

Appropriateness of indication and diagnostic yield of colonoscopy: First report based on the 2000 guidelines of the American Society for Gastrointestinal Endoscopy

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Abstract

AIM: To assess the appropriateness of referrals and to determine the diagnostic yield of colonoscopy according to the 2000 guidelines of the American Society for Gastrointestinal Endoscopy (ASGE).

METHODS: A total of 736 consecutive patients (415 males, 321 females; mean age 43.6±16.6 years) undergoing colonoscopy during October 2001-March 2002 were prospectively enrolled in the study. The 2000 ASGE guidelines were used to assess the appropriateness of the indications for the procedure. Diagnostic yield was defined as the ratio between significant findings detected on colonoscopy and the total number of procedures performed for that indication.

RESULTS: The large majority (64%) of patients had colonoscopy for an indication that was considered "generally indicated", it was "generally not indicated" for 20%, and it was "not listed" for 16% in the guidelines. The diagnostic yield of colonoscopy was highest for the "generally indicated" (38%) followed by "not listed" (13%) and "generally not indicated" (5%) categories. In the multivariable analysis, the diagnostic yield was independently associated with the appropriateness of indication that was "generally indicated" (odds ratio=12.3) and referrals by gastroenterologist (odds ratio =1.9).

CONCLUSION: There is a high likelihood of inappropriate referrals for colonoscopy in an open-access endoscopy system. The diagnostic yield of the procedure is dependent on the appropriateness of indication and

referring physician's specialty. Certain indications "not listed" in the guidelines have an intermediate diagnostic yield and further studies are required to evaluate whether they should be included in future revisions of the ASGE guidelines.

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Key words: Colonoscopy; Indications; Diagnostic yield; Guidelines; Appropriateness

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INTRODUCTION

Over the last two decades, there has been a remarkable advancement in gastrointestinal endoscopy, and colonoscopy has become the most commonly performed procedure for the diagnosis and treatment of diseases of the large intestine as well as screening for colon cancer^[1,2]. The increasing availability of colonoscopy, however, has also led to an inappropriate referral and overuse of this procedure, which is reported to range between 15% and 35% in different studies^[3-6]. Consensus-based guidelines for appropriate referral of both upper and lower gastrointestinal endoscopic procedures have been developed by several expert panels^[7,8]. The American Society for Gastrointestinal Endoscopy (ASGE) has also developed and periodically reviews the guidelines on the appropriate use of these procedures with the latest update made in the year 2000^[9].

The diagnostic yield of an endoscopic procedure is defined as its capacity for identifying a lesion that is potentially important to patient care and has been reported for both upper and lower endoscopy in relation to the appropriateness of the indication^[8]. For colonoscopy, it is reported to range 40-45% for procedures that are referred for appropriate indications, and 15-20% for those with inappropriate indications^[3,6,8,10].

The objectives of this study were to evaluate the appropriateness of referrals for colonoscopy based on

the 2000 ASGE guidelines on the appropriate use of gastrointestinal endoscopy, and to assess the diagnostic yield of the procedure according to these guidelines.

MATERIALS AND METHODS

For administrative purposes, Kuwait with its population of about 2.2 million is divided into six districts, each with a well-defined area and population. Medical services in each district comprise a network of primary care clinics and a general public hospital. In addition, there are a number of centralized specialty hospitals. Our study was conducted at the Thunayan Al-Ghanim Gastroenterology Center, which offers modern facilities in gastrointestinal endoscopy, and treatment and follow-up of gastroenterology and hepatology patients. The center provides open access endoscopy services for five out of six general public hospitals in Kuwait. Primary care physicians and specialists working in hospitals can directly refer patients for endoscopy. The majority of endoscopies are performed without prior consultation with a gastroenterologist.

This study was carried out prospectively between October 2001 and March 2002. Demographic data, in/outpatient status, specialty of the referring physician, indications for the procedure, and results of colonoscopy (including histologic reports, if any) were recorded in a standardized form specifically developed for this study. The year 2000 ASGE guidelines were used to determine the appropriateness of indication(s) for the procedure. These guidelines were printed on the form used for data collection, but the headings "generally indicated" and "generally not indicated" were omitted to avoid bias. Before starting the colonoscopy, the endoscopist obtained a brief history from the patient to confirm the indications for the procedure and to exclude any contraindications. If the indications were not listed in the ASGE guidelines, the endoscopist was asked to record it separately on the form. If the patient had more than one indication for colonoscopy and at least one of these was "generally indicated" by the guidelines, then the procedure was considered appropriate.

