

Appropriateness of Colonoscopy Indications in Multiple Digestive Endoscopy Centers in Abidjan: A Multicenter Study Using EPAGE II Criteria

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Abstract

Background: Colonoscopy is the reference examination for the lower gastrointestinal tract, yet inappropriate prescribing remains common, exposing patients to procedural risk and increasing costs. The European Panel on the Appropriateness of Gastrointestinal Endoscopy (EPAGE II) provides validated criteria for assessing colonoscopy indications. This study evaluated the appropriateness of colonoscopy indications across multiple endoscopy centers in Abidjan, Côte d'Ivoire, using EPAGE II criteria.

Methods: This prospective, analytical, multicenter study was conducted from January to September 2024 in four endoscopy units (two university hospitals and two private clinics). Adults undergoing diagnostic colonoscopy were enrolled after oral informed consent. Each indication was classified with the EPAGE II online tool as appropriate and necessary, appropriate, uncertain, or inappropriate. Associations were examined using chi-squared and Student t tests.

Results: Of 448 colonoscopies, 419 met the inclusion criteria. The mean age was 52 years, and 61.8% were male. Overall, 57.0% of indications were appropriate, 22.7% inappropriate, and 20.3% uncertain. Appropriateness was significantly higher among gastroenterologists (92.0%) than non-gastroenterologist specialists (42.6%), general practitioners (27.5%), or paramedical staff (7.4%). Inappropriate indications were associated with younger age. Significant lesions, including colorectal cancers and polyps, were detected almost exclusively in patients with appropriate indications.

Conclusion: Fewer than 60% of colonoscopy indications met EPAGE II criteria, and inappropriate referrals were associated with non-specialist prescribers and younger patient age. Routine application of EPAGE II criteria and targeted training of non-specialist prescribers could optimize resource use and reduce avoidable risk in resource-limited settings.

Keywords: Colonoscopy, EPAGE II criteria, appropriateness, gastrointestinal endoscopy, Côte d'Ivoire

Introduction

The incidence of organic colonic disease is increasing in sub-Saharan Africa, generating a growing need for lower gastrointestinal endoscopy (Kenfack et al., 2019). Colonoscopy, performed with a flexible endoscope, allows direct visualization of the colorectal mucosa from the rectum to the cecum (Ndjitoyap Ndam et al., 2025) and is the reference examination for the diagnosis, management, and surveillance of most colorectal disorders (Fall et al., 2023). Demand for diagnostic colonoscopy has increased steadily over the past decade, driven by improved availability, advances in image

quality, and gains in procedural safety and patient tolerance (Hammami et al., 2024). In sub-Saharan Africa, and in Côte d'Ivoire in particular, colonoscopy is now performed with increasing frequency (Assi et al., 2012).

The accepted indications for colonoscopy include investigation of lower gastrointestinal bleeding, abdominal pain, altered bowel habits, suspicion of malignancy, iron-deficiency anemia, and follow-up of abnormalities identified on cross-sectional imaging or barium studies (Olokoba et al., 2013). Many examinations, however, do not yield clinically relevant findings. Given the procedural risks, including perforation (0.1–0.3%), post-procedural hemorrhage, and anesthesia-related events, and the substantial economic cost, optimizing patient selection is a clinical priority (Kenfack et al., 2019; Assi et al., 2012). To address this need, the European Panel on the Appropriateness of Gastrointestinal Endoscopy (EPAGE II) developed validated criteria in 2008 that classify each colonoscopy indication, based on patient age, symptom duration, and clinical context, as appropriate and necessary, appropriate, uncertain, or inappropriate (Schussel   Filliettaz et al., 2009; Juillerat et al., 2009).

Despite the rising volume of colonoscopies performed across West Africa, data on the appropriateness of indications in this region remain scarce. The only Ivorian study to date, conducted by Assi et al. (2012) at the University Hospital of Cocody, reported that EPAGE criteria were applicable in 91% of cases, with 40% of indications classified as appropriate, 27% as uncertain, and 24% as inappropriate. No multicenter evaluation has since been performed.

The objective of the present study was to evaluate the appropriateness of colonoscopy indications across four digestive endoscopy centers in Abidjan (two university hospitals and two private clinics) using EPAGE II criteria.

Methods

Study design and setting

We conducted a prospective, analytical, multicenter cross-sectional study over 9 months, from January 1 to September 30, 2024, in the digestive endoscopy units of four centers in Abidjan, Côte d'Ivoire: Centre Hospitalier Universitaire d'Angré and Centre Hospitalier Universitaire de Cocody (university hospitals), as well as the private clinics (Centre Médical Mami Adjoua and Clinique Médicale de Danga).

