

Appropriateness of outpatient gastrointestinal endoscopy in a non-academic hospital

João Mangualde, Marie I Cremers, Ana M Vieira, Ricardo Freire, Élia Gamito, Cristina Lobato, Ana L Alves, Fátima Augusto, Ana P Oliveira

João Mangualde, Marie I Cremers, Ana M Vieira, Ricardo Freire, Élia Gamito, Cristina Lobato, Ana L Alves, Fátima Augusto, Ana P Oliveira, Gastroenterology Department Setúbal Hospital Center, São Bernardo Hospital, Setúbal 2910-446, Portugal

Author contributions: Cremers MI was responsible for the study conception and design and collaborated in data acquisition; Mangualde J participated in the study conception and design, collaborated in data acquisition and was responsible for the analysis and interpretation of the data collected and the manuscript writing; Vieira AM, Freire R, Gamito É, Lobato C, Alves AL, Augusto F and Oliveira AP were co-responsible for data acquisition. Correspondence to: João Mangualde, MD, Gastroenterology Department Setúbal Hospital Center, São Bernardo Hospital, R. Camilo Castelo Branco, Setubal 2910-446, Portugal. joanm@gmail.com

Telephone: +351-265549055 Fax: +351-265549525

Received: January 26, 2011 Revised: June 25, 2011

Accepted: August 10, 2011

Published online: October 16, 2011

Abstract

AIM: To assess the appropriate use and the diagnostic yield of upper gastrointestinal endoscopy and colonoscopy in this subgroup of patients.

METHODS: In total, 789 consecutive outpatients referred for gastrointestinal (GI) endoscopy [381 for esophagogastroduodenoscopy (EGD) and 408 for colonoscopy] were prospectively enrolled in the study. The American Society for Gastrointestinal Endoscopy (ASGE) guidelines were used to assess the relationship between appropriateness and the presence of relevant endoscopic findings.

RESULTS: The overall inappropriate rate was 13.3%. The indications for EGD and colonoscopy were, respectively, appropriate in 82.7% and 82.6% of the exams, uncertain in 5.8% and 2.4% and inappropriate in 11.5% and 15%. The diagnostic yield was significant higher for

EGDs and colonoscopies judged appropriate and uncertain when compared with those considered inappropriate (EGD: 36.6% vs 36.4% vs 11.4%, $P = 0.004$; Colonoscopy: 24.3% vs 20.0% vs 3.3%, $P = 0.001$). Of the 25 malignant lesions detected, all but one was detected in exams judged appropriate or uncertain.

CONCLUSION: This study shows a good adherence to ASGE guidelines by the referring physicians and a significant increase of the diagnostic yield in appropriate examinations, namely in detecting neoplastic lesions. It underscores the importance that the appropriateness of the indication assumes in assuring high-quality GI endoscopic procedures.

© 2011 Baishideng. All rights reserved.

Key words: Gastrointestinal endoscopy; Indications; Appropriateness

Peer reviewers: Nevin Oruc, MD, Associate Professor, Ege University, Gastroenterology Department, Ege University Hospital, Bornova, İzmir, 35100, Turkey; Sanjiv Mahadeva, MBBS, MRCP, CCST, MD, Associate Professor, Department of Medicine, Faculty of Medicine, University of Malaya, Kuala Lumpur 50603, Malaysia

Mangualde J, Cremers MI, Vieira AM, Freire R, Gamito É, Lobato C, Alves AL, Augusto F, Oliveira AP. Appropriateness of outpatient gastrointestinal endoscopy in a non-academic hospital. *World J Gastrointest Endosc* 2011; 3(10): 195-200 Available from: URL: <http://www.wjgnet.com/1948-5190/full/v3/i10/195.htm> DOI: <http://dx.doi.org/10.4253/wjge.v3.i10.195>

INTRODUCTION

Over the last decade, an increasing demand for gastrointestinal (GI) endoscopy has occurred^[1]. Unfortunately, the rise in quantity has not always been accompanied by a

parallel rise in quality. Several studies, based on the American Society for Gastrointestinal Endoscopy (ASGE) guidelines^[2], showed a substantial rate of inappropriateness of indications for esophagogastroduodenoscopy (EGD) and colonoscopy and a parallel decrease in the diagnostic yield of these endoscopic procedures^[3-10]. The inappropriate rate is higher in outpatients and in endoscopic units of non-academic hospitals^[5,9]. These represent the vast majority of patients submitted for GI endoscopy in Portuguese hospitals.

