentially a source of bias. However, there were no missing values for diagnosis, procedures, or outcomes in our Japanese data set, and items with missing values and their rates were lower than in the prospective study done in the United Kingdom (10). Third, the degree of cleanliness of bowel preparation may affect SRH identification, diagnostic yield, and outcomes, but we could not collect these data.

In conclusion, we have provided clinical findings useful for ALGIB management obtained from a large-scale analysis of 10,342 patients with acute hematochezia. Our high colonoscopy rate identified bleeding etiologies accurately and allowed us to stratify patients at high or low risk of adverse outcomes and those who will likely require more procedures. Our results highlighted the value of colonoscopy in diagnosis and subsequent management in patients with acute hematochezia.

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### CONFLICTS OF INTEREST

Guarantor of the article: Naoyoshi Nagata, MD, PhD.

Specific author contributions: N.N.: was the principal investigator of this study. N.N.: designed and conducted the study, interpreted the
Table 5. Association of bleeding etiologies with adverse clinical outcomes and procedures needed in patients with hematochezia

| Etiology                      | Need for surgery | Need for IVR | Need for transfusion | Need for transfusion ≥4 units |
|-------------------------------|------------------|--------------|----------------------|-------------------------------|
|                               | Absent | Present | P      | Absent | Present | P      | Absent | Present | P      | Absent | Present | P      |
| Diverticular bleeding         | 97 (2.6) | 45 (0.7) | <0.001 | 41 (1.1) | 176 (2.7) | <0.001 | 974 (25.9) | 2,106 (32.0) | <0.001 | 750 (19.9) | 1,541 (23.4) | <0.001 |
| Ischemic colitis              | 135 (1.4) | 7 (0.7) | 0.082 | 216 (2.3) | 1 (0.1) | <0.001 | 3,042 (32.4) | 38 (4.0) | <0.001 | 2,267 (24.1) | 24 (2.6) | <0.001 |
| Malignancy                    | 110 (1.1) | 32 (1.6) | <0.001 | 215 (2.1) | 2 (1.0) | 0.445 | 3,005 (29.6) | 75 (38.9) | 0.005 | 2,233 (22.0) | 58 (30.1) | 0.008 |
| Infectious colitis            | 140 (1.4) | 2 (1.5) | 0.707 | 217 (2.1) | 0 | 0.120 | 3,067 (31.0) | 13 (9.7) | <0.001 | 2,281 (22.4) | 10 (7.5) | <0.001 |
| IBD                           | 136 (1.3) | 6 (2.9) | 0.062 | 215 (2.1) | 2 (1.0) | 0.331 | 3,048 (30.1) | 32 (15.2) | <0.001 | 2,273 (22.4) | 18 (8.6) | <0.001 |
| Radiation colitis             | 142 (1.4) | 0 | 1.000 | 217 (2.1) | 0 | 0.650 | 3,061 (29.8) | 19 (28.8) | 0.859 | 2,281 (22.2) | 10 (15.2) | 0.169 |
| Other colitis                 | 141 (1.4) | 1 (0.9) | 1.000 | 217 (2.1) | 0 | 0.182 | 3,041 (29.7) | 39 (33.3) | 0.398 | 2,261 (22.1) | 30 (25.6) | 0.361 |
| Angioectasia                  | 142 (1.4) | 0 | 0.267 | 215 (2.1) | 2 (1.5) | 1.000 | 3,001 (29.4) | 79 (59.4) | <0.001 | 2,224 (21.8) | 67 (50.4) | <0.001 |
| Rectal ulcer                  | 137 (1.4) | 5 (2.0) | 0.406 | 215 (2.1) | 2 (0.8) | 0.182 | 2,952 (29.3) | 128 (49.8) | <0.001 | 2,186 (21.7) | 105 (40.9) | <0.001 |
| Hemorrhoids                   | 134 (1.3) | 8 (4.4) | <0.001 | 217 (2.1) | 0 | 0.035 | 3,036 (29.9) | 44 (23.9) | 0.079 | 2,257 (22.2) | 34 (18.5) | 0.226 |
| Postendoscopy bleeding        | 140 (1.4) | 2 (0.4) | 0.097 | 216 (2.2) | 1 (0.2) | 0.001 | 3,041 (30.8) | 39 (8.4) | <0.001 | 2,265 (22.9) | 26 (5.6) | <0.001 |
| Small bowel bleeding          | 119 (1.2) | 23 (9.4) | <0.001 | 198 (2.0) | 19 (7.7) | <0.001 | 2,943 (29.2) | 137 (55.7) | <0.001 | 2,177 (21.6) | 114 (46.3) | <0.001 |
| UGIB                          | 140 (1.4) | 2 (1.3) | 1.000 | 214 (2.1) | 3 (2.0) | 1.000 | 2,993 (29.4) | 87 (56.9) | <0.001 | 2,219 (21.8) | 72 (47.1) | <0.001 |
| Unknown etiology              | 139 (1.4) | 3 (0.6) | 0.122 | 212 (2.2) | 5 (1.0) | 0.060 | 2,895 (29.5) | 185 (35.2) | 0.006 | 2,157 (22.0) | 134 (25.5) | 0.060 |