Diagnostic yield in relation to each indication was defined as the ratio between significant findings detected on colonoscopy and the total number of procedures performed for that indication. Based on the criteria followed in previous studies^[3,6,11], the presence of any of the following lesions was considered as a significant finding on colonoscopy: a pre-malignant or malignant lesion, inflammatory bowel disease (IBD) (either newly diagnosed or a more precise diagnosis or determination of the extent of the disease that influenced immediate management of the disease), angiodysplasia, stricture (benign or malignant), other colitides (infectious, ischemic, eosinophilic, microscopic), and diverticulosis (as a definite or presumptive cause of acute hematochezia)^[12]. The following were not considered as significant findings: normal colonoscopy, hemorrhoids, anal fissures, previously established IBD, uncomplicated diverticulosis, and

nonadenomatous polyps. The study was carried out in accordance with the ethical standards of our institution and the Helsinki Declaration as revised in 1989.

We used Student's *t*-test to compare the difference between two means and the normal *Z* test to assess the significant difference between two proportions. Multiple logistic regression analysis was performed to study the clinical parameters independently associated with diagnostic yield of colonoscopy. *P*<0.05 was considered statistically significant. All *P* values presented are two sided. The data were analyzed using SPSS 13.0 for Windows software (SPSS Inc., Chicago, IL, USA).

RESULTS

A total of 759 patients were referred for colonoscopy during the study period. Colonoscopy could not be performed in 23 of these patients because of inadequate bowel preparation. None of the patients had any contraindications for the procedure. Table 1 shows the demographic and clinical characteristics of the 736 patients (415 males, 321 females) who were prospectively enrolled in the study. The mean age of the patients was 43.6±16.6 years (range 1-90 years), and the large majority (82.3%) were outpatients. The majority of the patients were referred by general physicians (34.6%) and surgeons (33.4%).

Table 1 Demographic and clinical characteristic of 736 patients undergoing colonoscopy in Kuwait

Characteristic	<i>n</i> (%)
Gender	
Male	415 (56.4)
Female	321 (43.6)
Age (yr)	
Mean age (SD)	43.6 (16.6)
<15	31 (4.2)
15-49	441 (59.9)
>50	264 (35.9)
Referring clinician	
General physician	255 (34.6)
Surgeon	246 (33.4)
Gastroenterologist	205 (27.9)
Pediatric gastroenterologist	22 (3.0)
Other ¹	8 (1.1)
Clinical status	
Inpatient	130 (17.7)
Outpatient	606 (82.3)

¹Oncologist (6), gynecologist (2).

Indications for colonoscopy

Of the 736 patients, 468 (63.6%) had colonoscopy for an indication that was considered appropriate according to the ASGE guidelines (Table 2). The two most common indications were "hematochezia" and "diarrhea of

Table 2 Indications for colonoscopy among 468 patients referred for reasons generally indicated according to the 2000 ASGE guidelines¹