The aims of this prospective study were to assess, according to the ASGE guidelines, the appropriateness of indications and the diagnostic yield of EGD and colonoscopy in outpatients referred to an endoscopy unit of a non-academic hospital in Portugal.

MATERIALS AND METHODS

The study was performed from October 2005 to June 2006 in an endoscopy unit of a non-academic hospital (São Bernardo Hospital, Setúbal). In Portugal, non-academic hospitals give assistance to 75% of the population. At our hospital, like in most Portuguese hospitals, GI endoscopy can be requested by hospital-based specialists without prior evaluation by a gastroenterologist, but primary care physicians cannot directly refer patients to endoscopy. The population of our geographical area includes around 270 000 inhabitants and is characterized by a high prevalence of gastric and colorectal cancer. Outpatients ($n = 789$) referred for EGD ($n = 381$) and colonoscopy ($n = 408$) were included in this study. All patients gave written informed consent for the endoscopic procedure. Referring physicians were unaware of the study.

Data were collected prospectively and uniformly according to a previously defined protocol. Before beginning the procedure, endoscopists determined the indications for the examination based on the clinical history. The exam was performed regardless of the indication, unless a contraindication was present. The endoscopic examination was carried out using standard, forward-viewing video endoscopes or colonoscopes by gastroenterologists ($n = 6$) or by trainees in gastroenterology ($n = 3$). After the procedure, demographic data, indications and endoscopic findings were reported in the same chart.

The indications were classified, by agreement of two endoscopists, according to the practice guidelines of the ASGE as appropriate, non-appropriate and uncertain (when the data did not allow a correct classification).

Endoscopic findings were classified as “clinically relevant”, when they affected the therapeutic decisions and prognosis, and “not clinically relevant”. Clinically significant findings for EGD included erosive esophagitis, candida esophagitis, Barrett’s esophagus, esophageal cancer, benign esophageal stenosis, achalasia, esophageal varices, Mallory-Weiss tears, gastric ulcer, gastric polyps, gastric cancer, benign gastric stenosis, angiodysplasia (when the indications were hematochezia, fecal occult blood or iron deficiency anemia), duodenal ulcer and duodenal cancer.

Table 1 Demographic and clinical characteristics of the study population

	EGD	Colonoscopy
Sex (M/F)	191/190	218/190
Age (mean \pm SD, yr)	59.5 \pm 15	61.4 \pm 13.0
Age (< 45 yr/ \geq 45 yr, %)	16.8/83.2	11.3/88.7
Clinical setting (elective/urgent)	94.8/5.2	94.4/5.6

EGD: Esophagogastroduodenoscopy.

Clinically relevant findings for colonoscopy included colorectal cancer, malignant polyps, advanced adenomas (> 1 cm, villous component or high-grade dysplasia), inflammatory bowel disease, angiodysplasia (when the indications were hematochezia, fecal occult blood or iron deficiency anemia) and radiation colitis. When there was more than one endoscopic diagnosis, the most severe one was used for analysis.

To evaluate the association between appropriateness and the presence of clinically relevant endoscopic diagnoses, patients in whom the endoscopic procedure was performed because of an ASGE indication were compared with those in whom an ASGE indication was absent or uncertain.

Statistical analysis was performed with the Chi-Square test and Fisher’s Exact test, using SPSS 11.5 (SPSS Inc.[®]) statistical software. A P value of < 0.05 was considered significant.

RESULTS

Esophagogastroduodenoscopy

Of the 381 outpatients included in the study, 191 (50.1%) were men and 190 (49.9%) were women. The mean age was 59.5 \pm 15.1 years (range 13-88 years), with 317 patients (83.2%) being older than 45 years. The exam was electively scheduled in 361 (94.8%) patients and performed urgently in 20 (5.2%) (Table 1).