Bleeding etiologies with 50 or more cases were included in the analysis. “Other” diagnosis includes various bleeding etiologies (Table 2), which are difficult to interpret and were not included in the analysis. Data are presented as n (%).

IBD, inflammatory bowel disease; UGIB, upper gastrointestinal bleeding.
Table 6. Association of bleeding etiologies with presenting symptoms and hemodynamic instability in patients with hematochezia

|                                | Elderly patients (age>65 yr) | Male sex | Abdominal pain | Fever |
|--------------------------------|------------------------------|----------|----------------|-------|
|                                | Absent | Present | P              | Absent | Present | P              | Absent | Present | P              |
| Diveritcular bleeding          | 2,511  | (66.7)  | 4,992 (75.9)   | <0.001 | 1,931    | (51.3)  | 3,868 (66.7)   | <0.001 | 1,249    | (33.2)  | 415 (6.3)   | <0.001 | 478      | 182 (2.8) | <0.001 |
| Ischemic colitis               | 6,838  | (72.7)  | 665 (70.7)     | 0.175  | 6,074    | (64.6)  | 243 (25.8)     | <0.001 | 915      | (9.8)   | 749 (79.8)  | <0.001 | 515      | 145 (15.4) | <0.001 |
| Malignancy                     | 7,349  | (72.4)  | 154 (79.8)     | 0.023  | 6,204    | (61.1)  | 113 (58.6)     | 0.466  | 1,623    | (16.0)  | 41 (21.2)   | 0.051  | 638      | 22 (11.4) | 0.004  |
| Infectious colitis             | 7,454  | (73.0)  | 49 (36.6)      | <0.001 | 6,248    | (61.2)  | 69 (51.5)      | 0.022  | 1,573    | (15.4)  | 91 (67.9)   | <0.001 | 617      | 43 (32.1) | <0.001 |
| IBD                            | 7,455  | (73.6)  | 48 (22.9)      | <0.001 | 6,203    | (61.2)  | 114 (54.3)     | 0.041  | 1,542    | (15.3)  | 122 (58.1)  | <0.001 | 585      | 75 (35.9) | <0.001 |
| Radiation colitis              | 7,441  | (72.4)  | 62 (93.9)      | <0.001 | 6,271    | (61.0)  | 46 (69.7)      | 0.15   | 1,661    | (16.2)  | 3 (4.6)     | 0.007  | 658      | 2 (3.0)   | 0.443  |
| Other colitis                  | 7,428  | (72.7)  | 75 (64.1)      | 0.04   | 6,265    | (61.3)  | 52 (44.4)      | <0.001 | 1,623    | (15.9)  | 41 (35.0)   | <0.001 | 647      | 13 (11.1) | 0.036  |
| Colorectal angioectasia        | 7,389  | (72.4)  | 114 (85.7)     | 0.001  | 6,259    | (61.3)  | 58 (43.6)      | <0.001 | 1,654    | (16.2)  | 10 (7.5)    | 0.007  | 653      | 7 (5.3)   | 0.606  |
| Rectal ulcer                   | 7,272  | (72.1)  | 231 (89.9)     | <0.001 | 6,205    | (61.5)  | 112 (43.6)     | <0.001 | 1,639    | (16.3)  | 25 (9.7)    | 0.005  | 639      | 21 (8.2)  | 0.224  |
| Hemorrhoids                    | 7,379  | (72.6)  | 124 (67.4)     | 0.114  | 6,209    | (61.1)  | 108 (58.7)     | 0.503  | 1,653    | (16.3)  | 11 (6.0)    | <0.001 | 646      | 14 (7.6)  | 0.497  |
| Postendoscopy bleeding         | 7,260  | (73.5)  | 243 (52.5)     | <0.001 | 5,970    | (60.4)  | 347 (75.0)     | <0.001 | 1,651    | (16.7)  | 13 (2.8)    | <0.001 | 647      | 13 (2.8)  | 0.001  |
| Small bowel bleeding           | 7,341  | (72.7)  | 162 (65.9)     | 0.017  | 6,158    | (61.0)  | 159 (64.6)     | 0.247  | 1,633    | (16.2)  | 31 (12.7)   | 0.135  | 637      | 23 (9.4)  | 0.055  |
| UGIB                           | 7,418  | (72.8)  | 85 (55.6)      | <0.001 | 6,198    | (60.8)  | 119 (77.8)     | <0.001 | 1,635    | (16.1)  | 29 (19.0)   | 0.337  | 631      | 29 (19.1) | <0.001 |
| Unknown etiology               | 7,103  | (72.4)  | 400 (76.1)     | 0.065  | 6,020    | (61.3)  | 297 (56.5)     | 0.026  | 1,599    | (16.3)  | 65 (12.4)   | 0.016  | 606      | 54 (10.3) | <0.001 |