Indication	n (%)
1 Hematochezia	151 (20.5)
2 Clinically significant diarrhea of unexplained origin	65(8.8)
3 Irritable bowel syndrome or chronic abdominal pain: colonoscopy done once to rule out organic disease	48(6.5)
4 Chronic inflammatory bowel disease of the colon, if more precise diagnosis or determination of the extent of activity of disease will influence immediate management	34 (4.6)
5 Unexplained iron deficiency anemia	27 (3.7)
6 Following adequate clearance of neoplastic polyp(s) survey at 3-5 year intervals	24 (3.3)
7 Colonoscopy to remove synchronous neoplastic lesions at or around time of curative resection of cancer followed by colonoscopy at 3 years and 3-5 years thereafter to detect metachronous cancer	23 (3.1)
8 Evaluation of an abnormality on barium enema or other imaging study, which is likely to be clinically significant, such as a filling defect or stricture	19 (2.6)
9 Presence of fecal occult blood	12 (1.6)
10 Examination to evaluate the entire colon for synchronous cancer or neoplastic polyps in a patient with treatable cancer or neoplastic polyp	11 (1.5)
11 Excision of colonic polyp	9 (1.2)
12 Balloon dilation of stenotic lesions (e.g., anastomotic strictures)	9 (1.2)
13 Melena after an upper GI source has been excluded	8 (1.1)
14 In patients with ulcerative or Crohn's pancolitis eight or more years' duration or left sided colitis 15 or more years' duration every 1-2 years with systematic biopsies to detect dysplasia	8 (1.1)
15 Treatment of bleeding from such lesions as vascular malformation, ulceration, neoplasia, and polypectomy site (e.g., electrocoagulation, heater probe, laser or injection therapy)	7 (1.0)
16 Family history of sporadic colorectal cancer before the age of 60: colonoscopy every 5 years beginning at the age of 10 years earlier than the affected relative or every three years if adenoma is found	6 (0.8)
17 Intraoperative identification of a lesion not apparent at surgery (e.g., polypectomy site, location of a bleeding site)	3 (0.4)
18 Family history of hereditary non-polyposis colorectal cancer: colonoscopy every two years beginning at the age of 25, or five years younger than the earliest age of diagnosis of colorectal cancer. Annual colonoscopy beginning at the age of 40	2 (0.3)
19 Palliative treatment of stenosing or bleeding neoplasms (e.g., laser, electrocoagulation, stenting)	2 (0.3)

¹According to 2000 American Society for Gastrointestinal Endoscopy (ASGE) guidelines on appropriate use of gastrointestinal endoscopy^[9].

unexplained etiology". Whereas, 149 (20.2%) patients underwent colonoscopy for an indication, which was "generally not indicated" (Table 3), and for 119 (16.2%) patients the indication for colonoscopy was not listed in the guidelines (Table 4). The most common indications for patients in these two categories were "chronic, stable, irritable bowel syndrome or chronic abdominal pain", and "constipation", respectively.

Table 5 shows the appropriateness of indications for colonoscopy in relation to patients' gender, age, admission status, and specialty of the referring physician. There was no material difference in the appropriateness of indications between males and females or in- and out-patients. The mean age of patients who had colonoscopy for an indication that was "generally not indicated" was significantly lower than those who had the procedure for an indication that was "generally indicated" or "not listed" in the guidelines (38.2 *vs* 44.7 years, $P < 0.0001$). Patients aged <15 years and those >50 years had a higher proportion of procedures for an indication that was considered "generally indicated" by the guidelines (77.4% and 74.6%, respectively). On the other hand, 29.5% of the patients aged 15-49 years had a significantly higher proportion of colonoscopies for an indication that was considered "generally not indicated" ($P < 0.0001$). There was no real difference in the age groups when the procedure was performed for an indication that was "not

listed" in the guidelines.

Pediatric gastroenterologists referred the highest proportion of patients (81.8%) for colonoscopy for an indication that was considered "generally indicated", followed by adult gastroenterologists (66.8%), surgeons (62.2%) and general physicians (60.4%). Among other specialists, general physicians referred the highest proportion of patients for colonoscopy for a reason that was considered "generally not indicated", while surgeons referred the highest proportion of patients for a "not listed" indication.

Diagnostic yield of colonoscopy

A total of 200 patients had one or more significant findings on colonoscopy giving an overall diagnostic yield of 27.2%. The most common significant findings were adenomatous polyps (29.5%), new diagnosis or more precise determination of the extent of IBD (23.5%) and colorectal cancer (12.0%). The yield of the procedures performed for "generally indicated" category was 37.8%, which was significantly higher than "generally not indicated" (4.7%, $P < 0.0001$) and "not listed" (13.4%, $P < 0.0001$) categories in the ASGE guidelines (Table 5). The yield of the procedures performed for "not listed" indications was also significantly higher than that for "generally not indicated" procedures (13.4% *vs* 4.7%, $P < 0.05$). Inpatients had a higher diagnostic yield of

Table 3 Indications for colonoscopy among 149 patients referred for reasons generally not indicated according to the 2000 ASGE guidelines¹

Indication	n (%)
1 Chronic, stable, irritable bowel syndrome or chronic abdominal pain	117 (15.9)
2 Routine follow-up of inflammatory bowel disease	15 (2.0)
3 Acute diarrhea	7 (1.0)
4 Metastatic adenocarcinoma of unknown primary site in the absence of colonic signs or symptoms when it will not influence management	6 (0.8)
5 Upper GI bleeding or melena with a demonstrated upper gastrointestinal source	4 (0.5)

¹According to 2000 American Society for Gastrointestinal Endoscopy (ASGE) guidelines on appropriate use of gastrointestinal endoscopy^[9].