The indication for EGD was considered appropriate, according to ASGE criteria, in 82.7% of cases, not-appropriate in 11.5% and uncertain in 5.8% (patients whose indication was anemia not otherwise specified). The inappropriate rate was similar in male patients compared with female patients (13.6% *vs* 9.5%, $P = 0.079$), in those younger than 45 years compared with older patients (14.1% *vs* 11.0%, $P = 0.245$) and in the scheduled procedures compared with those performed as an urgent procedure (11.5% *vs* 5.0%, $P = 0.141$). The most common appropriate indications were persistent upper abdominal symptoms despite therapy, associated with alarm symptoms or occurring in patients over 45 years of age (28.3%) and symptoms attributable to gastro-esophageal reflux (12.1%). The most frequent inappropriate indications were surveillance for malignancy in patients with chronic gastritis (2.9%) or a prior gastric operation (2.6%) and follow-up of duodenal ulcer (2.1%) (Table 2).

EGDs were normal in 16.8% of cases. The number

Table 2 Indications for esophagogastroduodenoscopy and diagnostic yield according to the American Society for Gastrointestinal Endoscopy guidelines *n* (%)

ASGE Indication	Frequency	Relevant lesions (%)	<i>P</i>
Appropriate indication	315 (82.7)	36.6	
Upper abdominal symptoms ¹	108 (28.3)	21.3	0.001
Esophageal reflux symptoms that are persistent or recurrent despite appropriate therapy	46 (12.1)	39.1	0.412
Portal hypertension evaluation	30 (7.9)	80.0	< 0.0001
Follow-up of gastric ulcer	24 (6.3)	33.3	1.0
Iron deficiency anemia	23 (6.0)	13.0	0.018
Endoscopic treatment	18 (4.7)	77.8	< 0.0001
Dysphagia or odynophagia	16 (4.1)	62.5	0.027
Surveillance for malignancy in patients with Barrett's esophagus	11 (2.9)	90.9	< 0.0001
Persistent vomiting of unknown cause	11 (2.9)	18.2	0.346
Active or recent GI bleeding for confirmation and specific histologic diagnosis of radiologically demonstrated lesions	10 (2.6)	30.0	1.0
Sampling of tissue or fluid	8 (2.1)	50.0	0.451
Others	7 (1.8)	14.3	0.236
Uncertain indication	24 (6.2)	25.0	0.523
Anemia not otherwise characterized	22 (5.8)	36.4	1.0
Inappropriate indication	22 (5.8)	36.4	1.0
Surveillance for malignancy in patients with chronic gastritis	44 (11.5)	11.4	< 0.0001
Surveillance for malignancy in patients with prior gastric operation	11 (2.9)	0	< 0.0001
Follow-up of duodenal ulcer	10 (2.6)	25.0	0.758
Others	8 (2.1)	30.0	1.0
Others	15 (3.8)	0	< 0.0001

¹Upper abdominal symptoms persistent, despite therapy, associated with symptoms or signs suggesting serious organic disease or occurring in patients > 45 years old. ASGE: American Society for Gastrointestinal Endoscopy; GI: Gastrointestinal.

of normal exams was higher in EGDs performed for a non-appropriate indication when compared with those performed for an appropriate indication (25.0% *vs* 15.2%, *P* = 0.047) and in patients younger than 45 years compared with older patients (42.2% *vs* 11.7%, *P* < 0.0001). The percentage of normal exams in EGDs performed for an uncertain indication was 22.7%.

A clinically relevant diagnosis was detected in 129 EGD (33.9%). The diagnostic yield of appropriate and uncertain EGDs was significantly higher than non-appropriate EGDs (36.6% *vs* 36.4% *vs* 11.4%, *P* = 0.004) (Table 2). This is particularly true for some indications, including surveillance of malignancy in Barrett's esophagus (90.9%, *P* < 0.0001), portal hypertension evaluation (80.0%, *P* < 0.0001), dysphagia/odynophagia (62.5%, *P* = 0.027) and for therapeutic procedures (77.8%, *P* < 0.0001). In contrast, EGDs performed for dyspepsia (21.3%, *P* = 0.001), iron deficiency anemia (13%, *P* = 0.018), surveillance for malignancy in patients with chronic gastritis (0.0%, *P* < 0.0001) and surveillance

Table 3 Clinically relevant endoscopic findings in esophagogastroduodenoscopies according to appropriateness of the indication