|                                | Absent | Present | P              | Absent | Present | P              | Absent | Present | P              |
| Diarrhea                       | 734     | (19.6)  | 282 (4.3)      | <0.001 | 209      | (5.6)   | 298 (4.5)     | 0.021  | 682      | (18.5)  | 318 (20.4)  |<0.001 | 192      | 476 (7.3) | <0.001 |
| Low blood pressure (<90 mm Hg) |         |         |                |        |          |        |                |        |          |        |                |        |          |        |        |
| Tachycardia (>100 beats/min)   | 906     | (9.8)   | 209 (4.5)      | <0.001 | 502      | (4.9)   | 5 (4.3)       | 1      | 1,977    | (19.7)  | 23 (20.2)   | 0.903  | 659      | 9 (7.7)   | 0.589  |
| Syncope/loss of consciousness  | 906     | (9.8)   | 209 (4.5)      | <0.001 | 502      | (4.9)   | 5 (4.3)       | 1      | 1,977    | (19.7)  | 23 (20.2)   | 0.903  | 659      | 9 (7.7)   | 0.589  |

Bleeding etiologies with 50 or more cases were included in the analysis. Data are presented as n (%). IBD, inflammatory bowel disease; UGIB, upper gastrointestinal bleeding.
data, and mainly wrote the article. K.K. (Bokuto hospital), A. Yamauchi, A. Yamada, J.O., T.I., T.A., N.T., Y. Sato, T. Kishino, N.I., T.S., M.M., A.T., K.M., K.K. (Fukuoka University Chikushi Hospital), S. Fujimori, T.U., M.F., H.S., S.S., T.N., J.H., T.F., Y. Kinjo, A.M., S.K., T.M., R.G., H.F., Y.F., N.G., Y.T., K. Narimatsu, N.M., K. Nagaika, T. Kinjo, Y.S., S. Funakoshi, K.K., T.M., Y. Komaki, K.M., K.W., and M.K.: designed the study, made decisions and definitions of survey items, and interpreted the data. N.N. and K.M.: performed the statistical analysis. M.F., T.I., N.U., T. Kinjo, and M.K.: provided corrections and advice on the preparation of the article.

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Study Highlights

WHAT IS KNOWN
- Many physicians empirically suspect bleeding etiology based on the presenting symptoms.
- The precise bleeding source of hematochezia is not known unless colonoscopy is performed.
- How bleeding sources are identified may affect adverse outcomes, which may trigger changes in management.

WHAT IS NEW HERE
- Colonoscopy had a high diagnostic yield of 95% and identified 48 bleeding etiologies.
- Differences in outcomes based on bleeding etiology suggest that endoscopy can guide the management of hematochezia.
- Differentiating between bleeding etiologies based on presenting symptoms and hemodynamic instability alone would be challenging.

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