Published in final edited form as:

Gastrointest Endosc. 2012 July ; 76(1): 100–6.e1-4. doi:10.1016/j.gie.2012.01.019.

Knowledge of quality performance measures associated with endoscopy among gastroenterology trainees and the impact of a web-based intervention

Jennifer S. Thompson, MD¹, Benjamin Lebwohl, MD^{1,2}, Sapna Syngal, MD^{3,4}, and Fay Kastrinos, MD^{1,2}
New York, New York, USA

Abstract

Background—Knowledge of quality measures in endoscopy among trainees is unknown.

Objective—To assess knowledge of endoscopy-related quality indicators among U.S. trainees and determine whether it improves with a Web-based intervention.

Design—Randomized, controlled study.

Setting—Multicenter.

Participants—This study involved trainees identified from the American Society for Gastrointestinal Endoscopy membership database.

Intervention—Participants were invited to complete an 18-question online test. Respondents were randomized to receive a Web-based tutorial (intervention) or not. The test was readministered 6 weeks after randomization to determine the intervention's impact.

Main Outcome Measurements—Baseline knowledge of endoscopy-related quality indicators and impact of the tutorial.

Results—A total of 347 of 1220 trainees (28%) completed the test; the mean percentage of correct responses was 55%. For screening colonoscopy, 44% knew the adenoma detection rate benchmark, 42% identified the cecal intubation rate goal, and 74% knew the recommended minimum withdrawal time. A total of 208 of 347 trainees (59%) completed the second test; baseline scores were similar for the tutorial (n = 106) and no tutorial (n = 102) groups (56.4% vs 56.9%, respectively). Scores improved after intervention for the tutorial group (65%, $P = .003$) but remained unchanged in the no tutorial group. On multivariate analysis, each additional year in training (odds ratio [OR] 2.3; 95% confidence interval [CI], 1.5–3.4), training at an academic institution (OR 2.6; 95% CI, 1.1–6.3), and receiving the tutorial (OR 3.2; 95% CI, 1.7–5.9) were associated with scores in the upper tertile.

Limitations—Low response rate.

Copyright © 2012 by the American Society for Gastrointestinal Endoscopy

Reprint requests: Fay Kastrinos, MD, MPH, Columbia University Medical Center, 630 West 168th Street, New York, NY 10032.

¹Division of Liver and Digestive Diseases

²the Herbert Irving Comprehensive Cancer Center at Columbia University Medical Center New York, New York, USA,

³Population Sciences Division, Dana-Farber Cancer Institute

⁴Division of Gastroenterology, Brigham and Women's Hospital Boston, Massachusetts, USA.

DISCLOSURE: Funding was provided by a 2008 American Society for Gastrointestinal Endoscopy Olympus Career Development Award (F. Kastrinos), NCI K24 113433 (S. Syngal). No other financial relationships relevant to this publication were disclosed.

Conclusion—Knowledge of endoscopy-related quality performance measures is low among trainees but can improve with a Web-based tutorial. Gastroenterology training programs may need to incorporate a formal didactic curriculum to supplement practice-based learning of quality standards in endoscopy. (*Gastrointest Endosc* 2012;76:100–6.)

There is an increasing interest and a growing body of literature concerning the quality of endoscopic practice. Endoscopy has a proven value in the diagnosis and treatment of GI disorders and provides screening and prevention for a number of cancers. The benefits of endoscopy are maximized only when procedures are performed to an optimal level of quality. In an effort to quantify and demonstrate the value provided by gastroenterologists regarding endoscopic performance, multiple professional societies associated with endoscopy have developed metrics and systems to measure and collect relevant data and to help define areas for continuous quality improvement.^{1–5} At the forefront of these efforts has been the development of key quality-of-care indicators for the performance of colonoscopy, in particular for its use in colorectal cancer prevention.^{6–8}

The use of colonoscopy has become an accepted effective method to screen the colon for neoplasia in average-risk, asymptomatic patients aged over 50 years.⁹ A high-quality evaluation consists of intubation of the entire colon to the cecum and a detailed mucosal inspection in an adequately prepared colon.⁸ Careful mucosal inspection is essential to effective colorectal cancer prevention and reduction of cancer mortality because the primary goal is the detection of neoplastic lesions.^{10,11} Longer withdrawal times, which allow for diligent examination of the mucosa, have been demonstrated to improve adenoma detection rates.¹²