Endoscopic finding	<i>n</i> (%)	ASGE (%)	Uncertain (%)	Non-ASGE (%)	<i>P</i>
Esophageal varices	30 (7.9)	8.9	9.1	0.0	0.119
Erosive esophagitis	27 (7.1)	7.6	4.5	4.5	0.676
Gastric ulcer	21 (5.5)	6.7	0.0	0.0	0.097
Gastric polyps	16 (4.2)	4.1	13.6	0.0	0.033
Barrett's esophagus	17 (4.5)	4.8	0.0	4.5	0.578
Duodenal ulcer	10 (2.6)	2.2	9.1	2.3	0.148
Gastric cancer	9 (2.4)	2.9	0.0	0.0	0.038
Candida esophagitis	5 (1.3)	1.6	0.0	0.0	0.475
Angiodysplasia ¹	2 (0.5)	0.6	0.0	0.0	0.856
Esophageal cancer	1 (0.3)	0.3	0.0	0.0	0.900
Esophageal stenosis	1 (0.3)	0.3	0.0	0.0	0.900
Gastric stenosis	1 (0.3)	0.3	0.0	0.0	0.900
Total	129 (33.9)	36.6	36.4	11.4	0.004

¹Only angiodysplasias found in exams performed for hematochezia or iron deficiency anemia were considered clinically relevant. ASGE: American Society for Gastrointestinal Endoscopy.

for malignancy in patients with prior gastric operations (0.0%, *P* < 0.0001) had a relatively low diagnostic yield.

A higher number of relevant endoscopic findings was found in patients older than 45 years when compared with younger patients (36.6% *vs* 20.3%, *P* = 0.013), but not in urgent EGDs comparing to elective ones (35% *vs* 33.8%, *P* = 1.0).

The most frequent significant diagnoses were esophageal varices (7.9%), erosive esophagitis (7.1%) and gastric ulcer (5.5%). Ten malignancies (2.7%) were detected, all of them in EGDs with an appropriate ASGE indication (Table 3).

Colonoscopy

Of the 408 outpatients included in the study, 218 (53.4%) were men and 190 (46.6%) were women. The mean age was 61.4 ± 13 years (range 19-88 years), with 362 patients (88.7%) being older than 45 years. The exam was electively scheduled in 385 (94.4%) patients and performed urgently in 23 (5.6%) (Table 1).

The indication for colonoscopy was considered appropriate, according to ASGE criteria, in 82.6% of cases, not-appropriate in 15% and uncertain in 2.4% (patients whose indication was anemia not otherwise specified). The inappropriate rate was significantly higher in female patients compared with male patients (19.5% *vs* 11%, *P* = 0.038). The inappropriate rate was similar in those younger than 45 years compared with older patients (8.7% *vs* 15.7%, *P* = 0.212) and in the scheduled procedures compared with those performed as an urgent procedure (15.6% *vs* 4.3%, *P* = 0.299). The most common appropriate indications were surveillance after resection of colonic polyps (19.4%), excision of colonic polyps (17.4%) and screening for colonic neoplasia (12.7%). The most frequent inappropriate indications were abdominal pain (12.3%) and chronic constipation (4.4%) (Table 4).

Table 4 Indications for colonoscopy and diagnostic yield according to the American Society for Gastrointestinal Endoscopy guidelines *n* (%)

ASGE Indication	Frequency	Relevant lesions (%)	<i>P</i>
Appropriate indication	337 (82.6)	24.3	
Follow-up of colonic polyps	79 (19.4)	21.5	0.879
Excision of colonic polyp	71 (17.4)	42.3	< 0.0001
Screening for colonic neoplasia	52 (12.7)	7.7	0.010
Hematochezia	36 (8.8)	30.6	0.197
Follow-up for colorectal cancer	31 (7.6)	9.7	0.166
Diarrhea	30 (7.4)	16.7	0.647
Iron deficiency anemia	20 (4.9)	5.0	0.090
Follow-up for inflammatory bowel disease	12 (2.9)	100	< 0.0001
Evaluation of an imaging study abnormality that is likely to be clinically significant	10 (2.5)	0.0	0.129
Presence of fecal occult blood	9 (2.2)	44.4	0.098
Evaluation for synchronous cancer or neoplastic polyps	4 (1.0)	100	0.002
Uncertain indication	10 (2.4)	20.0	
Anemia not otherwise characterized	10 (2.4)	20.0	1.000
Inappropriate indication	61 (15.0)	3.3	
Abdominal pain	50 (12.3)	6.0	0.005
Chronic constipation	18 (4.4)	5.5	0.006
Unexplained weight loss	6 (1.5)	0.0	< 0.0001
Others	14 (3.4)	0.0	< 0.0001

ASGE: American Society for Gastrointestinal Endoscopy.