Participants

All adults who underwent diagnostic colonoscopy during the study period were eligible. Patients were included after providing oral informed consent. Patients were excluded if they had an incomplete colonoscopy, a

therapeutic colonoscopy (e.g., polypectomy), a colonoscopy performed for preoperative assessment, or if they declined to participate.

Data collection

For each participant, the endoscopist completed a standardized form recording sociodemographic characteristics (age and sex), relevant medical history, the indication(s) for colonoscopy, the prescriber's professional group (gastroenterologist, non-gastroenterologist specialist, general practitioner, or paramedical staff), and the endoscopic findings. When multiple indications were present, the one with the highest EPAGE II score was used for analysis.

EPAGE II classification

The appropriateness of each indication was assessed using the EPAGE II online tool (www.epage.ch), which classifies indications into four categories: (1) appropriate and necessary, (2) appropriate, (3) uncertain, and (4) inappropriate. Cases that could not be classified by EPAGE II criteria were excluded. For comparative analyses, categories (1) and (2) were combined as appropriate, and categories (3) and (4) were considered non-appropriate.

Statistical analysis

Data were entered using Epi Info version 7.2.6.0 and analyzed with SPSS version 30.0. Categorical variables are reported as frequencies and percentages, and continuous variables as means $\pm$ standard deviations. Categorical variables were compared with the χ^2 test and continuous variables with the Student *t* test. A two-sided *P* value < 0.05 was considered statistically significant.

Results

Study population

During the study period, 448 colonoscopies were performed; 29 (6.5%) were excluded (7 incomplete examinations, 6 therapeutic procedures, and 16 not classifiable by EPAGE II), yielding 419 patients for analysis (EPAGE II applicable in 96.3%). The mean age was 52 ± 11 years (range 16–87), and male patients predominated (sex ratio M/F 1.6). The most frequent indications were gastrointestinal bleeding (rectal bleeding and/or melena) in 128 patients (30.5%), chronic constipation in 80 patients (19.1%), and chronic diarrhea in 36 patients (8.6%).

Appropriateness of colonoscopy indications

Applying EPAGE II criteria, 239 colonoscopies (57.0%) were classified as appropriate: 109 (26.0%) as appropriate and necessary, and 130

(31.0%) as appropriate, whereas 95 (22.7%) were inappropriate and 85 (20.3%) were uncertain. Younger age was significantly associated with inappropriate indications (mean age 38 ± 10 years in the inappropriate group vs. 63 ± 10 years in the appropriate and necessary group; $P < 0.001$). Sociodemographic data and prescriber distribution by EPAGE II category are shown in Table 1.

Gastroenterologists prescribed 175 colonoscopies (41.8%); non-gastroenterologist specialists, 108 (25.8%); general practitioners, 109 (26.0%); and paramedical staff, 27 (6.4%). Appropriateness varied significantly by prescriber category ($P < 0.001$): 161 of 175 colonoscopies prescribed by gastroenterologists (92.0%) were appropriate, with only 3 (1.7%) inappropriate and 11 (6.3%) uncertain. By contrast, appropriateness rates were 42.6% for non-gastroenterologist specialists, 27.5% for general practitioners, and 7.4% for paramedical staff.

Distribution of indications by EPAGE II category

Gastrointestinal bleeding accounted for 47.7% of appropriate and necessary indications, while abdominal pain was the leading inappropriate indication (37.9%). Chronic constipation (24.2%) and acute diarrhea (17.9%) were also frequently classified as inappropriate. The full distribution of indications by EPAGE II category is shown in Table 2.

Endoscopic findings

Colonoscopy was normal in 190 patients (45.3%). Significant lesions, defined as colorectal cancer, polyps, or diverticula, were identified in 108 patients (25.8%): 50 colorectal cancers (11.9%; 34 colonic [8.1%] and 16 rectal [3.8%]), 37 polyps (8.8%), and 21 cases of diverticulosis (5.0%). Other findings included hemorrhoidal disease (16.7%), colitis (6.4%), proctitis (3.6%), and angiodysplasia (2.1%).

Detection of significant lesions was strongly associated with appropriate indications: 92.0% of colorectal cancers (46/50), 89.2% of polyps (33/37), and 95.2% of diverticula (20/21) were identified in patients with appropriate indications ($P < 0.001$). Conversely, 78 of 95 colonoscopies (82.1%) prescribed for inappropriate indications were normal. Notably, 8.8% of colonic cancers and 8.1% of polyps were diagnosed in the uncertain-indications group, underscoring the importance of clinical judgment alongside algorithmic criteria. Endoscopic findings stratified by EPAGE II category are presented in Table 3.