High-quality performance of screening colonoscopy has emerged as a major focus after increased recognition that there is significant variation in performance by endoscopists, which can affect patient-related outcomes in clinical practice.^{12–16} As an example, adenoma detection rate during screening colonoscopy is a quality measure that is increasingly monitored; its validity was recently proven in a study in which patients who underwent colonoscopy by endoscopists with higher adenoma detection rates had a lower risk of interval cancer development.¹⁷

The ability of continuous quality improvement programs and monitoring of quality indicators to enhance the practice of endoscopy depends on their widespread dissemination and utilization, along with the development of methods to promote improvement when deficiencies are documented. In addition, quality-related metrics bring objectivity to the assessment of competency among gastroenterologists and can potentially impact training. Although much has been written about endoscopic training, the predominant emphasis has been on determining achievement of competency based on numbers, such as the number of performed colonoscopies, polypectomies, and biopsies. There are currently no established recommendations for teaching endoscopy quality indicators to trainees.¹⁸ Nor is it known whether trainees are cognizant of the importance of quality measures and the need to monitor performance in order to achieve the recommended benchmarks. The aim of this study was to assess the knowledge among gastroenterology trainees regarding quality indicators associated with endoscopy, with a focus on screening colonoscopy. We also determined whether the trainee knowledge base on quality performance measures can be improved with a Web-based tutorial intervention.

METHODS

Participants

Gastroenterology trainees enrolled in U.S. fellowship programs through the academic year ending June 2010 were identified by using the membership roster of the American Society for Gastrointestinal Endoscopy (ASGE). E-mail addresses of the trainees were provided by the ASGE to the principal investigator without any other identifying information. A total of 1239 participants were contacted via e-mail and invited to participate in this study. Participants were informed that the study involved (1) completion of a Web-based survey (phase I), (2) randomization to either receive or not receive electronic access to an online tutorial that provided answers and explanations to the survey questions, and (3) completion of a second, identical Web-based survey (phase II). This study protocol was reviewed and approved by the Institutional Review Board at Columbia University.

Survey instrument

An 18-question, Web-based survey was developed to assess gastroenterology trainees' basic knowledge of quality-related measures associated with endoscopy. The survey was hosted by SurveyMonkey (SurveyMonkey.com, LLC, Palo Alto, Calif) and was structured to be completed in approximately 10 minutes. The survey was divided into two sections: knowledge assessment and demographics.

The knowledge assessment portion of the survey consisted of 12 questions related to quality indicators for colonoscopy and other endoscopic procedures. The questions were designed to assess the following 3 areas of quality-related endoscopic performance: (1) before the procedure (ie, risk stratification, periprocedural anticoagulation and antibiotic prophylaxis indications), (2) during the procedure (ie, withdrawal times, adenoma detection rates, cecal intubation rates, definition of adequate bowel preparation, and endoscopic documentation), and (3) after the procedure (ie, complications and surveillance recommendations based on histologic findings at index colonoscopy). The survey questions either were adapted from those previously published in the Digestive Diseases Self-Education Program (version 5), were existing Continuing Medical Education (CME) questions, or were developed from evidence and consensus-based guidelines developed by several American gastroenterological professional societies including the ASGE, American Gastroenterological Association, and American College of Gastroenterology, Digestive Diseases Self-Education Program or as well as the U.S. Multi-Society Task Force on Colorectal Cancer.^{8–10,12,19–25} Whenever possible, the wording of questions was kept similar to those used in previously published materials. In addition, the following demographic data pertaining to study participants was collected: trainee sex, year in training (1, 2, 3), setting of training (academic, community, Veterans Affairs, other), number of trainees in the training program, perceived emphasis on quality endoscopy during training (very frequently, frequently, rarely, or not emphasized at all), and number of screening colonoscopies performed weekly (<5, 5–9, 10–15, >15). The survey was administered to 8 attending gastroenterologists before its distribution to trainees to assess time needed to complete, content of material, and whether there was any difficulty in understanding any concepts or language used in the survey. A copy of the survey is found in the Supplementary Data section.