Table 4 Indications for colonoscopy among 119 patients referred for reasons not listed in the 2000 ASGE guidelines¹

Indication	n (%)
1 Constipation	71 (9.6)
2 Unexplained weight loss	14 (1.9)
3 Normochromic anemia	7 (1.0)
4 Perianal abscess or fistula	6 (0.8)
5 Abdominal mass of unknown origin	4 (0.5)
6 Periodic follow up of healed benign lesions	4 (0.5)
7 Surveillance after resection of colonic polyps or cancer, at different intervals from those recommended	3(0.4)
8 Intestinal obstruction	2 (0.3)
9 Routine examination of the colon in patients with no colon-related signs or symptoms about to have elective abdominal surgery for non-colonic disease	2 (0.3)
10 Others	6 (0.8)

¹According to 2000 American Society for Gastrointestinal Endoscopy (ASGE) guidelines on appropriate use of gastrointestinal endoscopy^[9].

Table 5 Appropriateness of indication and diagnostic yield of colonoscopy according to patients' characteristics

Characteristic (no. of patients)	Appropriateness of referral ¹ n (%)			Diagnostic yield (%)
	Generally indicated	Generally not indicated	Not listed	
All patients (736)	468 (63.6)	149 (20.2)	119 (16.2)	27.2
Diagnostic yield	37.8%	4.7%	13.4%	-
Gender				
Male (415)	263(63.4)	87 (21.0)	65 (15.7)	28.0
Female (321)	205 (63.9)	62 (19.3)	54 (16.8)	26.2
Age (yr)				
Mean age (SD)	44.7 (17.3)	38.2 (12.1)	46.3 (17.3)	
<15 (31)	24 (77.4)	2 (6.5)	5 (16.1)	48.4
15-49 (441)	247 (56.0)	130 (29.5)	64 (14.5)	22.2
≥ 50 (264)	197 (74.6)	17 (6.4)	50 (18.9)	33.0
Referring clinician				
General physician (255)	154 (60.4)	63 (24.7)	38 (14.9)	18.0
Surgeon (246)	153 (62.2)	34 (13.8)	59 (24.0)	27.6
Gastroenterologist (205)	137 (66.8)	49 (23.9)	19 (9.3)	36.6
Pediatric gastroenterologist (22)	18 (81.8)	1 (4.5)	3 (13.6)	50.0
Other ² (8)	6 (75.0)	2 (25.0)	0	0
Clinical status				
Inpatient (130)	89 (68.5)	19 (14.6)	22 (16.9)	35.4
Outpatient (606)	379 (62.5)	130 (21.5)	97 (16.0)	25.4

¹According to 2000 American Society for Gastrointestinal Endoscopy (ASGE) guidelines on appropriate use of gastrointestinal endoscopy^[9]. ²Oncologist (6), gynecologist (2).

Table 6 Clinical findings on colonoscopy by appropriateness of referral

	Appropriateness of referral ¹ n (%)		
	Generally indicated	Generally not indicated	Not listed
Cancer	21 (4.5)	0 ^a	3 (2.5)
Adenoma	54 (11.5)	1 (0.7) ^c	4 (3.4) ^a
IBD ²	62 (13.2)	6 (4.0) ^c	8 (6.7)
Other colitides ³	36 (1.3)	0	1 (0.8)
Angiodysplasia	5 (1.1)	0	0

¹According to 2000 American Society for Gastrointestinal Endoscopy (ASGE) guidelines on appropriate use of gastrointestinal endoscopy^[9].

²IBD, inflammatory bowel disease.

³Non-specific colitis (3), infectious colitis (3), eosinophilic colitis (1).

^a*P*<0.05 compared to "Generally indicated".

^c*P*<0.005 compared to "Generally indicated".

