

# Outcomes and appropriateness of colonoscopy referrals at King Khalid University Hospital, Saudi Arabia

## *An opportunity to expand the colonoscopy screening*

Shahad M. AlQahtani, MBBS, Sulaiman A. Alshammari, MBBS, FRCGP, Reem J. Khidir, MBBS, Maha F. AlKhunaizi, MBBS, Osama M. Abdulqader, MBBS.

### ABSTRACT

**الأهداف:** لفحص إحالات تنظير القولون في نظام الوصول المفتوح وتحديد النتيجة والعوامل المرتبطة بالإحالة المناسبة.

**المنهجية:** دراسة بأثر رجعي لإحالات تنظير القولون استخدمت السجلات الطبية للمرضى في مستشفى الملك خالد الجامعي، المملكة العربية السعودية، خلال 2020-2022م. تم استخدام اختبار فيشر الدقيق أو اختبار مربع كاي لتحليل البيانات.

**النتائج:** من أصل 365 مريضاً، تم إحالة 95.1% من عيادات طب الأسرة بمتوسط عمر 56.2±15.7 سنة. يمثل الرجال 53.2% من المرضى. كانت الأعراض الأكثر شيوعاً هي تغيير عادات الأمعاء بنسبة (35.6%) وآلام في البطن (30.4%) وفقر دم بنسبة (20.1%). كان التاريخ الشخصي أو العائلي للإصابة بسرطان القولون والمستقيم إيجابياً في 4.4% و 12.1% على التوالي. كانت معظم الإحالات (86.0%) مناسبة بناءً على إرشادات (ASGE)؛ لكن ما يقرب من 89.1% من المرضى الذين تتراوح أعمارهم بين 45 سنة يعانون من الأورام، و 40.0% لديهم مرض التهاب الأمعاء ( $p=0.019$ ). لم تؤثر رتبة الأطباء ( $p=0.558$ ) أو جنس المرضى ( $p=0.665$ ) على الملاءمة. كانت الإحالات غير الملائمة أقل في المرضى الذين يعانون من الأورام (1.6%) مقارنة بالمرضى الذين يعانون من آفات أخرى ( $p=0.002$ ).

**الخلاصة:** كانت الإحالات منظار القولون مناسبة. كان معدل حدوث الأورام أعلى بين أولئك الذين تتراوح أعمارهم بين 45. تم العثور على إحالات غير مناسبة منخفضة وكشف عن الأورام عالية بناءً على إرشادات ASGE. يجب أن تتضمن الأبحاث المستقبلية إحالات متعددة المراكز من أطباء الأسرة خارج المستشفيات ودراسة أسباب تردد المرضى في الشروع في تنظير القولون والفعالية والتكلفة.

**Objectives:** To examine the colonoscopy referrals in an open-access system and determine the outcome and factors associated with appropriate referral.

**Methods:** A retrospective study of colonoscopy referrals used patients' medical records at King Khalid University Hospital, Riyadh, Saudi Arabia, during 2020-2022. Fisher's exact or Pearson's Chi-squared test were used for data analysis.

**Results:** Out of 365 patients, 95.1% were referred from family medicine clinics with a mean age of 56.2±15.7 years. Men account for 53.2% of patients. The most common symptoms were change in bowel habits (35.6%), abdominal pain (30.4%), and anemia

(20.1%). A family history of colorectal cancer was positive in 12.1%, while a personal history was positive in 4.4%. Most referrals (86.0%) were appropriate based on the American Society for Gastrointestinal Endoscopy (ASGE) guidelines. However, approximately 89.1% of patients aged ≥45 years had neoplasia and 40.0% had inflammatory bowel disease ( $p=0.019$ ). The rank of the physicians ( $p=0.558$ ) or the gender of the patients ( $p=0.665$ ) did not influence the appropriateness. The inappropriate referrals were lower in patients with neoplasia (1.6%) than in patients with other lesions ( $p=0.002$ ).