Intervention: tutorial

The tutorial was designed as an online answer key, with short explanations provided for each survey question. The tutorial also provided references with electronic links to the corresponding PubMed citations for each question and was composed solely of reading material. The answers were derived from the information provided in the cited publications

or from previously published testing materials (ie, Digestive Diseases Self-Education Program or existing CME questions). Respondents randomized to the tutorial arm were sent an e-mail link to the online tutorial within 24 to 48 hours of their completion of the first survey. All participants were given the opportunity to view the tutorial at the end of phase II. A copy of the tutorial can be viewed online at www.columbia.edu/~fk18.

Study protocol

Phase I: completion of the first survey—The first survey was distributed to eligible trainees, with a reminder e-mail sent to nonparticipants at 1 and 2 weeks after the initial invitation. The survey was electronically accessible for a total of 18 days. Each individual who responded to the e-mail solicitation by completing the first survey was randomized immediately thereafter in an alternating manner to receive a link to the tutorial arm or no tutorial arm. The tutorial Web site was available to those in the tutorial arm for an additional 1 week after the end of the first survey accessibility period.

Phase II: completion of the second survey—Six weeks after completion of phase I, all individuals who completed the first survey were invited to complete the second survey. The second survey was composed of the same questions pertaining to knowledge assessment, but the question order and answer choice sequence was changed. A reminder invitation to complete the survey was sent at 1 and 2 weeks after the e-mail distribution for phase II of the study. The second survey was electronically accessible for 25 days.

Statistical analysis

Statistical analysis was performed by using SAS statistical software (version 9.2; SAS Institute Inc, Cary, NC). Categorical outcome data are reported as frequencies. Comparisons between participants in the two randomization arms based on demographic data and responses to surveys one and two were assessed by using chi-square tests. Continuous data were reported in mean values, and mean score comparisons between groups were assessed by using a *t* test or analysis of variance where applicable. Test for trend to assess responses to questions based on year in training were assessed by using the Cochran-Armitage test. Multivariable logistic regression analysis was used to determine those predictors associated with an improved score within the upper tertile, including impact of the tutorial. It was determined a priori that the following predictors would be included in the model: year in training, sex of trainee, hospital training setting (dichotomized: academic versus other), training program's emphasis of quality (dichotomized: very frequent/frequent versus rarely/not), and volume of screening colonoscopies performed by trainee (dichotomized: <10/week vs 10). Comparisons are reported as odds ratios with 95% confidence intervals. A 2-sided *P* value of < .05 was considered statistically significant.

RESULTS

General characteristics of study participants

A total of 1239 gastroenterology trainees were identified from the ASGE trainee membership roster and were eligible to receive an e-mail invitation to participate in this study. Of these, 1220 had active e-mail addresses and were included in the analyses. Twenty-eight percent (347/1220) completed the online survey and were subsequently randomized into the tutorial versus no tutorial arms. Of the 347 randomized participants, 208 (59%) completed the second survey. A schematic on participation is presented in Figure 1.

The general characteristics of study participants, overall and stratified by randomized arm, are shown in Table 1. The majority of respondents were men (74%), and there was a near equal distribution of trainees in their first, second, and third or more years of training (31%,

38%, and 31%, respectively). Sixty-six percent (228/347) of trainees performed 10 or fewer screening colonoscopies per week, with only 14% reporting more than 15 screening procedures a week. Eighty-four percent (291/347) identified their hospital training settings as academic/tertiary care, and 73% reported a frequent or very frequent emphasis on quality-related measures in endoscopy during training. Twenty-seven percent described their training program's emphasis on quality endoscopy as rare or never emphasized. There were no differences in demographic characteristics among those trainees randomized to either the tutorial or no tutorial arms.

Survey results

Trainee knowledge—Results from the 347 study participants who responded to the first survey were used to determine the overall baseline knowledge in quality-related measures associated with endoscopy. The mean percentage of correct responses in the 12 assessment questions among all participants was 55%, and the results for each question are shown in Table 2. Trainees scored highest in knowledge of correct procedural documentation and regarding complications related to colonoscopy, with 97% and 80% of participants answering these questions correctly. Less than 50% of trainees were able to correctly identify the currently recommended national benchmarks for adenoma detection rate in average-risk men and women aged over 50 years, the definition of an adequate bowel preparation, the cecal intubation rate goal for screening colonoscopy, and what constitutes a complete colonoscopy for calculating the cecal intubation rate. The majority of trainees (75%) knew the recommended withdrawal time associated with screening colonoscopy in the absence of polyp removal, and 61% of trainees were familiar with the documented miss rates for adenoma detection as determined by studies of tandem colonoscopy and in comparison to radiographic modalities.^{14,15} With respect to assessment of surveillance recommendations after colonoscopy, 59% of trainees correctly identified the appropriate interval in a case where an advanced adenoma was removed during screening colonoscopy. There was an improvement in the overall mean score with each additional year in training from 49.2% correct among first year trainees to 55.8% and 60.4% among second and third year trainees, respectively ($P < .0001$), and the results of each individual question compared by year in training are shown in Supplemental Data Table 1.

