Benchmarking Adenoma Detection Rates for Colonoscopy: Results From a US-Based Registry

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INTRODUCTION: **Adenoma detection rate (ADR) is highly variable across practices, and national or population-based estimates are not available. Our aim was to study the ADR, variability of rates over time, and factors associated with detection rates of ADR in a national sample of patients undergoing colonoscopy.**

METHODS: **We used colonoscopies submitted to the GI Quality Improvement Consortium, Ltd. registry from 2014 to 2018 on adults aged 50–89 years. We used hierarchical logistic models to study factors associated with ADR.**

RESULTS: **A total of 2,646,833 colonoscopies were performed by 1,169 endoscopists during the study period. The average ADR for screening colonoscopies per endoscopist was 36.80% (SD 10.21), 44.08 (SD 10.98) in men and 31.20 (SD 9.65) in women. Adjusted to the US population, the ADR was 39.08%. There was a significant increase in ADR from screening colonoscopies over the study period from 33.93% in 2014 to 38.12% in 2018.**

DISCUSSION: **The average ADR from a large national US sample standardized to the US population is 39.05% and has increased over time.**

SUPPLEMENTARY MATERIAL accompanies this paper at http://links.lww.com/AJG/C90, http://links.lww.com/AJG/C91.

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INTRODUCTION

Colonoscopy is an effective screening and diagnostic tool, but highly operator dependent for detection of neoplasia (1–7). Adenoma detection rate (ADR) has been validated as a predictor of cancer occurring after colonoscopy in 3 landmark studies (6–8). Current recommended minimal thresholds for detection are 25% overall, 30% in men and 20% in women (9), but these are based on expert opinion, and no national benchmarking data are available for the United States. Also, although studies show increase in ADR over time (10), the change in ADR at a larger scale in the United States is not known. Our aim was to study the ADR, variability of detection over time, and factors associated with detection in a national sample of patients undergoing colonoscopy using the GI Quality Improvement Consortium, Ltd. (GIQuIC) registry.

METHODS

GIQuIC was established in 2009 as a collaborative, nonprofit, scientific organization between the American College of Gastroenterology and the American Society for Gastrointestinal Endoscopy (11). Our analysis included colonoscopies from 2014 to 2018 on adults aged 50–89 years. Only the first colonoscopy record per patient at each site was included, with adequate preparation and photodocumentation. For provider-level analyses, we only included endoscopists who contributed data to each year of the study, performed a minimum of 30 examinations per year and at least 150 examinations over the study period, and had less than 5% of pathology information missing. ADR was defined as number of colonoscopies with at least 1 adenomatous polyp detected divided by the total number of colonoscopies performed by an endoscopist over a given period. Sessile serrated lesions were not included in the definition of ADR. For the ADR calculation and analysis, we excluded procedures with inadequate bowel preparation or no photodocumentation of the cecum. We also calculated standardized screening ADRs, standardized to the US population of 50 years of age and older using the 2010 census data. We used generalized estimating equations to study factors associated with ADR while accounting for clustering within individual endoscopists, adjusted for age, sex, race, American Society of Anesthesiology class, withdrawal time, indication, year, and geographic location. In separate analysis, we evaluated preparation quality over time. The Friedman test was used for significance of trends over time. The study was deemed

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Table 1. Distribution of patient-, provider-, and procedure-level variables (n = 2,646,833)