**Conclusion:** The colonoscopy referrals were appropriate. The incidence of neoplasia was higher among those aged ≥45. Low inappropriate referrals and a high neoplasia detection were found based on ASGE guidelines. Future research should involve prospective multicenter referrals from family physicians outside hospitals and investigate patients' hesitancy to proceed with colonoscopy and cost-effectiveness.

**Keywords:** colonoscopy, referrals, outcomes, colorectal cancer

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From the Department of Family & Community Medicine (AlQahtani, Alshammari, Abdulqader), College of Medicine, King Saud University, from the Department of Family & Community Medicine (Alshammari), King Saud University Medical City, Riyadh, Kingdom of Saudi Arabia, from the Department of Paediatrics (Khidir), University of Khartoum, Khartoum, Sudan, and from the Department of Family Medicine (AlKhunaizi), Xi'an Jiaotong University, Shaanxi, China.

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Address correspondence and reprint request to: Dr. Sulaiman A. Alshammari, Department of Family & Community Medicine, King Saud University Medical City, Riyadh, Kingdom of Saudi Arabia. E-mail: amsabsa@gmail.com  
ORCID ID: <https://orcid.org/0000-0001-9596-5590>

Cancer is the primary cause of death and a barrier to increasing life expectancy worldwide.<sup>1</sup> It has become a major burden on the healthcare systems of many countries since its treatment requires highly sophisticated expertise and resources. Cancer also has a significant impact on the economic and social lives of individuals.<sup>2</sup>

According to Global Cancer Statistics 2020, the third most prevalent malignancy is colorectal cancer (CRC), the second primary cause of cancer-related mortality.<sup>3</sup> The incidence of CRC in Saudi Arabia is low. However, mortality due to CRC has steadily increased in the Kingdom over the past years. Hence, CRC screening programs are recommended for early detection and prevention.<sup>4</sup> Furthermore, the observational descriptive epidemiological analysis from Saudi Arabia showed that CRC was more prevalent in males than females and had a higher mean number and percentage in older-aged groups.<sup>4,5</sup>

The detection of early-stage cancer and precancerous lesions is important. Studies have shown an improvement in the prevention and prognosis of CRC using screening methods.<sup>6,7</sup> Colonoscopy is a diagnostic modality and therapeutic procedure widely used for screening CRC and diagnosing and treating other colorectal diseases.<sup>8,9</sup> The frequency of lower endoscopic procedures has increased in the past decades.<sup>10</sup> The number of colonoscopies carried out in the United States has increased 3-4 times between 1998-2004, with a similar pattern in Europe.<sup>11,12</sup> Improvements in patient safety and conscious sedation have improved the efficacy and quality of CRC screening. This enhancement eventually led to an increase in the frequency of colonoscopy use.<sup>10</sup>

However, colonoscopy can result in some complications, such as bleeding. Although the rate of these complications is not high, particularly after following the already-issued colon cancer screening guidelines.<sup>13</sup> Additionally, open-access endoscopy units have led to an increase in inappropriate referrals in Western countries.<sup>10,14</sup> A previous study from Switzerland showed a significant proportion of inappropriate colonoscopies.<sup>15</sup> Inappropriate colonoscopy can lead to complications as well as financial burdens. However, there needs to be more data in the literature reporting the appropriateness of referrals for colonoscopies in Saudi Arabia.

The study's primary objectives were to examine the practice of patient referral to colonoscopy in an open access system, whether it was based on the indications. In addition, we aimed to determine colonoscopy diagnostic outcomes and further investigate the association between the appropriateness of referral and other variables supporting the necessity for referral.

**Methods.** This study was carried out in an open-access colonoscopy system at King Khalid University Hospital, a tertiary hospital in Riyadh, Saudi Arabia. This retrospective study included all eligible outpatient referrals to the endoscopy unit during the past 3 years (2020-2022). We use the following formula to estimate the sample size: where  $n$  = sample size and  $Z$  = level of confidence (2-sided 95% confidence interval [CI]=1.96), percentage of appropriateness of colonoscopy referral from family medicine clinics from a previous study ( $p=84.9\%$ ) = precision (4%). The required sample size was 308.