Impact of intervention—Results from the 208 trainees who responded to the second survey after randomization were used to determine the impact of the tutorial intervention. There was no significant difference in the baseline scores (overall and by individual question) between those trainees randomized into the tutorial and no tutorial arms (56.4% vs 56.9%, respectively; $P = .40$), (Table 2).

The respondents who did not receive the tutorial achieved the same overall mean score on surveys one and two (56.9%), with no significant differences noted in responses to individual questions. In contrast, mean scores among those trainees randomized to receive the tutorial increased significantly after the tutorial intervention from 56.4% to 64.5% ($P = .0003$) (Table 2). Specifically, improvement was noted in correct identification of complications associated with screening colonoscopy (increase from 78%–91%; $P = .01$), recommended cecal intubation rates for screening colonoscopy (49%–66% correct; $P = .01$), and what constitutes a complete colonoscopy for calculating cecal intubation rates (15%–31% correct; $P = .006$). The tutorial also improved trainees' knowledge on the definition of an adequate bowel preparation (32%–48% correct; $P = .02$) and the ability to correctly identify the appropriate surveillance interval for an advanced adenoma detected on screening colonoscopy (50%–65% correct; $P = .03$).

Predictors of attaining an improved overall score—On multivariate analysis, those trainees who received the tutorial were 3.2 times (95% confidence interval, 1.7–5.9) more likely to score in the top tertile on the readministered survey than those trainees who had not received the tutorial. Attaining a higher overall score was also noted with advancing year in training, and training at an academic center (Table 3). Sex of trainee, degree of emphasis on quality during training, and number of screening colonoscopies performed weekly were not predictive of achieving a higher score within the top tertile.

DISCUSSION

Knowledge of quality measures associated with endoscopic procedures, screening colonoscopy in particular, is low among gastroenterology trainees in the United States. Fewer than 50% of trainees were able to correctly identify the currently recommended national benchmarks for adenoma detection rate in average-risk men and women aged over 50 years, the definition of an adequate bowel preparation, and the cecal intubation rate goal for screening colonoscopy. As anticipated, baseline knowledge of certain quality measures improved with each additional year in training, but baseline knowledge of certain quality measures was similarly low among all trainees, regardless of year in training, for identifying the correct surveillance interval in the case of a completely resected advanced adenoma. This was a striking finding because it is essential for gastroenterologists to have a solid command of the recommended guidelines related to colorectal cancer screening to be able to give clear directives on surveillance intervals. We found that a Web-based tutorial could improve knowledge of indicators of quality endoscopy. Training programs may therefore benefit from complementing practice-based learning with a more formal didactic curriculum in quality standards for endoscopic performance.

To our knowledge, this is the first study to determine trainees' knowledge of quality parameters associated with the performance of endoscopic procedures. The ability to survey a large group of trainees from diverse programs throughout the nation is a strength of this study. The response rate to the initial survey is comparable to that described in other recent nationwide surveys of gastroenterology trainees²⁶ and other e-mail surveys conducted among health professionals.^{27,28} More than half of the initial study participants completed the second survey needed to assess the impact of the intervention. The impact of a simple intervention—a Web-based tutorial—in a randomized, controlled design also provides insight to whether a didactic approach can be effective in enhancing trainee knowledge in this area of endoscopic practice.