Table 5 Clinically relevant endoscopic findings in colonoscopies according to appropriateness of the indication

Endoscopic finding	<i>n</i> (%)	ASGE (%)	Uncertain (%)	Non-ASGE (%)	<i>P</i>
Adenoma ¹	69 (13.2)	15.7	0.0	1.6	0.005
Colorectal cancer	15 (3.7)	3.6	20.0	1.6	0.755
Inflammatory bowel disease	12 (2.9)	3.6	0.0	0.0	0.272
Angiodysplasia ²	2 (0.5)	0.6	0.0	0.0	1.000
Radiation colitis	3 (0.7)	1.0	0.0	0.0	1.000
Total	86 (21.1)	24.3	20.0	3.3	0.001

¹Only malignant or advanced adenomas were considered clinically relevant; ²Only angiodysplasias found in exams performed for hematochezia or iron deficiency anemia were considered clinically relevant. ASGE: American Society for Gastrointestinal Endoscopy.

Colonoscopies were normal in 33.8% of cases. The number of normal exams was higher in colonoscopies performed for a non-appropriate indication when compared with those performed for an appropriate indication (45.9% *vs* 31.5%, *P* = 0.007) and in patients younger than 45 years compared with older patients (54.3% *vs* 31.2%, *P* = 0.004). The percentage of normal exams in colonoscopies performed for an uncertain indication was 40.0%.

A clinically relevant diagnosis was detected in 86 colonoscopies (21.1%) (Table 5). The diagnostic yield of appropriate and uncertain colonoscopies was significantly higher than non-appropriate colonoscopies (24.3% *vs* 20.0% *vs* 3.3%, *P* = 0.001). This is particularly true for

some indications, including surveillance for colonic neoplasia in inflammatory bowel disease (100%, *P* < 0.0001), screening for synchronous cancer or neoplastic polyps (100%, *P* < 0.0001) and for excision of a colonic polyp (42.3%, *P* < 0.0001). Conversely, referrals for screening for colonic neoplasia (7.7%, *P* = 0.01), for abdominal pain (6.0%, *P* = 0.005) and for chronic constipation (5.5%, *P* = 0.006) had a relatively low diagnostic yield. A higher number of relevant endoscopic findings were also found in urgent colonoscopies compared to elective ones (43.5% *vs* 19.7%, *P* = 0.014) but not in patients older than 45 years when compared with younger patients (21.3% *vs* 19.6%, *P* = 1.0).

The most frequent significant diagnoses were adenomas (13.2%), colorectal cancer (3.7%) and inflammatory bowel disease (2.9%). With regard to malignancies, 12 were detected in exams with an appropriate ASGE indication, 2 in exams with an uncertain indication and 1 in an exam without an appropriate ASGE indication (Table 5).

DISCUSSION

GI endoscopy plays a central role in gastroenterology as an accurate and safe procedure for diagnosis, follow-up, treatment or exclusion of clinically important gastrointestinal disease^[11,12]. For this reason, most GI endoscopic centers in Europe and the United States implement some type of open-access service^[10,13,14]. This has led to an increasing demand for endoscopic procedures and, consequently, an increase in the costs and the waiting lists^[1,10]. Therefore, adherence to appropriate indications for endoscopic procedures is essential to the rational use of finite resources.

Several studies show a substantial overuse of EGD (12% to 39%) and colonoscopy (15% to 43%) and a parallel decrease in the diagnostic yield of these endoscopic procedures^[3-10]. The rate of inappropriateness is higher in outpatients and in endoscopic units of non-academic hospitals^[4,5]. These represent the vast majority of patients submitted to GI endoscopy in Portuguese hospitals.