Characteristic	Overall 2,646,833 n (%)	Screening 1,417,824 (53.6%) n (%)	Surveillance 740,487 (28.0%) n (%)	Diagnostic 488,522 (18.5%) n (%)
Age (yr)				
50–59	1,109,548 (41.9)	755,578 (53.3)	195,925 (26.5)	158,045 (32.4)
60–69	986,408 (37.3)	492,682 (34.8)	318,669 (43.0)	175,057 (35.8)
70–79	482,731 (18.2)	159,598 (11.3)	201,027 (27.2)	122,106 (25.0)
80–89	68,146 (2.6)	9,966 (0.7)	24,866 (3.4)	33,314 (6.8)
Mean (SD)	62.07 (8.50)	59.45 (7.71)	65.20 (7.79)	64.93 (9.16)
Median	61.0	59.00	65.00	65.00
Male	1,217,665 (46.0)	642,571 (45.3)	384,282 (51.9)	190,812 (39.1)
Race				
White	1,679,037 (63.4)	854,582 (60.3)	506,453 (68.4)	318,002 (65.1)
Black	216,393 (8.2)	123,247 (8.7)	53,441 (7.2)	39,705 (8.1)
Asian	58,530 (2.2)	36,144 (2.6)	13,916 (1.9)	8,470 (1.7)
Other	88,866 (3.4)	55,823 (3.9)	17,018 (2.3)	16,025 (3.3)
Unknown/declined	604,007 (22.8)	348,028 (24.6)	149,659 (20.2)	106,320 (21.8)
ASA classification				
I	285,819 (10.8)	207,161 (14.6)	52,213 (7.1)	26,445 (5.4)
II	1,878,866 (71.0)	1,020,808 (72.0)	530,558 (71.7)	327,500 (67.0)
III	477,126 (18.0)	188,609 (13.3)	156,547 (21.1)	131,970 (27.0)
IV	4,840 (0.2)	1,229 (0.1)	1,164 (0.2)	2,447 (0.5)
V	17 (0.0)	7 (0.0)	4 (0.0)	6 (0.0)
E	165 (0.0)	10 (0.0)	1 (0.0)	154 (0.0)
Withdrawal time (min)				
≤6	320,356 (12.1)	180,672 (12.7)	74,360 (10.0)	65,324 (13.4)
6–11	1,278,103 (48.3)	712,241 (50.2)	335,878 (45.4)	229,984 (47.1)
>11	866,759 (32.8)	438,824 (31.0)	274,931 (37.1)	153,004 (31.3)
Unknown/other	181,615 (6.9)	86,087 (6.1)	55,318 (7.5)	40,210 (8.2)
Year				
2014	392,016 (14.8)	207,181 (14.6)	105,162 (14.2)	79,673 (16.3)
2015	554,813 (21.0)	298,451 (21.2)	153,134 (20.7)	103,228 (21.1)
2016	588,985 (22.3)	312,555 (22.0)	164,546 (22.2)	111,884 (22.9)
2017	569,578 (21.5)	304,498 (21.5)	161,396 (21.8)	103,684 (21.2)
2018	541,441 (20.5)	295,139 (20.8)	156,249 (21.1)	90,053 (18.4)
Geography				
Midwest	385,344 (14.6)	182,767 (12.9)	128,401 (17.3)	74,176 (15.2)
Northeast	514,923 (19.5)	305,086 (21.5)	116,288 (15.7)	93,549 (19.2)
South	1,211,338 (45.8)	644,606 (45.5)	340,114 (45.9)	226,618 (46.4)
West	529,750 (20.0)	282,154 (19.9)	154,276 (20.8)	93,320 (19.1)
Other/unknown	5,478 (0.2)	3,211 (0.2)	1,408 (0.2)	859 (0.2)
Endoscopist GI specialty[a]	2,171,500 (82.0)	1,146,849 (80.9)	618,239 (83.5)	406,412 (83.2)
Endoscopy suite type				
Hospital	255.229 (9.6)	123,043 (8.7)	65,066 (8.8)	67,120 (13.7)
ASC	2,204,555 (83.3)	1,295,414 (84.3)	617,820 (83.4)	391,321 (80.1)
Office-based	69,312 (4.5)	60,865 (4.3)	37,411 (5.1)	19,461 (4.0)
Unknown	117,737 (4.5)	60,865 (4.3)	37,411 (5.1)	19,461 (4.0)

ASA, American Society of Anesthesiology; ASC, ambulatory surgical center; GI, gastrointestinal; NPI, National Provider Identifier.
[a]Defined as having one of the gastroenterology-specific taxonomy codes listed in the NPI Database.