Data were obtained from the electronic medical records, all patients directly or indirectly referred from family medicine, general surgery, or gastroenterology clinics were included for screening, and those with sufficient data were entered into a pre-designed Excel sheet.

We followed the indications the American Society for Gastrointestinal Endoscopy (ASGE) set in determining the appropriateness of referrals in our study. The collected data included: demographic information, presenting symptoms, risk factors, rank of referring medical personnel, success, results, and complications of colonoscopy if carried out. We included all patients referred for colonoscopy and had one carried out on them; individuals referred from clinics or inpatients who did not get a colonoscopy were excluded. This study was approved by the Institutional Review Board of King Saud University, College of Medicine, Riyadh, Saudi Arabia (research project no.: E-22-6909). Names of patients and referring physicians were not revealed. The study was carried out according to the principles of the Helsinki Declaration.

Significant findings were described as neoplasia or inflammatory bowel disease (IBD). Neoplasia was defined as malignant lesions or neoplastic polyps on colonoscopy and confirmed by histological examination.

**Statistical analysis.** Statistical analyses were carried out using R studio for Windows, version 4.1.1 (Integrated Development Environment for R., Boston, MA, USA). Frequencies and percentages illustrated

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categorical data. Fisher's exact or Pearson's Chi-squared test assessed the differences between patient groups. A  $p$ -value of  $<0.05$  was considered significant.

**Results.** Initially, 378 patients were included in the study, but 13 had insufficient information. Therefore, records of 365 patients were analyzed in the current study. Most patients were referred from family medicine clinics (95.1%), whereas only 3.3% were from gastroenterology and 1.6% from general surgery clinics. More than half of the patients were men (53.2%). The mean age of the patients was  $56.2 \pm 15.7$  years, and approximately three-quarters (77.8%) were aged  $\geq 45$  years. The most common symptoms indicating the need for colonoscopy were as follows: change in bowel habits for  $>6$  weeks (35.6%), abdominal pain (30.4%), and anemia (20.1%). A family history of colorectal cancer was positive in 12.1%, while a personal history was positive in 4.4%. There were no confirmed or suspected hereditary CRC syndromes, such as familial adenomatous polyposis or Lynch syndrome, among the patients (Table 1).

Most colonoscopy referrals were carried out by consultants (68.5%). Many referrals (86.0%) were

appropriate based on the ASGE guidelines. However, only 51.8% of the colonoscopy examinations were carried out after referral. Of note, 3 (1.6%) patients were hospitalized for colonoscopy. Colonoscopy was successful in 94.7% of patients and failed in 5.3%. Poor bowel preparation was the primary reason for the failed cases. Complications were developed in one (0.6%) patient (Table 2).

Among patients who underwent colonoscopy ( $n=189$ ), neoplasia was detected in 64 (33.9%) patients and non-neoplastic polyps in 10 (5.3%) patients, whereas diverticular disease, inflammatory bowel disease, and other diseases were detected in 6 patients (3.2%; Figure 1). The appropriateness of referral did not significantly differ based on the rank of the referring physician ( $p=0.558$ ) or performance of colonoscopy after referral ( $p=0.183$ ). However, inappropriate referrals were significantly lower in patients with neoplasia (1.6%) than those without neoplastic findings (16.6%;  $p=0.002$ ). The appropriateness of referral was not significantly different among the other positive colonoscopy findings ( $p>0.05$ ; Table 3).