Table 7 Odds ratios (OR) and 95% confidence intervals (95% CI) for association between selected clinical parameters and diagnostic yield of colonoscopy

Parameter (n)	Diagnostic yield (%)	OR ¹ (95% CI ²)	<i>P</i>
Gender			
Female (321)	26.2	1.0 -	
Male (415)	28.0	1.1 (0.8-1.5)	>0.50
Age (years)			
<50 (472)	23.9	1.0 -	
≥50 (264)	33.0	1.6 (1.1-2.2)	<0.05
Clinical status			
Outpatient (606)	25.4	1.0 -	
Inpatient (130)	35.4	1.6 (1.1-2.4)	<0.05
Referring clinician			
Other (531)	23.5	1.0 -	
Gastroenterologist (205)	36.6	1.9 (1.3-2.7)	<0.001
Appropriateness of indication ³			
Generally not indicated (149)	4.7	1.0 -	
Not listed (119)	13.4	3.2 (1.3-7.9)	<0.05
Generally indicated (468)	37.8	12.3 (5.7-27.0)	<0.001

¹OR, odds ratio.

²CI, confidence interval.

³According to 2000 American Society for Gastrointestinal Endoscopy (ASGE) guidelines on appropriate use of gastrointestinal endoscopy^[9].

colonoscopy compared to outpatients (35.4% *vs* 25.4%, *P*<0.05). The highest diagnostic yield was obtained in those aged <15 years, and in those who were referred by a gastroenterologist.

Table 6 lists some of the significant findings on colonoscopy by appropriateness of referrals. Colorectal cancer, adenomatous polyps, and IBD were more likely to be detected, if the colonoscopy was performed for a "generally indicated" reason. The colon was reported as completely normal in 82.6% of the patients in the "generally not indicated" and 73.9% in "not listed" groups, compared to 51.7% in the "generally indicated" group.

Determinants of diagnostic yield

Table 7 shows the association between selected clinical parameters and diagnostic yield of colonoscopy. The probability of finding a clinically significant lesion was

significantly higher in patients aged ≥50 years (odds ratio = 1.6), inpatients (odds ratio = 1.6), those referred by gastroenterologists (odds ratio = 1.9), and those who had the colonoscopy for "generally indicated" (odds ratio = 12.3) or "not listed" (odds ratio = 3.2) categories. After adjustment for the other variables, appropriateness of indications for colonoscopy according to the ASGE guidelines and referrals by gastroenterologist were the two independent parameters associated with the diagnostic yield.

DISCUSSION

To our knowledge, this is the first study to assess the appropriateness of referrals for colonoscopy and to determine the diagnostic yield according to the year 2000 ASGE guidelines. About 64% of our patients had an indication for colonoscopy that was appropriate or

“generally indicated”, according to the ASGE guidelines. This finding is similar to the 61-66% rate reported from open-access colonoscopy settings in the United States, Italy and Switzerland^[3,5,6,8]. A higher rate (81%) has been reported in a study from the United States, where the referring physicians were instructed on the accepted indications for gastrointestinal endoscopy^[4]. All these studies were based on the 1992 version of the ASGE guidelines. The year 2000 guidelines include several new conditions for which colonoscopy is now considered “generally indicated” such as all patients presenting with hematochezia, while the older guidelines only considered colonoscopy to be appropriate, if the hematochezia was not thought to be from the rectum or a perianal source. In addition, screening of asymptomatic, average risk patients for colonic neoplasia and seven new therapeutic indications have been included in the new guidelines. Inclusion of these additional indications means that a higher proportion of the patients referred for open-access colonoscopy should have an appropriate indication for the procedure. In our study, the overall rate of “generally indicated” colonoscopies was comparable to the studies based on the 1992 guidelines. It is noteworthy that our patients were relatively younger than those in other studies. Compared to an average age of 53-62 years in other studies, the average age of our patients was about 44 years and 60% were aged between 15 and 49 years. This may be the reason why we did not have a higher proportion of patients referred for appropriate indications even though we used more “liberal” ASGE guidelines. We did, however, observe a higher rate of “generally indicated” colonoscopy for patients aged <15 years (77%), which is not unexpected as colonoscopy is usually not performed in children unless an appropriate indication is present, and for those aged >50 years (75%).