In order to address this problem, we decided to perform a prospective study in this specific scenario. Overuse of EGD (11.5%) and colonoscopy (15%) was low in this prospective study, compared to other studies conducted in Europe, particularly in this subset of patients. In part, this could be due to the fact that primary care physicians cannot directly refer patients to our endoscopic unit, as many studies have shown that they have a high overuse rate^[4,6]. The inappropriate rate of colonoscopies was significantly higher in female patients compared with male patients. This probably reflects the higher prevalence of functional gastrointestinal disorders in women^[15,16]. Like in the study of Hassan *et al*^[4], the percentage of not accepted indications was higher in scheduled procedures compared with those performed as an urgent procedure, but it did not reach statistical significance. This was also the case for patients younger than 45 years in EGD. Interestingly, in colonoscopy, the overuse was superior

in patients older than 45 years, a finding similar to that reported by Minoli *et al*⁵¹. The main inappropriate indications for EGD were surveillance for malignancy in patients with prior gastric operations and surveillance of healed benign disease. For colonoscopy, they were abdominal pain and chronic constipation. Special attention should be given to these topics when implementing educational programs for referring physicians.

The other aim of this study was to assess the relationship of the appropriateness of indications with the endoscopic findings. One-third of colonoscopies were normal, twice the number of normal EGDs. In both procedures, the percentage of normal exams was higher in non-appropriate indications and in patients younger than 45 years. More important than the number of normal exams, the efficacy of an endoscopic procedure is usually defined as its diagnostic yield, that is, the ability to detect a finding that is potentially relevant to patient care¹⁷. In our study, clinically significant abnormalities were found in about one-third of EGDs and one-fifth of colonoscopies. These numbers are lower than those reported in most published studies, particularly regarding colonoscopy¹⁴⁻⁹. This is mainly due a more restricted criteria applied in this study for the classification of a diagnosis as clinically relevant. In other studies, all adenomas were considered clinically relevant, as well as all angiodysplasias, which was not the case in this study. The probability of detecting a clinically relevant finding was significantly higher when EGDs and colonoscopies were performed for an appropriate as compared to an inappropriate indication, as has been previously reported¹⁴⁻⁹. The diagnostic yield of GI endoscopies performed for an uncertain indication (anemia not otherwise specified) were similar to the ones performed for an appropriate indication. This probably reflects the fact that these patients indeed had iron deficiency anemia and should be incorporated in the appropriate examinations group. The probability of detecting a clinically relevant finding was also significantly higher for some specific indications, namely, surveillance of malignancy in Barrett's esophagus, portal hypertension evaluation, dysphagia/odynophagia and for therapeutic procedures in EGD and surveillance for colonic neoplasia in inflammatory bowel disease, screening for synchronous cancer or neoplastic polyps and for therapeutic procedures in colonoscopies. On the other hand, EGDs performed for dyspepsia, iron deficiency anemia, surveillance for malignancy in patients with chronic gastritis and surveillance for malignancy in patients with prior gastric operations and colonoscopies performed for abdominal pain and chronic constipation had a relatively low diagnostic yield. While the latter are inappropriate indications, the former two are indications considered appropriate by the ASGE guidelines. The low diagnostic yield of dyspepsia, found also in other studies¹⁴, probably reflects the contamination of this group by dyspeptic patients younger than 45 years (one-quarter of the total number of dyspeptic patients). The percentage of significant lesions in patients referred for iron deficiency anemia (13.0%) was

low compared to previous published data (40%)¹⁸⁻²¹. If we included the patients with anemia not otherwise specified in this group, the percentage of significant lesions would increase to 24.4%, still lower than expected. This can be due in part to a higher number of lesions beyond the reach of EGD in our population where the incidence of colorectal cancer is very high. A higher number of relevant endoscopic findings were also found in EGDs performed in patients older than 45 years when compared with younger patients and in urgent colonoscopies compared to elective ones. The former can be used as a useful parameter in scheduling the exams.

In this study, 25 neoplastic lesions were detected, 10 in EGDs and 15 in colonoscopies. All cancers in EGDs were detected in appropriate exams. This finding is very important because Portugal is a country that has a high prevalence of gastric cancer and because there has been some concern about the efficacy of ASGE guidelines in selecting those patients at risk for upper GI neoplasia from those who are not, following from the studies by Gonvers *et al*²² and Rossi *et al*²³ that found a substantial number of cancer in inappropriate EGDs. With regard to colonoscopy, 12 malignancies were detected in exams with an appropriate ASGE indication, 2 in exams with an uncertain indication and 1 in an exam without an appropriate ASGE indication. As previously discussed, the exams performed for anemia not otherwise specified probably correspond to iron deficiency anemia and should be given the same importance of an appropriate indication when scheduling this subgroup of examinations. The single malignancy found at a colonoscopy in the group of patients with inappropriate indications was located in the sigmoid and was detected in a 78-year-old patient with chronic constipation who had never had a colonoscopy. Due to the age of the patient, if we considered this exam as screening for colonic neoplasia consistent with the concept of "colonoscopy once in a life"²⁴, all neoplastic lesions in this study would be detected in appropriate exams. In addition, only 6 other significant lesions were found in inappropriate examinations, a number much lower than in previous studies^{14-9,24}.

