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The role of colonoscopy in evaluating hematochezia: a population-based study in a large consortium of endoscopy practices

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Abstract

Background—Data on the role of colonoscopy in hematochezia are almost exclusively derived from clinical experience in tertiary care practice.

Objective—To characterize the patient population who received colonoscopy for hematochezia in a consortium of diverse gastroenterology practices.

Design—Retrospective analysis.

Setting—Clinical Outcomes Research Initiative Database, 2002 to 2008.

Patients—Adults undergoing colonoscopy for the indication of hematochezia.

Main Outcome Measurements—Demographics, comorbidity, practice setting, adverse events, and colonoscopy procedure characteristics and findings. Age-stratified analyses and analyses of inpatient- versus outpatient-performed colonoscopies were also performed.

Results—A total of 966,536 colonoscopies were performed during the study period, 76,186 (7.9%) were performed for evaluation of hematochezia. The majority of patients were white non-Hispanic men younger than 60 years old who underwent colonoscopy at a community practice site (79.1%) and had a low-risk American Society of Anesthesiologists (ASA) score (81.5%), in whom colonoscopy reached the cecum (94.8%), and serious adverse events were rare. Colonoscopy findings were hemorrhoids (64.4%), diverticulosis (38.6%), and polyp or multiple polyps (38.8%). From the overall cohort, 38.3% were 60 years of age and older. The older age cohort had significantly more white non-Hispanic females, high-risk ASA scores, incomplete colonoscopies, and unplanned events. Colonoscopy findings demonstrated significantly higher rates of diverticulosis, polyp or multiple polyps, mucosal abnormality/colitis, tumor, and solitary ulcer ($P < .0001$). There were 3941 (5.2%) who underwent inpatient performed colonoscopy. One third of this cohort (32.6%) was defined as having a high ASA score.

Limitations—Retrospective database review.

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Conclusions—These results describe patient populations and characterize colonoscopy findings in individuals presenting with hematochezia primarily in a community practice setting.

Acute overt lower GI bleeding (LGIB), manifested as hematochezia, accounts for approximately 20% of all cases of GI bleeding, most often leads to hospital admission with inpatient diagnostic evaluations (eg, endoscopic, radiographic, nuclear medicine), and thus consumes significant medical resources.^{1–5} Approximately 75% of patients with acute LGIB will stop bleeding spontaneously and have an uneventful medical course.^{1,2} However, morbidity and mortality are increased in older patients and those with comorbid medical conditions.^{1,2,6,7} Causes of acute hematochezia include colonic diverticulosis, vascular ectasias, ischemic colitis, colorectal neoplasms, inflammatory bowel disease, anorectal conditions (eg, hemorrhoids), and post polypectomy bleeding.^{2,4,5}

Colonoscopy is the preferred management strategy for most patients with acute hematochezia.^{1,7} The advantage of colonoscopy over other tests is its ability to provide a diagnosis and endotherapy when indicated.^{1,7} Yet, in contrast to acute upper GI bleeding and outside of tertiary care medical centers, there are only limited population-based data on LGIB etiologies, endoscopic findings, and endoscopic treatments.^{1,6} Moreover, there are no published data describing or comparing LGIB by age-stratified patient populations. The aims of this study were to describe the patient population presenting with acute, overt LGIB in a large consortium of diverse gastroenterology practices in the United States. In addition, we performed age-stratified analyses comparing a cohort of older patients (60 years of age and older) presenting with acute LGIB with a younger LGIB population (18–59 years) and also evaluated the subgroup of patients who underwent colonoscopy in an inpatient setting and not in the ambulatory setting, as well as comparing tertiary practice and community practice settings.

METHODS

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 the use 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, Oregon. The data transmitted from the local endoscopy site to the NED do not contain patient or provider identifiers and qualify 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 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}

Patient inclusion and exclusion criteria

We identified all adult patients (18 years of age and older) in the CORI database over a 7-year period between January 1, 2002, and December 31, 2008, who underwent colonoscopy for the sole indication of hematochezia. The endoscopist performing the colonoscopy is required to choose a primary indication for the CORI colonoscopy report.