In the current study, 69 patients had significant findings of neoplasia or IBD, representing 36.5% of

**Table 1** - Characteristics of the included patients (N=365).

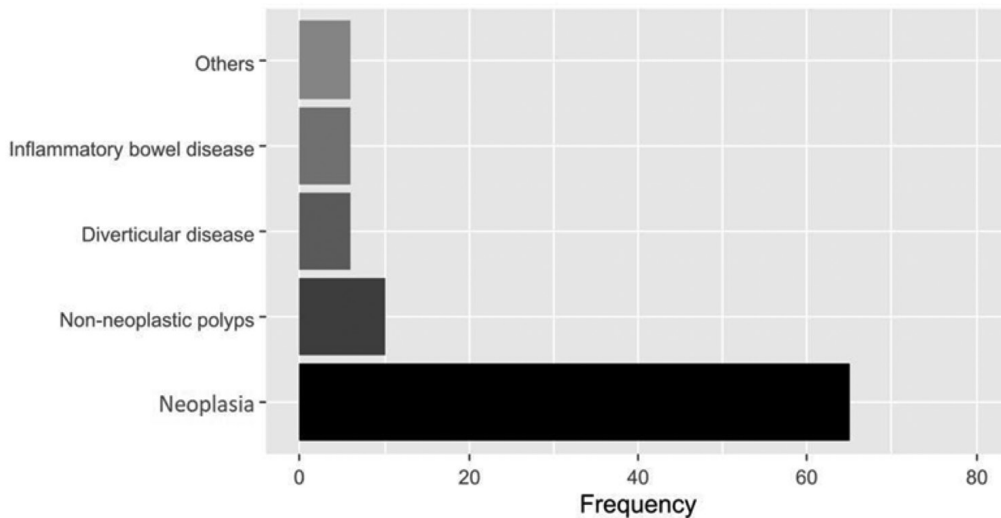
Parameters	n (%)
<i>Specialty</i>	
Family Medicine	347 (95.1)
Gastroenterology	12 (3.3)
General Surgery	6 (1.6)
Age, mean $\pm$ SD	56.2 $\pm$ 15.7
<i>Gender</i>	
Male	194 (53.2)
Female	171 (46.8)
<i>Symptoms indicating need for colonoscopy</i>	
Change in bowel habits $>6$ weeks	130 (35.6)
Abdominal pain	111 (30.4)
Anemia	73 (20.1)
Constipation	54 (14.8)
Weight loss	49 (13.5)
Bloating	46 (12.6)
Rectal bleeding	45 (12.3)
Blood mixed with stool	41 (11.2)
Diarrhea	23 (6.3)
Melena	10 (2.7)
<i>Risk factors for CRC</i>	
Age $\geq 45$ years	284 (77.8)
Family history of colorectal cancer	44 (12.1)
Colorectal cancer or polyps	16 (4.4)
IBD	7 (1.9)
Radiation to the abdomen or pelvic area to treat a prior cancer	3 (0.8)
Confirmed or suspected hereditary colorectal cancer syndrome*	0 (0.0)

Values are presented as numbers and percentages (%). SD: standard deviation, CRC: colorectal cancer, IBD: inflammatory bowel disease

**Table 2** - Colonoscopy-related data.

Parameters	n (%)
<i>Appropriateness of CRC screening according to ASGE guideline</i>	
Appropriate	314 (86.0)
Inappropriate	51 (14.0)
<i>Rank of the referring doctor<sup>†</sup></i>	
Consultant	172 (68.5)
Associate consultant	23 (9.2)
Assistant consultant	27 (10.8)
Resident	21 (8.4)
Staff physician	8 (3.2)
Colonoscopy carried out after referral (yes)	189 (51.8)
Colonoscopy succeed <sup>‡</sup> (yes) <sup>‡</sup>	179 (94.7)
Colonoscopy failed (yes) <sup>‡</sup>	10 (5.3)
Admitted for colonoscopy (yes) <sup>††</sup>	3 (1.6)
Complication after colonoscopy (yes) <sup>††</sup>	1 (0.6)

Values are presented as numbers and percentages (%). <sup>†</sup>The variables have missing records (n=114 for the rank of the referring doctor, n=5 admission for colonoscopy, and n=17 for the complications after colonoscopy). <sup>‡</sup>Descriptive data is based on 189 patients who underwent colonoscopy after referral. CRC: colorectal cancer, ASGE: the American Society for Gastrointestinal Endoscopy



**Figure 1** - Frequencies of positive colonoscopy result.

the patients who underwent colonoscopy. One patient had both neoplasia and IBD. There were no significant gender differences in the patients ( $p=0.665$ ). However, a significantly higher percentage of patients aged  $\geq 45$  years had neoplasia (89.1%) compared with 40.0% who had IBD ( $p=0.019$ ; **Table 4**).