Table 2. ADR for screening colonoscopy per physician

	Overall			Male patients		Female patients	
	Physician N	Mean ADR (SD)[a]	Adjusted ADR[b]	Physician N	Mean ADR (SD)	Physician N	Mean ADR (SD)
Overall	1,140	36.80 (10.21)	39.08	1,061	44.08 (10.98)	1,103	31.20 (9.65)
2014	1,025	33.93 (11.76)	36.36	824	41.08 (12.90)	912	28.55 (11.15)
2015	1,131	35.80 (11.06)	38.25	1,040	43.12 (12.50)	1,080	30.14 (10.39)
2016	1,131	36.95 (11.16)	39.36	1,062	44.12 (12.43)	1,101	31.50 (10.75)
2017	1,130	38.01 (10.82)	40.62	1,069	45.18 (12.00)	1,100	32.37 (10.56)
2018	1,103	38.12 (10.98)	40.01	1,031	45.36 (11.62)	1,065	32.38 (10.81)

ADR, adenoma detection rate.
[a]Per physician.
[b]Adjusted to the US population aged 50 years and older per 2010 US census data, per procedure.

Institutional Review Board (IRB) exempt by University of Minnesota, and the GIQuIC Research Database is exempt from IRB overview as determined by Western IRB.

RESULTS

A total of 2,646,833 colonoscopies were performed during the study period that met the inclusion criteria (Table 1). The average endoscopist ADR for screening colonoscopies was 36.80% (SD 10.21), 44.08 (SD 10.98) in men and 31.20 (SD 9.65) in women (Table 2). There was an increase in ADR from screening colonoscopies over the study period from 33.93% in 2014 to 38.12% in 2018 (Table 2; see Supplementary Figure 1, Supplementary Digital Content 1, http://links.lww.com/AJG/C90). This trend was significant when the analysis was restricted to physicians with at least 30 colonoscopies per year for every year of the study ($n = 978$, $P < 0.0001$). We calculated the ADR adjusted to the US population aged 50 years and older per the 2010 census (age standardized) to be 39.08% (Table 2). There was also a significant trend for improvement in cases with adequate bowel preparation over the same period (93.5% vs 95.6% adequate in 2014 and 2018, respectively; P value for trend < 0.0001) (see Supplementary Table 1, Supplementary Digital Content 2, http://links.lww.com/AJG/C91). Overall ADRs were higher for surveillance colonoscopy compared with screening or diagnostic examinations (detection rates 47.25% and 34.14% for surveillance and diagnostic colonoscopies, respectively; see Supplementary Table 2, Supplementary Digital Content 2, http://links.lww.com/AJG/C91).

Clinically significant factors associated with higher ADR were age (odds ratio [OR] 1.28; 95% confidence interval [CI] 1.27–1.29 for 60–69 years; 1.57, 95% CI 1.55–1.58 for 70–79 years compared with 50–59 years), male sex (OR 1.57; 95% CI 1.56–1.58), surveillance indication (vs screening; OR 1.24; 95% CI 1.22, 1.26), and longer withdrawal times (>11 minutes vs ≤6 minutes) (OR 10.07; 95% CI 9.51–10.66). These and other associated factors are shown in Table 3.

DISCUSSION

We found that ADRs for screening colonoscopy from a large national quality benchmarking registry are 36.80 (39.08% standardized to the US population older than 50 years) and have increased over time. An increase by endoscopist and by year was seen. There was also a significant increase in adequate bowel preparation quality over this period. Although the generalizability of the current study is not known, to the best of our knowledge, these are the first estimates of a large US sample standardized to the US population and inform national benchmarks that a standardized target of ADR target of 30–35% may be considered for national benchmarking.