Definitions

We characterized acute overt LGIB by patient demographics, disease comorbidity per the American Society of Anesthesiologists (ASA) score, gastroenterology practice setting, endoscopic diagnosis, reported extent of colonoscopy examination, repeat colonoscopy procedures performed within 72 hours of the index colonoscopy, and procedural adverse events. We defined gastroenterology practice setting as follows: tertiary care included academic and Veterans Affairs/military practice sites versus community practice, which included community/health maintenance organization practices. In the CORI data, patients may have more than 1 endoscopic finding reported at colonoscopy, and thus we included all findings in our analyses. In addition, we performed age-stratified analyses whereby we compared older subjects (60 years of age and older) presenting with hematochezia with a younger LGIB population (18–59 years), and we also evaluated the sub- group of patients who underwent colonoscopy as an inpatient and not in the outpatient setting. Our analysis of the subgroup of patients undergoing colonoscopy in the inpatient setting was an attempt to further characterize patients with potentially more severe hematochezia.

Data analyses

Comparisons of categorical data were performed by using Pearson's χ^2 test of independence. An a priori determined $P < .05$ was considered statistically significant. All analyses were performed by using SAS software version 9.2 (SAS Institute, Cary, NC).

RESULTS

A total of 966,536 colonoscopy procedures in 846,159 patients were performed for all indications at 1 of 72 CORI sites during the study period. Of those colonoscopies performed, 76,186 (7.9% of procedures and 9.0% of patients) underwent colonoscopy for the sole indication of hematochezia. In this hematochezia cohort, 43,521 (57.1%) were male and 33,665 (42.9%) were female. There were 62,314 (81.8%) white non-Hispanic and 47,039 (61.7%) were younger than 60 years of age. The vast majority of patients 60,290 (79.1%) underwent colonoscopy at a community practice site, and 62,080 (81.5%) were defined as having a low-risk ASA score (ASA score of 1 or 2). In total, 94.8% of colonoscopy examinations were reported to have reached the cecum. We also found that 478 (0.6%) of the cohort underwent repeat colonoscopy within 72 hours of their index colonoscopy. In this subgroup, 404 (84.5%) had hematochezia as an indication and 394 (82.4%) as the primary indication for repeat colonoscopy. Serious adverse events (eg, bleeding, perforation, death) were rare (76; 0.1%) (Table 1).

Colonoscopy findings included hemorrhoids (49,057 [64.4%]), diverticulosis (29,437 [38.6%]), polyp or multiple polyps (29,560 [38.8%]), mucosal abnormality/colitis (5985 [7.9%]), tumor (1522 [2.0%]), vascular ectasias (899 [1.2%]), and solitary ulcer (325 [0.4%]). There were 92 (0.1%) who were reported to be having active bleeding at the time of colonoscopy (Table 2). Patients may have had more than 1 endoscopic finding reported at colonoscopy.

Age-stratified analyses

Of the 76,186 persons who underwent colonoscopy for hematochezia, 29,147 (38.3%) were 60 years of age and older (range 60–102 years). Compared with the younger hematochezia patients, the older age cohort had significantly more females (44.8% vs 41.7%) and white non-Hispanics (85.4% vs 79.6%) ($P < .0001$), with most undergoing colonoscopy at a community practice site (n 22,686 [77.8%]). Significantly more of the older age cohort (13.2% vs 3.7%, $P < .0001$) were defined as having a high-risk ASA score (ASA score of III or IV). Moreover, significantly fewer colonoscopy examinations reached the cecum in the

older age cohort (92.2% vs 96.2%, $P < .0001$), and unplanned events, including any unplanned event or cardiopulmonary or serious adverse event, were significantly higher in the older patients (3.2% vs 1.4%, $P < .0001$) (Table 3). Compared with the younger age cohort, colonoscopy findings in the older age patients demonstrated significantly higher rates of diverticulosis (59.6% vs 25.7%), polyp or multiple polyps (44.0% vs 35.6%), mucosal abnormality/colitis (8.9% vs 7.2%), tumor (3.3% vs 1.2%), angiodysplasia (2.0% vs 0.7%), and solitary ulcer (0.6% vs 0.3%) (all comparisons $P < .0001$). There were significantly fewer hemorrhoids reported as an endoscopic finding in the older age cohort (17,784 [61.0%] vs 31,273 [66.5%], $P < .0001$) (Table 4).