In conclusion, this study shows a good adherence to ASGE guidelines by referring physicians and a significant increase of the diagnostic yield in appropriate examinations, namely in detecting neoplastic lesions. For this reason, the appropriateness of the indication is critical to the cost-effectiveness of GI endoscopic procedures and must occupy a central role to filter the requests for GI endoscopy whether an open access or a hospital based system is used because we can no longer keep wasting limited resources and money.

COMMENTS

Background

Ethical and economical considerations are very important when considering inadequate endoscopic examinations. This study portrays Portugal's general situation in regard to endoscopic practice and gives an account of the activity of an endoscopic unit in a general non-academic hospital.

Research frontiers

Portugal is a country with a high prevalence of gastric cancer and in our study all cancers in esophagogastroduodenoscopy (EGD) were detected in appropriate examinations. This underlines the efficacy of American Society for Gastrointestinal Endoscopy (ASGE) guidelines in selecting patients at risk for upper gastrointestinal (GI) neoplasia.

Innovations and breakthroughs

Referral of patients by hospital practitioners opposed to open-access service leads to a decrease of overuse of EGD and colonoscopy, a decrease of health costs and waiting lists. This cannot be overrated in an area of economical restraints. Proper indications lead to an increase of diagnostic yield, that is, the ability to detect a finding that is potentially relevant to patient care.

Applications

The design of this study revealed great utility for managing an endoscopic unit in Portugal and should be applied to a multicenter evaluation of endoscopic practice in our country.

Peer review

The high level of appropriateness of endoscopic exams (EGD and colonoscopy) in this study reflected the referral of cases by hospital practitioners as opposed to open-access service. Diagnostic yield related significantly to appropriateness of indications according to ASGE guidelines. This study is important to local doctors and shows the practice for GI exams indications in Portugal.

REFERENCES

- 1 **Marshall JB.** Open access endoscopy in Britain: a service in evolution. *Gastrointest Endosc* 1998; **48**: 653-658
- 2 **American Society for Gastrointestinal Endoscopy.** Appropriate use of gastrointestinal endoscopy. *Gastrointest Endosc* 2000; **52**: 831-837
- 3 **Charles RJ, Chak A, Cooper GS, Wong RC, Sivak MV.** Use of open access in GI endoscopy at an academic medical center. *Gastrointest Endosc* 1999; **50**: 480-485
- 4 **Hassan C, Bersani G, Buri L, Zullo A, Anti M, Bianco MA, Di Giulio E, Ficano L, Morini S, Di Matteo G, Loriga P, Pietropaolo V, Cipolletta L, Costamagna G.** Appropriateness of upper-GI endoscopy: an Italian survey on behalf of the Italian Society of Digestive Endoscopy. *Gastrointest Endosc* 2007; **65**: 767-774
- 5 **Minoli G, Meucci G, Bortoli A, Garripoli A, Gullotta R, Leo P, Pera A, Prada A, Rocca F, Zambelli A.** The ASGE guidelines for the appropriate use of colonoscopy in an open access system. *Gastrointest Endosc* 2000; **52**: 39-44
- 6 **Morini S, Hassan C, Meucci G, Toldi A, Zullo A, Minoli G.** Diagnostic yield of open access colonoscopy according to appropriateness. *Gastrointest Endosc* 2001; **54**: 175-179
- 7 **de Bosset V, Froehlich F, Rey JP, Thorens J, Schneider C, Wietlisbach V, Vader JP, Burnand B, Muhlhaupt B, Fried M, Gonvers JJ.** Do explicit appropriateness criteria enhance the diagnostic yield of colonoscopy? *Endoscopy* 2002; **34**: 360-368
- 8 **Bersani G, Rossi A, Ricci G, Pollino V, Defabritiis G, Suzzi A, Alvisi V.** Do ASGE guidelines for the appropriate use of colonoscopy enhance the probability of finding relevant pathologies in an open access service? *Dig Liver Dis* 2005; **37**: 609-614