Table 1. Sociodemographic characteristics, prescriber distribution, and appropriateness of colonoscopy indications according to EPAGE II criteria.

Parameter	Appropriate & Necessary, n (%)	Appropriate, n (%)	Inappropriate, n (%)	Uncertain, n (%)	P value
No. of patients	109 (26.0)	130 (31.0)	95 (22.7)	85 (20.3)	—
Mean age, years ($\pm$ SD)	63 $\pm$ 10	58 $\pm$ 11	38 $\pm$ 10	44 $\pm$ 11	< 0.001
Male/Female	69 / 40	81 / 49	57 / 38	52 / 33	0.97
Prescriber category					< 0.001
Hepato-gastroenterologist	71 (65.1)	90 (69.2)	3 (3.2)	11 (12.9)	
Non-gastroenterologist specialist	18 (16.5)	28 (21.5)	32 (33.7)	30 (35.3)	
General practitioner	20 (18.3)	10 (7.7)	43 (45.3)	36 (42.4)	
Paramedical staff	0 (0.0)	2 (1.5)	17 (17.9)	8 (9.4)	

SD, standard deviation. Percentages are within each EPAGE II category column.

Table 2. Distribution of colonoscopy indications by EPAGE II appropriateness category.

Indication	Appropriate & Necessary, n (%)	Appropriate, n (%)	Inappropriate, n (%)	Uncertain, n (%)
Gastrointestinal bleeding	52 (47.7)	24 (18.5)	10 (10.5)	42 (49.4)
Chronic constipation	11 (10.1)	37 (28.5)	23 (24.2)	9 (10.6)
Chronic diarrhea	13 (11.9)	16 (12.3)	2 (2.1)	5 (5.9)
Abdominal pain	2 (1.8)	9 (6.9)	36 (37.9)	12 (14.1)
Iron-deficiency anemia	19 (17.4)	13 (10.0)	0 (0.0)	1 (1.2)
Colorectal cancer screening	11 (10.1)	21 (16.2)	2 (2.1)	1 (1.2)
Weight loss	0 (0.0)	8 (6.2)	3 (3.2)	10 (11.8)
Acute diarrhea	0 (0.0)	0 (0.0)	17 (17.9)	2 (2.4)
Other	1 (0.9)	2 (1.5)	2 (2.1)	3 (3.5)
Total	109 (100)	130 (100)	95 (100)	85 (100)

Percentages are within each EPAGE II category column. $P < 0.001$ (χ^2 test).

Table 3. Endoscopic findings stratified by EPAGE II appropriateness category.

Endoscopic finding	Appropriate & Necessary, n (%)	Appropriate, n (%)	Inappropriate, n (%)	Uncertain, n (%)	Total, n (%)
Normal	18 (16.5)	56 (43.1)	78 (82.1)	38 (44.7)	190 (45.3)
Colonic tumor	15 (13.8)	15 (11.5)	1 (1.1)	3 (3.5)	34 (8.1)
Rectal tumor	7 (6.4)	9 (6.9)	0 (0.0)	0 (0.0)	16 (3.8)
Polyp	17 (15.6)	16 (12.3)	1 (1.1)	3 (3.5)	37 (8.8)
Diverticulosis	12 (11.0)	8 (6.2)	0 (0.0)	1 (1.2)	21 (5.0)
Hemorrhoidal disease	22 (20.2)	6 (4.6)	12 (12.6)	30 (35.3)	70 (16.7)
Colitis	10 (9.2)	9 (6.9)	3 (3.2)	5 (5.9)	27 (6.4)
Proctitis	5 (4.6)	5 (3.8)	0 (0.0)	5 (5.9)	15 (3.6)
Angiodysplasia	3 (2.8)	6 (4.6)	0 (0.0)	0 (0.0)	9 (2.1)
Total	109 (100)	130 (100)	95 (100)	85 (100)	419 (100)

Percentages are within each EPAGE II category column; the Total column gives percentages of the overall sample ($n = 419$). $P < 0.001$ (χ^2 test).

Discussion

This prospective, multicenter cross-sectional study evaluated the appropriateness of colonoscopy indications across four digestive endoscopy centers in Abidjan using EPAGE II criteria. EPAGE II criteria were applicable to 96.3% of the colonoscopies performed, comparable to the 91% reported by Assi et al. (2012) in Côte d'Ivoire and the 89.2% reported by Juillerat et al. (2009) in Western Europe, confirming the broad applicability of the instrument in our setting.