Inpatient- versus outpatient-performed colonoscopy

Of the 76,186 colonoscopies performed for the indication of hematochezia, 3941 (5.2%) were performed in an inpatient setting and 57,909 (76.0%) in an outpatient setting. There were 14,336 that were not categorized (inpatient or outpatient) and are thus considered as missing data. Compared with those patients undergoing colonoscopy in the outpatient setting, the inpatient cohort had significantly fewer females (41.4% vs 42.4%; $P < .0001$) and white non-Hispanics (69.9% vs 82.9%, $P < .0001$). One third of the inpatient-performed colonoscopy cohort (32.6% vs 5.5%, $P < .0001$) were defined as having a significantly higher ASA score (ASA score of 3 or 4). Moreover, significantly fewer colonoscopy examinations reached the cecum in the inpatient cohort (85.8% vs 95.6%, $P < .0001$), and there were significantly more unplanned events during inpatient colonoscopies (1.6% vs 1.1%, $P = .002$) (Table 5). In addition, compared with the outpatient-performed colonoscopy cohort, inpatient-performed colonoscopy findings demonstrated significantly higher rates of diverticulosis (56.2% vs 37.6%), mucosal abnormality/colitis (19.4% vs 7.0%), tumor (4.9% vs 1.8%), angiodysplasia (3.2% vs 1.1%), active bleeding (0.6% vs 0.1%), and solitary ulcer (1.9% vs 0.3%) (all comparisons $P < .0001$). There were significantly fewer polyps or multiple polyps (32.3% vs 40.0%) and hemorrhoids (50.9% vs 66.7%) reported in the inpatient-performed colonoscopy cohort (both comparisons $P < .0001$) (Table 6).

Tertiary care versus community practice setting

In total, 60,290 (79.1%) patients underwent colonoscopy for hematochezia in a community practice setting. Compared with those patients undergoing colonoscopy in a tertiary care setting, the community practice patients were significantly younger, more likely to be white non-Hispanic females, and be healthier based on the ASA score ($P < .0001$). Moreover, in the community practice patient cohort, there was a significantly higher rate of reaching the cecum and significantly fewer unplanned events, both cardiopulmonary and severe events ($P < .0001$) (Table 7).

DISCUSSION

This population-based study, using the CORI NED, defines and describes patients presenting with acute overt LGIB (hematochezia) in a large consortium of diverse gastroenterology practices, primarily community-based practice, in the United States. We further characterized this hematochezia population by stratifying by age, practice setting, and, to better select for more severe cases of hematochezia, inpatient- versus outpatient-performed colonoscopy. Compared with published data from tertiary care centers, we found in the overall cohort a different prevalence for reported colonoscopic lesions as the cause of hematochezia.^{2,6} Specifically, we found internal hemorrhoids reported in 64.4% followed by diverticulosis in 38.8%. When we performed age-stratified analyses and restricted our analyses to patients 60 years of age and older, diverticulosis was the primary reported cause of hematochezia at 59.6%. Overall, 94.8% of colonoscopy examinations were reported to have reached the cecum, and this only decreased to 92.6% in the older age cohort. Less than

1% of patients underwent repeat colonoscopy within 72 hours of their index examination. Similar to other reported data, we found that serious adverse events with colonoscopy in the clinical setting of hematochezia were rare.¹

We believe this to be the first population-based report examining the role of colonoscopy in patients with hematochezia that stratifies by age. We found that 29,147 (38.3%), a significant proportion, of the patients undergoing colonoscopy for hematochezia were 60 years of age and older. This older age cohort had significantly more females and white non-Hispanics compared with the younger hematochezia patients. We also found significantly more of the older age cohort having a high-risk ASA score. As in reports from tertiary care centers, we found that the primary colonoscopic diagnosis for hematochezia in the older patients was diverticular disease.⁵ Furthermore, we found that for patients undergoing inpatient colonoscopy, one third had significantly higher ASA scores, there was a significantly lower rate of cecal intubation, and there were significantly more adverse events reported. Not surprisingly, we also found that the patients undergoing colonoscopy in a community practice setting were significantly younger and healthier, with more complete colonoscopies and fewer unplanned events.