- 9 **Grassini M, Verna C, Niola P, Navino M, Battaglia E, Bassotti G.** Appropriateness of colonoscopy: diagnostic yield and safety in guidelines. *World J Gastroenterol* 2007; **13**: 1816-1819; discussion 1819
- 10 **Froehlich F, Burnand B, Pache I, Vader JP, Fried M, Schneider C, Kosecoff J, Kolodny M, DuBois RW, Brook RH, Gonvers JJ.** Overuse of upper gastrointestinal endoscopy in a country with open-access endoscopy: a prospective study in primary care. *Gastrointest Endosc* 1997; **45**: 13-19
- 11 **Brenna E, Skreden K, Waldum HL, Mårvik R, Dybdahl JH, Kleveland PM, Sandvik AK, Halvorsen T, Myrvold HE, Petersen H.** The benefit of colonoscopy. *Scand J Gastroenterol* 1990; **25**: 81-88
- 12 **Dooley CP, Larson AW, Stace NH, Renner IG, Valenzuela JE, Eliasoph J, Colletti PM, Halls JM, Weiner JM.** Double-contrast barium meal and upper gastrointestinal endoscopy. A comparative study. *Ann Intern Med* 1984; **101**: 538-545
- 13 **Mahajan RJ, Marshall JB.** Prevalence of open-access gastrointestinal endoscopy in the United States. *Gastrointest Endosc* 1997; **46**: 21-26
- 14 **Bramble MG.** Open access endoscopy--a nationwide survey of current practice. *Gut* 1992; **33**: 282-285
- 15 **Saito YA, Schoenfeld P, Locke GR.** The epidemiology of irritable bowel syndrome in North America: a systematic review. *Am J Gastroenterol* 2002; **97**: 1910-1915
- 16 **Thompson WG.** Gender differences in irritable bowel symptoms. *Eur J Gastroenterol Hepatol* 1997; **9**: 299-302
- 17 **Froehlich F, Pache I, Burnand B, Vader JP, Fried M, Beglinger C, Stalder G, Gyr K, Thorens J, Schneider C, Kosecoff J, Kolodny M, DuBois RW, Gonvers JJ, Brook RH.** Performance of panel-based criteria to evaluate the appropriateness of colonoscopy: a prospective study. *Gastrointest Endosc* 1998; **48**: 128-136
- 18 **Cook IJ, Pavli P, Riley JW, Goulston KJ, Dent OF.** Gastrointestinal investigation of iron deficiency anaemia. *Br Med J (Clin Res Ed)* 1986; **292**: 1380-1382
- 19 **Kepeczyk T, Kadakia SC.** Prospective evaluation of gastrointestinal tract in patients with iron-deficiency anemia. *Dig Dis Sci* 1995; **40**: 1283-1289
- 20 **McIntyre AS, Long RG.** Prospective survey of investigations in outpatients referred with iron deficiency anaemia. *Gut* 1993; **34**: 1102-1107
- 21 **Rockey DC, Cello JP.** Evaluation of the gastrointestinal tract in patients with iron-deficiency anemia. *N Engl J Med* 1993; **329**: 1691-1695
- 22 **Gonvers JJ, Burnand B, Froehlich F, Pache I, Thorens J, Fried M, Kosecoff J, Vader JP, Brook RH.** Appropriateness and diagnostic yield of upper gastrointestinal endoscopy in an open-access endoscopy unit. *Endoscopy* 1996; **28**: 661-666
- 23 **Rossi A, Bersani G, Ricci G, Defabritiis G, Pollino V, Suzzi A, Gorini B, Alvisi V.** ASGE guidelines for the appropriate use of upper endoscopy: association with endoscopic findings. *Gastrointest Endosc* 2002; **56**: 714-719
- 24 **Inadomi JM, Sonnenberg A.** The impact of colorectal cancer screening on life expectancy. *Gastrointest Endosc* 2000; **51**: 517-523

S- Editor Zhang SJ L- Editor Roemmele A E- Editor Zheng XM