The mean patient age (52 years) and male predominance (M/F ratio, 1.6) are consistent with the study populations of Assi et al. (2012; 49 years) and Agar et al. (2018; 58 years) and reflect the typical demographic profile of patients undergoing colonoscopy in sub-Saharan Africa. Together, these findings indicate that colonoscopy is performed mainly in middle-aged and older adults in this setting.

Overall, 57.0% of indications met EPAGE II appropriateness criteria, in line with the rates reported by Agar et al. (2018; 62.3%), Medhioub et al. (2023; 60.9%), and Ollivier et al. (2008; 56%). By contrast, Kaliszan et al. (2006) reported only 31% appropriateness. This difference likely reflects two features of our study: (i) a high proportion of gastroenterologist-driven referrals (41.8%) and (ii) the predominance of gastrointestinal bleeding as the leading indication, a clinical scenario that typically scores as appropriate or appropriate and necessary on EPAGE II. Among gastroenterologists, 92.0% of indications were appropriate, with a strong correlation between specialty and appropriateness ($P < 0.001$). This finding is plausible: gastroenterologists are familiar with the indications for colonoscopy and routinely consider symptom duration, alarm features, and patient age when ordering the procedure.

Inappropriate indications accounted for 22.7% of cases, comparable to the rates reported by Njossu et al. (2011; 24%) and Balaguer et al. (2005; 23%). Three factors appeared to drive inappropriate referral in our study: the indication itself, patient age, and prescriber category. Approximately 60% of inappropriate indications originated from non-gastroenterology prescribers (general practitioners and paramedical staff), and younger age was significantly associated with inappropriate indications ($P < 0.001$). Non-specialist prescribers frequently ordered colonoscopy without systematically assessing chronicity of symptoms, prior medical history, or alarm features, particularly in younger patients. In young patients with chronic abdominal pain or altered bowel habits but no alarm features, functional bowel disorders should be considered before organic colonic disease, and colonoscopy is generally not indicated. These findings argue for continuing medical education in digestive disease for general practitioners and paramedical staff and for systematic use of EPAGE II criteria to improve referral quality.

With respect to endoscopic outcomes, significant lesions (colorectal cancers, polyps, and diverticula) were mostly found in the appropriate-indications group (92.0%, 89.2%, and 95.2%, respectively; $P < 0.001$), indicating a meaningful association between appropriateness and the probability of detecting clinically significant pathology. This pattern is broadly consistent with data from Ollivier et al. (2008), Majdouli et al. (2012), and Njossu et al. (2011), who reported that the great majority (over 95%) of significant lesions, predominantly colorectal cancers and polyps, were detected in patients with appropriate indications. Our findings support the use of EPAGE II criteria as a gatekeeping tool to improve the cost-effectiveness of colonoscopy in resource-limited settings.

Nevertheless, 8.8% of colonic cancers (3/34) and 8.1% of polyps (3/37) were diagnosed in the uncertain-indications group. This observation highlights an important limitation of any algorithmic instrument: clinical judgment must complement EPAGE II scoring, particularly for patients with atypical presentations or multiple risk factors. Strict reliance on EPAGE II criteria, without contextual clinical reasoning, could theoretically lead to missed early cancers or precancerous lesions.

Conclusions

In this prospective, multicenter cross-sectional study, 57.0% of colonoscopy indications in Abidjan met EPAGE II appropriateness criteria, with 22.7% classified as inappropriate and 20.3% as uncertain. Inappropriate referral was significantly associated with non-specialist prescribers and younger patient age. Detection of significant endoscopic lesions, including colorectal cancers, polyps, and diverticula, was strongly concentrated in the appropriate-indications group. These findings support the systematic integration of EPAGE II criteria into colonoscopy referral pathways in Côte d'Ivoire and similar sub-Saharan African settings. Targeted educational interventions for general practitioners and paramedical staff are needed to improve referral quality, optimize resource utilization, and minimize avoidable patient risk.

Author contributions

Study conception: Yaogo Abdoulatif; Data collection: Yaogo Abdoulatif, Nicaise Koffi, Claude Regis Lah Bi, Rebecca Gnininoun Lofigue; Data analysis: Claver Olivier Kouassi Koffi, Ange Christelle Amon Degnon; Manuscript drafting: Yaogo Abdoulatif, Aboubacar Demba Bangoura, Nancy Arlene Mesode Ekane Halle; Manuscript revision: Henriette Kissi Anzouan-Kacou, Fulgence Mammert Yao-Bathiax. All authors read and approved the final version.

Conflict of Interest: The authors reported no conflict of interest.

Data Availability: All data are included in the content of the paper.

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Ethical considerations

This study was conducted in accordance with the ethical principles of the Declaration of Helsinki. Ethical approval was granted by the four participating hospitals, and all participants provided informed consent before enrollment.

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