There are several potential limitations to the current study. The first relates to the content validity of the survey and whether each question adequately and representatively samples the content area to be measured. To minimize this possible shortcoming, we chose to predominantly use previously published questions and to derive additional questions from widely accepted guidelines. We also performed pilot testing of the survey among several practicing gastroenterologists to address survey content and language, particularly for those questions adapted from existing guidelines. A second potential limitation may be related to volunteer bias, whereas those trainees who elected to participate may have been more confident in their knowledge of quality measures related to endoscopy than nonparticipating trainees. A low response rate also may raise concerns about nonresponse bias or the likelihood that nonresponding trainees are systematically different from the population under study. However, such bias likely would have led to an overestimate in the baseline knowledge of trainees, and overall scores would have been expected to be lower than the 55% attained by participating trainees. In addition, there were no demographic differences among the randomized trainees who responded to the second survey and those who did not (Supplemental Data, Table 2). We also are unable to confirm how many trainees randomized

to the tutorial arm actually accessed and reviewed the tutorial. However, the higher scores attained on the readministered test by trainees in the tutorial arm suggest that they reviewed the Web-based material. It is also possible that because trainees were informed that they would be evaluated a second time on the same material, they may have sought out the answers to the questions or subject matters addressed, independent of the randomization phase of the study. However, because there was no improvement in the scores on the second survey among trainees in the no tutorial arm, we believe that any such effect was negligible. Last, this study did not assess the longterm impact of the tutorial and whether any knowledge improvement was sustainable. Such analyses would have required retesting the trainees many months after exposure to the tutorial, which likely would have led to further participant attrition.

The culture of quality needs to be better emphasized in the training of future gastroenterologists. The practice of high-quality endoscopy starts during fellowship training and requires clear fluency in key quality performance indicators. Although the fundamental goal of any gastroenterology training program is to produce knowledgeable, competent specialists with excellent technical skills, early indoctrination of quality endoscopy may ensure that trainees carry forward these best practices to further enhance patient care and outcomes, while maintaining transparency and accountability for the endoscopic-related care they provide. Although the most effective way to improve the knowledge base of trainees regarding quality indicators and best practices is unclear, our study suggests that a formal didactic method may complement the more commonly applied practice-based approach to endoscopy-related teaching. In developing future teaching tools, it may be useful to categorize quality indicators based on clinical relevance that pertains to direct patient care or as they relate to endoscopists' knowledge of performance benchmarks. There was considerable variation in responses regarding periprocedural antibiotic and anticoagulation management, appropriate surveillance recommendations for screening colonoscopy versus adenoma detection rate, withdrawal times, and cecal intubation rates. In addition, explicit monitoring of trainees' performances on certain quality measures for colonoscopy may be a better method of assessing endoscopic competency than our current practice. Training programs that engage fellows in the performance of high-quality endoscopy from the inception of fellowship will undoubtedly produce future gastroenterologists who will promote, adhere to, and ensure the best practice of endoscopy and clinical outcomes.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Abbreviations

ASGE American Society for Gastrointestinal Endoscopy

References

1. Rex DK, Petrini JL, Baron TH, et al. ASGE/ACG Taskforce on Quality in Endoscopy. Quality indicators for colonoscopy. *Am J Gastroenterol.* 2006; 101:886–91. [PubMed: 16635232]
2. AGA Task Force on Quality in Practice: A national overview and implications for GI practice. *Gastroenterology.* 2005; 129:361–9. [PubMed: 16012961]
3. Petersen BT. Demand the Data! Your patients will ask and your practice will need it. *Am J Gastroenterol.* 2007; 102:862–3. [PubMed: 17397411]
4. Cotton PB, Hawes RH, Barkun A, et al. Excellence in endoscopy: toward practical metrics. *Gastrointest Endosc.* 2006; 63:286–91. [PubMed: 16427937]