We found no real difference between various specialties when patients were referred for a “generally indicated” colonoscopy. As for “generally not indicated” procedure, the rate was lowest for surgeons, while that for gastroenterologists was similar to general physicians. This finding is consistent with a study of open-access colonoscopy from Italy which reported similar rates of “generally not indicated” colonoscopy between gastroenterologists and family physicians^[5], but is in contrast with studies of open access upper gastrointestinal endoscopy^[13]. The majority (80%) of “generally not indicated” colonoscopies requested by gastroenterologists in our study were for chronic stable abdominal pain or irritable bowel syndrome (IBS), while the other 20% were for routine follow-up of IBD. This high referral rate of colonoscopy for chronic stable abdominal pain or IBS by gastroenterologists may be because in Kuwait many such patients after failing to respond to therapy are referred to the gastroenterology clinics by primary care physicians. When these patients were excluded from the analysis, the rate of “generally indicated” colonoscopy for gastroenterologists increased to about 83%, which was higher than that for all other specialties.

In our study, the definition of significant findings was based on certain positive results on colonoscopy. A normal

colonoscopy was not considered significant, although this may be relevant to patient care as it may rule out a serious disease in the colon. Our results show that the diagnostic yield of colonoscopy was independently associated with appropriateness of indications and referrals by gastroenterologists. Our findings are consistent with studies conducted in Europe and the United States^[3,6,11], but the difference between the yield of “generally indicated” and “generally not indicated” procedures (37.8% *vs* 4.7%) is much higher than reported in these studies. Charles *et al*^[3] reported that 40% of patients who have colonoscopy for an ASGE (1992 version) approved indication have a significant pathological finding compared to 22% of those who do not meet the guidelines. Similarly, Morini *et al*^[6] have reported a diagnostic yield of 43% for “generally indicated” and 16% for “generally not indicated” categories. De Bosset *et al*^[11], using the Swiss criteria developed by the Rand Corporation/University of California at Los Angeles (RAND/UCLA) panel, have reported a diagnostic yield of 26% for patients who have colonoscopy for an appropriate or uncertain indication and 17% for those with an inappropriate indication. The higher difference in the diagnostic yield of colonoscopy for a “generally indicated” and “generally not indicated” category seen in our study suggests that the 2000 ASGE guidelines for appropriate use of gastrointestinal endoscopy are more efficient in discriminating indications for colonoscopy than the earlier versions or the Swiss (RAND/UCLA) criteria.

The year 2000 ASGE guidelines clearly differentiate between the “generally indicated” and “generally not indicated” colonoscopies in terms of the diagnostic yield of the procedure. Clinicians can therefore predict the expected yield of colonoscopy as long as the indications for the procedure can clearly be classified as “generally indicated” or “generally not indicated”. However, in clinical practice there are always some patients who undergo colonoscopy for indications that cannot be clearly classified into either of these two categories. It has been reported that about 12-28% of the patients undergoing colonoscopy have indications that are not listed in the ASGE guidelines^[5,6,8]. In our study, the proportion of patients in “not listed” category was about 16% with a diagnostic yield of 13.4%, being about three times higher than the diagnostic yield of colonoscopy which is “generally not indicated”. Among the patients in the “not listed” category, three were diagnosed with colorectal cancer compared to none in the “generally not indicated” group and the proportion of patients diagnosed with adenomatous polyps and IBD was also higher. The ASGE guidelines appear to be deficient with regard to these “not listed” indications, but it is acknowledged that clinical considerations may occasionally justify a course of action at variance with the recommendations of the ASGE. The two most frequent unlisted indications in our study were constipation and unexplained weight loss, and all three cases of colorectal cancer were found in patients who underwent colonoscopy for constipation. Clear recommendations are needed for such common unlisted

indications such as constipation as provided in the Swiss and American panel-based guidelines^[8]. Further studies are needed to identify other common but unlisted indications that may be included in future versions of the ASGE guidelines.

In summary, the results of this prospective study demonstrate that a large proportion of colonoscopies performed in an open-access system in Kuwait is for the indications considered inappropriate by, or not listed in the 2000 guidelines of the ASGE on appropriate use of gastrointestinal endoscopy. The probability of identifying a significant finding on colonoscopy is particularly higher when the indications for the procedure are judged to be appropriate by the ASGE guidelines, but a proportion of patients who undergo colonoscopy for an unlisted indication also have significant findings. Further studies are required to evaluate these unlisted indications to determine whether they should be included in future revisions of the guidelines. General physicians need further edification for appropriate referrals of patients for colonoscopy.

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