We believe that there are a number of strengths to this study and in using the CORI NED as the primary endoscopic data source. CORI uses standardized and strict quality-control measures for all of their data, endoscopic data are derived from a variety of GI practice type settings with highly varied patient demographics, the majority of CORI sites are community based, providing a real-world view of endoscopic practice, and CORI has been used as the primary endoscopic data source for multiple previously published studies. This includes CORI data that we evaluated in patients presenting with nonvariceal upper GI hemorrhage.^{13,14} However, this 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 hematochezia (eg, hypotension, anemia, transfusion requirements), medication use, timing of colonoscopy, adequacy of colon preparation, or other diagnostic studies (eg, radiographic, nuclear medicine, angiographic), which may have been performed before or after colonoscopy. In addition, because of 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 who 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. Endoscopies 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 endoscopy data may be “at least” figures because some patients may have sought care at a non-CORI participating site and thus would not have been captured. In our study, lower GI hemorrhage was diagnosed based on the endoscopist’s suspicion to proceed with colonoscopy based on the patient’s presenting symptoms, physical examination, and laboratory data. Our study used repeat colonoscopy within 72 hours of the index endoscopy as a surrogate marker for recurrent hematochezia. Repeat colonoscopy may have had nothing to do with recurrent hematochezia and may only indicate an incomplete examination at the index colonoscopy with the need for a second-look examination. 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 United States and are susceptible to site-selection bias. Despite these limitations, the CORI database remains unique in that it provides us with insight into how real-life endoscopy is 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, the majority of persons presenting with hematochezia and undergoing colonoscopy in a GI community practice appear to be younger white non-Hispanic men, in good health who are found to have hemorrhoids, diverticulosis, polyps, and/or mucosal abnormalities/colitis that may explain their hematochezia. Yet, compared with younger patients with hematochezia who undergo colonoscopy, older patients are more likely to be female, white non-Hispanic, with significantly more severe comorbid medical conditions and who are more likely to have diverticulosis, polyps, mucosal abnormalities/colitis, tumors, or angiodysplasia that may explain their hematochezia. Furthermore, there were significantly higher rates of incomplete colonoscopy and adverse events in older patients. These data provide new information on colonoscopy performed in patients with hematochezia evaluated primarily in community practice.

Abbreviations

ASA	American Society of Anesthesiologists
CORI	Clinical Outcomes Research Initiative
LGIB	lower GI bleeding
NED	National Endoscopic Database

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TABLE 1**Hematochezia cohort demographics and procedural characteristics**

Total no.	76,186
Age group, y, no. (%)	
<50	23,495 (30.8)
50–59	23,544 (30.9)
60–69	14,876 (19.5)
70–79	9739 (12.8)
≥80	4532 (6)
Sex, no. (%)	
Female	33,665 (42.9)
Male	43,521 (57.1)
Race/ethnicity, no. (%)	
White non-Hispanic	62,314 (81.8)
Black non-Hispanic	5034 (6.6)
Asian/Pacific Islander non-Hispanic	1427 (1.9)
Native American non-Hispanic	731 (1.0)
Multiracial non-Hispanic	139 (0.2)
Hispanic	6347 (8.3)
Missing/unknown	194 (0.3)
ASA score, no. (%)	
I	20,958 (27.5)
II	41,122 (54.0)
III	5289 (6.9)
IV	289 (0.4)
V	1 (0)
Unknown	8527 (11.2)
Practice setting, no. (%)	
Community/HMO	60,290 (79.1)
Academic	6709 (8.8)
VA/military	9187 (12.1)
Depth of insertion, no. (%)	
Reached cecum	72,427 (94.8)
Repeat colonoscopy within 72 h of index examination, no. (%)	478 (0.6)
Unplanned events, no. (%)	
Any unplanned event	808 (1.1)
Cardiopulmonary unplanned event	696 (0.9)
Serious adverse event (bleeding, perforation, death)	76 (0.10)

ASA, American Society of Anesthesiologists; HMO, health maintenance organization; VA, Veterans Affairs.

TABLE 2**Colonoscopy findings***

Hemorrhoids	49,057 (64.4)
Diverticulosis	29,437 (38.6)
Polyp	25,205 (33.1)
Other finding	8150 (10.7)
Mucosal abnormality/colitis	5985 (7.9)
Multiple polyps	4355 (5.7)
Tumor	1522 (2.0)
Angiodysplasia	899 (1.2)
Solitary ulcer	325 (0.4)
Active bleeding	92 (0.1)

* Patients may have had multiple findings reported at colonoscopy.