**Discussion.** Colorectal cancer screening has been well-established as a national policy in many parts of Europe and North America.<sup>16</sup> Screening refers to the early detection of CRC or precancerous lesions in

asymptomatic individuals using non-invasive methods (namely, fecal occult blood tests) or invasive ones, with colonoscopy being the preferred modality. Screening colonoscopies differ from diagnostic colonoscopies since patients with symptoms or positive screening tests other than colonoscopy were further examined.<sup>17</sup>

The ASGE guidelines have long been developed to direct clinicians in evaluating and managing patients undergoing gastrointestinal endoscopic procedures.<sup>18</sup> These evidence-based recommendations ensure that patients referred for diagnostic colonoscopy fall under

**Table 3** - Factors associated with the appropriateness of colonoscopy referrals.

Parameters	Appropriateness of referral		P-values
	Appropriate (n=314)	Inappropriate (n=51)	
<i>Rank of the referring doctor</i>			
Staff physician	6 (75.0)	2 (25.0)	0.558
Resident	19 (90.5)	2 (9.5)	
Assistant consultant	21 (77.8)	6 (22.2)	
Associate consultant	18 (78.3)	5 (21.7)	
Consultant	146 (84.9)	26 (15.1)	
<i>Colonoscopy carried out after referral</i>			
No	147 (83.5)	29 (16.5)	0.183
Yes	167 (88.4)	22 (11.6)	
<i>Results of positive colonoscopy</i>			
<i>Neoplasia</i>			
No	251 (83.4)	50 (16.6)	0.002
Yes	63 (98.4)	1 (1.6)	
<i>Non-neoplastic polyps</i>			
No	304 (85.6)	51 (14.4)	0.369
Yes	10 (100)	0 (0.0)	
<i>Diverticular disease</i>			
No	308 (85.8)	51 (14.2)	>0.999
Yes	6 (100)	0 (0.0)	
<i>Inflammatory bowel disease</i>			
No	308 (85.8)	51 (14.2)	>0.999
Yes	6 (100)	0 (0.0)	
<i>Other</i>			
No	308 (85.8)	51 (14.2)	>0.999
Yes	6 (100)	0 (0.0)	

Values are presented as numbers and percentages (%).

**Table 4** - Factors associated with the significant findings.

Parameters	Significant findings		P-values
	Neoplasia (n=64)	IBD only (n=5)	
<i>Gender</i>			
Male	30 (46.9)	3 (60.0)	0.665
Female	34 (53.1)	2 (40.0)	
<i>Age</i>			
<45	7 (10.9)	3 (60.0)	0.019
≥45	57 (89.1)	2 (40.0)	

Values are presented as numbers and percentages (%).  
IBD: inflammatory bowel disease

at least one of the indications for referral to justify/warrant its appropriateness.<sup>10</sup>

We applied the latest ASGE guidelines in this novel study, and referrals were judged appropriate or inappropriate. Among those referred to undergo colonoscopy, there were slightly more males than females. However, no significant association was found between gender and malignant findings on colonoscopy. This followed the natural distribution of CRC in Saudi Arabia, where the crude incidence rate was 3.6 for females with colon cancer and 2.1 for females with

rectal cancer, and a similar rate of 3.3 for males with colon cancer and 2.8 for males with rectal cancer.<sup>19</sup>