Although we do not know all the factors that may had led to the increase in ADR over time, it indicates roles of improved bowel preparation and increased awareness and recognition of importance of detecting and removing adenomatous polyps. It may also indicate the value of feedback and report cards, as well as contributions of benchmarking for users of GIQuIC (12). The estimates in the literature range from average of 11%–78%, and (13–15) expert opinion suggests that the recommended thresholds of ADR of 25% should be considered minimum targets and that colonoscopists with ADRs above the thresholds should strive for aspirational ADRs in the range of 45%–50% (9). Recent screening recommendations from the Multi-Society Task Force encourage patients to ask potential colonoscopists for their ADR (16). Gains in ADR can be achieved by education regarding the spectrum of endoscopic appearances of precancerous lesions and optimal withdrawal technique (17). Split-dose bowel preparations improved ADR in retrospective trials (18) and randomized controlled trials (19). Technical measures that have been associated with increased detection include rotating the patient during withdrawal (20,21).

We also found that male sex and longer withdrawal times are associated with higher ADR. These associations are consistent with other reports (5,8,22,23). Others have reported an independent association of longer withdrawal time with reduction in postcolonoscopy colon cancer (8). Our study confirms the importance of measuring and reporting withdrawal time.

Limitations of our study include the lack of information on other risk factors such as smoking, body mass index, medication use, and diet. Also, we do not have information on specific quality improvement projects that may impact improved endoscopic performance and detection of adenomas (24,25). Physicians who self-select to use GIQuIC may be more focused on quality parameters, and this may contribute to a higher baseline ADR.

The strength of our study is the large and diverse nature of the database: GIQuIC registry has more than 10 million examinations included, representing diverse geographic and practice settings, and approximately one-third of practicing gastroenterologists in the United States. Other strengths are internal quality processes on collected data and information on modifiable factors such as bowel preparation quality and withdrawal time. Future

Table 3. Factors associated with adenoma detection rate using hierarchical logistic models (n = 2,465,218 colonoscopies by n = 1,169 endoscopists)

Characteristic	OR	Lower CI	Upper CI
Age			
50–59	1.0 (ref)		
60–69	1.28	1.27	1.29
70–79	1.57	1.55	1.58
80–89	1.88	1.84	1.93
Sex			
Female	1.0 (ref)		
Male	1.57	1.56	1.58
Race			
White	1.0 (ref)		
Nonwhite	0.98	0.97	0.99
ASA class			
I	1.0 (ref)		
II	1.19	1.17	1.20
III	1.46	1.44	1.48
IV-E	1.62	1.46	1.79
Indication			
Screening	1.0 (ref)		
Surveillance	1.24	1.22	1.26
Diagnostic	0.79	0.77	0.80
Withdrawal time (min)			
≤6	1.0 (ref)		
7–11	2.87	2.73	3.02
>11	10.07	9.51	10.66
Year			
2014	1.0 (ref)		
2015	1.03	1.02	1.05
2016	1.05	1.03	1.07
2017	1.06	1.04	1.09
2018	1.05	1.03	1.08
Region			
West	1.0 (ref)		
Midwest	1.08	0.98	1.20
South	1.07	0.99	1.16
Northeast	0.83	0.74	0.92
Other/unknown	0.94	0.87	1.01

ASA, American Society of Anesthesiology; CI, confidence interval; OR, odds ratio.

studies are needed to understand the association of changes in ADRs and postcolonoscopy colorectal cancers. In conclusion, in this large national database of colonoscopy, the average ADR is 36.80% and has increased over time.

CONFLICTS OF INTEREST

Guarantor of the article: Aasma Shaukat, MD, MPH.
Specific author contributions: A.S. (concept, design, analysis, writing, and editing manuscript); J.H. (concept, design, analysis, and edits); and I.M.P., M.P., D.G., C.S., and G.E. (design, analysis, and editing revisions).

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