TABLE 3

Age-stratified demographics and procedural characteristics

Age-stratified cohort, no. (%)	<60 y	≥60 y	<i>P</i> value
No.	47,039	29,147	
Sex, no. (%)			
Female	19,608 (41.7)	13,057 (44.8)	<.0001
Male	27,431 (58.3)	16,090 (55.2)	
Race/ethnicity, no. (%)			
White non-Hispanic	37,432 (79.6)	24,882 (85.4)	<.0001
Black non-Hispanic	3447 (7.3)	1687 (5.4)	
Asian/Pacific Islander non-Hispanic	1008 (2.1)	419 (1.4)	
Native American non-Hispanic	496 (1.1)	235 (0.8)	
Multiracial non-Hispanic	101 (0.2)	38 (0.1)	
Hispanic	4460 (9.5)	1887 (6.5)	
Missing/unknown	95 (0.2)	99 (0.3)	
ASA classification, no. (%)			
I	17,038 (36.2)	3920 (13.5)	<.0001
II	22,962 (48.8)	18,160 (62.3)	
III	1647 (3.5)	3642 (12.5)	
IV	88 (0.2)	201 (0.7)	
V	0	1 (0.0)	
Unknown	5304 (11.3)	3223 (11.1)	
Site type			
Community/HMO	37,039 (79.9)	22,686 (77.8)	<.0001
Academic	4093 (8.7)	2616 (9.0)	
VA/military	5342 (11.4)	3845 (13.2)	
Depth of insertion			
Reached the cecum	45,237 (96.2)	27,010 (92.7)	<.0001
Unplanned events			
Any unplanned event	345 (0.7)	463 (1.6)	<.0001
Cardiopulmonary	297 (0.6)	399 (1.4)	<.0001
Serious adverse event (bleeding, perforation, death)	23 (0.1)	53 (0.2)	<.0001

ASA, American Society of Anesthesiologists; HMO, Health maintenance organization; VA, Veterans Affairs.

TABLE 4

Colonoscopy findings by age strata *

	N = 76,186		
	<60 y (n =47,039)	>=60 y (n= 29,147)	P value
Hemorrhoids	31,273 (66.5)	17,784 (61.0)	<.0001
Diverticulosis	12,068 (25.7)	17,369 (59.6)	<.0001
Polyp	14,373 (30.6)	10,832 (37.2)	<.0001
Other findings	4524 (9.6)	3626(12.4)	<.0001
Mucosal abnormality/colitis	3390 (7.2)	2595 (8.9)	<.0001
Multiple polyp	2372 (5.0)	1983 (6.8)	<.0001
Tumor	558 (1.2)	964(3.3)	<.0001
Angiodysplasia	322 (0.7)	577(2.0)	<.0001
Actively bleeding	21 (0.0)	71 (0.2)	<.0001
Solitary ulcer	151 (0.3)	174(0.6)	<.0001

* Patients may have had multiple endoscopic findings reported at colonoscopy.

TABLE 5

Inpatient versus outpatient colonoscopy demographics

Characteristic	Inpatient, no. (%)	Outpatient, no. (%)	Unknown/missing, no. (%)	P value
Sex	3941 (5.2)	57,909 (76.0)	14,336 (18.8)	
Female	1630 (41.4)	24,541 (42.4)	6494(45.3)	<.0001
Male	2311 (58.6)	33,368 (57.6)	7842(54.7)	
Race/ethnicity				
White non-Hispanic	2756 (69.9)	47,977 (82.9)	11,581 (80.8)	<.0001
Black non-Hispanic	624 (15.8)	3352 (5.8)	1058 (7.4)	
Asian/Pacific Islander non-Hispanic	76 (1.9)	1151 (2.0)	200(1.4)	
Native American non-Hispanic	63 (1.6)	591 (1.0)	77 (0.5)	
Multiracial non-Hispanic	2 (0.1)	110 (0.2)	27 (0.2)	
Hispanic	412 (10.5)	4556 (7.9)	1,379 (9.6)	
Missing/unknown	8 (0.2)	172 (0.3)	14 (0.1)	
ASA classification				
I	479 (12.2)	15,444 (26.7)	5035(35.1)	<.0001
II	1792 (45.5)	33,055 (57.1)	6275(43.8)	
III	1178 (29.9)	3102 (5.4)	1009 (7.0)	
IV	108 (2.7)	71 (0.1)	110(0.8)	
V	0 (0)	0 (0)	1 (0.0)	
Site type				
Community/HMO	2645 (67.1)	44,976 (77.7)	12,669 (88.4)	<.0001
Academic	658 (16.7)	5086 (8.8)	965(6.7)	
VA/Military	638 (16.2)	7847 (13.6)	702(4.9)	
Depth of insertion				
Reached the cecum	3,381 (85.8)	55,378 (95.6)	13,488 (94.1)	<.0001
Unplanned events				
Any unplanned event	63 (1.6)	606 (1.1)	139(1.0)	.002
Cardiopulmonary unplanned event	56 (1.4)	523 (0.9)	117(0.8)	.002
Serious adverse event (bleeding, perforation, death)	6 (0.2)	57 (0.1)	13 (0.1)	.544