5. American Society for Gastrointestinal Endoscopy. Quality and outcomes assessment in gastrointestinal endoscopy. *Gastrointest Endosc.* 2000; 52:827–30.
6. Rex DK, Petrini JL, Baron TH, et al. Quality indicators for colonoscopy. *Am J Gastroenterol.* 2006; 101:873–85. [PubMed: 16635231]
7. Lieberman D. A call to action—measuring the quality of colonoscopy. *N Engl J Med.* 2006; 355:2588–9. [PubMed: 17167143]
8. Rex DK, Bond JH, Winawer S, et al. Quality in the technical performance of colonoscopy and the continuous quality improvement process for colonoscopy: recommendations of the U.S. Multi-Society Task Force on Colorectal Cancer. *Am J Gastroenterol.* 2002; 97:1296–308. [PubMed: 12094842]
9. Levin B, Lieberman DA, McFarland B, et al. Screening and surveillance for the early detection of colorectal cancer and adenomatous polyps, 2008: a joint guideline from the American Cancer Society, the U.S. Multi-Society Task Force on Colorectal Cancer, and the American College of Radiology. *Gastroenterology.* 2008; 134:1570–95. [PubMed: 18384785]
10. Rex DK. Colonoscopic withdrawal technique is associated with adenoma miss rates. *Gastrointest Endosc.* 2000; 51:33–6. [PubMed: 10625792]
11. Sanchez W, Harewood GC, Petersen BT. Evaluation of polyp detection in relation to procedure time of screening or surveillance colonoscopy. *Am J Gastroenterol.* 2004; 99:1941–5. [PubMed: 15447753]
12. Barclay RL, Vicari JJ, Doughty AS, et al. Colonoscopic withdrawal times and adenoma detection during screening colonoscopy. *N Engl J Med.* 2006; 355:2533–41. [PubMed: 17167136]
13. Haseman JH, Lemmel GT, Rahmani EY, et al. Failure of colonoscopy to detect colorectal cancer: evaluation of 47 cases in 20 hospitals. *Gastrointest Endosc.* 1997; 45:451–5. [PubMed: 9199899]
14. Rex DK, Rahmani EY, Haseman JH, et al. Relative sensitivity of colonoscopy and barium enema for detection of colorectal cancer in clinical practice. *Gastroenterology.* 1997; 112:17–23. [PubMed: 8978337]
15. Atkin W, Rogers P, Cardwell C, et al. Wide variation in adenoma detection rates at screening flexible sigmoidoscopy. *Gastroenterology.* 2004; 126:1247–56. [PubMed: 15131784]
16. Chen SC, Rex DK. Endoscopist can be more powerful than age and male gender in predicting adenoma detection at colonoscopy. *Am J Gastroenterol.* 2007; 102:856–61. [PubMed: 17222317]
17. Kaminski MF, Regula J, Kraszewska E, et al. Quality indicators for colonoscopy and the risk of interval cancer. *N Engl J Med.* 2010; 362:1795–803. [PubMed: 20463339]
18. American Association for the Study of Liver Diseases, American College of Gastroenterology, AGA Institute, and American Society for Gastrointestinal Endoscopy. A journey towards excellence: training future gastroenterologists—The Gastroenterology Core Curriculum, Third Edition. *Am J Gastroenterol.* 2007; 102:921–7. [PubMed: 17489779]
19. Winawer SJ, Zauber AG, Fletcher RH, et al. Guidelines for colonoscopy surveillance after polypectomy: a consensus update by the U.S. Multi-Society Task Force on Colorectal Cancer and the American Cancer Society. *CA Cancer J Clin.* 2006; 56:143–159. quiz 184–5. [PubMed: 16737947]
20. Rex DK, Cutler CS, Lemmel GT, et al. Colonoscopic miss rates of adenomas determined by back-to-back colonoscopies. *Gastroenterology.* 1997; 112:243–8.
21. Hixson LS, Fennerty MB, Sampliner RE, et al. Prospective study of the frequency and size distribution of polyps missed by colonoscopy. *J Natl Cancer Inst.* 1990; 82:1769–72. [PubMed: 2231773]
22. Pickhardt PJ, Nugent PA, Mysliwiec PA, et al. Location of adenomas missed by optical colonoscopy. *Ann Intern Med.* 2004; 141:352–9.
23. van Gelder RE, Nio CY, Florie J, et al. Computed tomographic colonography compared with colonoscopy in patients at increased risk for colorectal cancer. *Gastroenterology.* 2004; 127:41–8. [PubMed: 15236170]
24. Banerjee S, Shen B, Baron TH, et al. Antibiotic prophylaxis for GI endoscopy. *Gastrointest Endosc.* 2008; 67:791–8. [PubMed: 18374919]

25. Eisen GM, Baron TH, Dominitz JA, et al. Guideline on the management of anticoagulation and antiplatelet therapy for endoscopic procedures. *Gastrointest Endosc.* 2002; 55:775–9. [PubMed: 12024126]
26. Saha S, Roberson E, Richie K, et al. Women’s health training in gastroenterology fellowship: a national survey of fellows and program directors. *Dig Dis Sci.* 2011; 56:751–60. [PubMed: 21267780]
27. Oxentenko AS, Vierkant RA, Pardi DS, et al. Colorectal cancer screening perceptions and practices: results from a national survey of gastroenterology, surgery and radiology trainees. *J Cancer Ed.* 2007; 22:219–26.
28. Braithwaite D, Emery J, De Lusignan S, et al. Using the Internet to conduct surveys of health professionals: a valid alternative? *Fam Pract.* 2003; 20:545–51. [PubMed: 14507796]

Take-home Message

- Knowledge of endoscopy-related quality measures is low among gastroenterology trainees, particularly for screening colonoscopy. A Web-based tutorial could improve trainees' knowledge of indicators of quality endoscopy.
- Training programs may need to develop a formal didactic curriculum to address quality standards for endoscopic performance.

Figure 1.
Schematic of participation.

TABLE 1

General characteristics of study participants: overall and by randomization arm

Characteristic	Survey 1		Survey 2*			
	Overall		Tutorial	No tutorial		
	N = 347	%	N = 106	%	N = 102	%
Sex						
Male	256	74	83	78	76	75
Female	90	26	23	22	26	25
Hospital setting						
Academic/tertiary care	291	84	88	84	87	85
Community	46	13	13	12	13	13
Veterans Affairs	6	2	4	4	1	1
Other	2	1	0	0	1	1
Year in training						
1	108	31	30	28	35	34
2	131	38	46	44	38	38
3	105	31	30	28	29	28
No. of screening colonoscopies/wk						
<5	106	31	38	36	26	25
5-9	122	35	32	30	46	45
10-15	69	20	22	21	18	18
>15	50	14	14	13	12	12
Emphasis on quality in fellowship						

Characteristic	Survey 1		Survey 2*			
	Overall		Tutorial		No tutorial	
	N = 347	%	N = 106	%	N = 102	%
Very frequent	65	19	15	14	22	21
Frequent	187	54	64	60	55	54
Rarely	89	26	25	24	23	23
Not at all	5	1	2	2	2	2

* There were no significant differences ($P < .05$) between groups; Survey 1 = before intervention, Survey 2 = after intervention.

TABLE 2
Trainee knowledge by topic: overall baseline scores and results by randomization arm after intervention

Question by topic	Overall (N = 347)		No tutorial (N = 102) [*]		Tutorial (N = 106)	
	Survey 1, % correct	Survey 1, % correct	Survey 1, % correct	Survey 2, % correct	Survey 1, % correct	Survey 2, % correct
Definition of goal ADR in female patients	39	38	36	39	49	49
Definition of goal ADR in male patients	49	57	59	49	49	49
Correct procedural documentation	97	96	96	99	96	96
Colonoscopy-associated complications	80	84	82	78	91 [†]	91 [†]
Goal withdrawal times	74	78	85	74	80	80
Periprocedural antibiotic prophylaxis	60	62	62	63	66	66
Periprocedural anticoagulation management	56	52	53	62	65	65
Cecal intubation rates goal	42	40	44	49	66 [‡]	66 [‡]
Definition of complete colonoscopy	17	16	12	15	31 [†]	31 [†]
Predicted polyp miss rates	61	63	49	67	68	68
Definition of adequate bowel preparation	30	31	32	32	48 [‡]	48 [‡]
Surveillance recommendations	59	64	72	50	65 [‡]	65 [‡]
Total score, mean $\pm$ standard deviation	55.2 $\pm$ 16	56.9 $\pm$ 15	56.9 $\pm$ 14	56.4 $\pm$ 16	64.5 $\pm$ 18 [‡]	64.5 $\pm$ 18 [‡]

ADR, Adenoma detection rate.

^{*} There were no significant differences ($P < .05$) in scores between surveys 1 and 2 in the “no tutorial” randomized arm.

[†] $P < .05$.

[‡] $P = .003$.

TABLE 3

Independent predictors of attaining a higher score after intervention

Predictor	OR	95% CI
Sex of trainee	1.0	0.51–2.17
Training institution (academic vs other)	2.6	1.05–6.32
Year in training	2.3	1.51–3.42
No. of screening colonoscopies/wk (<10 vs ≥10)	0.9	0.47–1.76
Emphasis on quality during training (very frequent/frequent vs rarely/ not)	1.5	0.74–3.03
Received tutorial (yes vs no)	3.2	1.74–5.95

OR, Odds ratio; *CI*, confidence interval.