ASA, American Society of Anesthesiologists; HMO, health maintenance organization; VA, Veterans Affairs.

TABLE 6

Colonoscopy findings stratified by inpatient versus outpatient status (N = 76,186)

Characteristic	Inpatient	Outpatient	Unknown/missing	P value
Findings*	3941 (5.2)	57,909(76.0)	14,336 (18.8)	
Hemorrhoids	2005(50.9)	38,643(66.7)	8409(58.7)	<.0001
Diverticulosis	2215(56.2)	21,753(37.6)	5469(38.2)	<.0001
Polyp	1104(28.0)	19,641(33.9)	4460(31.1)	<.0001
Other finding	917(23.3)	5408 (9.3)	1825(12.7)	<.0001
Mucosal abnormality/colitis	766(19.4)	4035 (7.0)	1184 (8.3)	<.0001
Multiple polyp	168(4.3)	3528 (6.1)	659(4.6)	<.0001
Tumor	193(4.9)	1,055(1.8)	274(1.9)	<.0001
Angiodysplasia	126(3.2)	629 (1.1)	144(1.0)	<.0001
Active bleeding	23(0.6)	49 (0.1)	20 (0.1)	<.0001
Solitary ulcer	76(1.9)	151 (0.3)	98 (0.7)	<.0001

* Patients may have had multiple findings per procedure.

TABLE 7

Tertiary care versus community practice colonoscopy demographics

Characteristic	Tertiary care	Community practice	P value
No. (%)	15,896 (20.1)	60,290 (79.1)	
Age group, no. (%)			
<50	4344(27.3)	19,151 (31.8)	<.0001
50–59	5091(32.0)	18,453 (30.6)	
60–69	3331(21.0)	11,545 (19.2)	
70–79	2161(13.6)	7578 (12.6)	
≥80	969(6.1)	3563 (5.9)	
Sex			
Female	3985(25.1)	28,680 (47.6)	<.0001
Male	11,911 (74.9)	31,610 (52.4)	
Race/ethnicity, no. (%)			
White non-Hispanic	12,379 (77.9)	49,935 (82.8)	<.0001
Black non-Hispanic	1568 (9.9)	3466 (5.8)	
Asian/Pacific Islander non-Hispanic	323(2.0)	1104 (1.8)	
Native American non-Hispanic	80 (0.5)	651 (1.1)	
Multiracial non-Hispanic	38 (27.3)	101 (0.2)	
Hispanic	1502 (9.5)	4845 (8.0)	
ASA classification			
I	3091(19.5)	17,867 (29.6)	<.0001
II	9905(62.3)	31,217 (51.8)	
III	1879(11.8)	3410 (5.7)	
IV	146(0.9)	143 (0.2)	
V	1 (0.0)	0 (0.0)	
Depth of insertion			
Reached the cecum	14,524 (91.4)	57,723 (95.7)	<.0001
Unplanned events			
Any unplanned event	260(1.6)	548 (0.9)	<.0001
Cardiopulmonary unplanned event	211(1.3)	485 (0.8)	<.0001
Serious adverse event (bleeding, perforation, death)	37 (0.2)	39 (0.1)	<.0001

ASA, American Society of Anesthesiologists.