More than three-quarters of the referred patients were 45 years and older. Unsurprisingly, this age group had many neoplastic findings ( $p=0.019$ ). In a recent study comparing trends of the CRC incidence rate in Saudi Arabia last 2001-2016, the CRC rate increased more than twice, with the steepest increase observed among patients aged 50 years and above.<sup>20</sup> Moreover, our study found that a considerable proportion of patients (10.9%) with neoplasia were below 45. Alyabsi et al<sup>20</sup> also reported an increase in the average annual percentage change in the rate of early diagnosed CRC, with patients between the age of 40-49 years having the highest rates, especially among women. These findings emphasized the need for a screening policy carefully tailored to the CRC distribution in Saudi Arabia.<sup>2</sup>

Despite the high likelihood of inappropriate referrals in an open-access system, our study revealed a high percentage (86%) of appropriate colonoscopy referrals based on ASGE indications. This finding was similar to a previous study, which showed that 84% of

colonoscopy referrals were appropriate.<sup>21</sup> Other similar studies had lower rates of appropriate referrals, ranging from 57.9–68.3% in Asia and 63.9% in Italy.<sup>22–24</sup> In our study, 14% of the referrals were deemed inappropriate or unlisted in the ASGE guidelines, in contrast to previous studies.<sup>22,24</sup> The proportion of inappropriate referrals was significantly lower among patients with malignancies (1.6%) than among those without malignancies, reflecting the high diagnostic yield for neoplasia and the importance of following guidelines.

According to the 2020 Global Cancer Observatory statistics, CRC in Saudi Arabia accounted for 14.4% of new cancer cases in 2020, ranking first and second among males and females.<sup>25</sup> A national policy or programmatic screening for CRC has yet to be implemented, although the Saudi Arabian Ministry of Health has been gradually enrolling in a “colorectal cancer early detection” program. Screening is offered to moderate-risk individuals aged 45–75 using a fecal occult blood test. Individuals classified as high-risk and those who tested positive on fecal occult blood tests will undergo a screening colonoscopy.<sup>26</sup> Adherence to the recommended healthcare system guidelines on CRC screening may not only improve early detection of CRC but may also reduce unnecessary and inappropriate colonoscopy referrals.<sup>24</sup>

In the present study, nearly half of the colonoscopies ordered were not carried out, which was attributed to either patient refusal or loss of follow-up. This may largely be reflected by the need for more awareness and perception of CRC screening methods among the population. A recent community-based survey reported participants’ unwillingness to undergo colonoscopy in nearly two-thirds of those surveyed. The reasons included fear of CRC diagnosis and delays due to administrative reasons.<sup>27</sup> Notably, most referrals were deemed appropriate (86%). Given that CRC screening is a cost-effective measure for preventing CRC and reducing CRC mortality. It is anticipated that the demand for screening colonoscopy will increase due to the efforts carried out by the professional health community to improve people’s awareness, attitude, and practice regarding colonoscopy.<sup>28,29</sup> With the help of primary care physicians, policymakers may increase access to CRC screening.<sup>30,31</sup> Better CRC screening compliance was also linked to lower costs, according to a prior study, when more primary care doctors and rural general practitioner endoscopists were trained to carry out colonoscopies in the office.<sup>32,33</sup> Non-physicians, such as trained nurse practitioners, may be able to help with CRC screening needs, as demand for colonoscopies exceeds supply.<sup>28</sup>

**Study limitations.** A major limitation of our study included the drawbacks of being a retrospective study design since patient records must be properly filled-up. Some required details and reasons for referral may need to be included, which may lead to inaccurate data. Furthermore, most patients’ records did not explore the reasons for refraining from colonoscopy. The data were obtained from a single center. Hence, the findings may need to be more generalizable to patients in other centers.

In conclusion, since there is a scarcity of studies on the appropriateness of colonoscopy referrals in our healthcare system, the current study may draw the attention of clinicians, researchers, and decision-makers to expand the service. Adherence to practice guidelines for diagnostic colonoscopy referrals was observed in our study. However, many patients did not proceed with colonoscopy, necessitating further investigation. More than two-thirds of the patients had significant colonoscopy findings, with neoplasia significantly higher among those aged  $\geq 45$  years. Among those with inappropriate referrals, a significantly low rate of patients with neoplasia was found, reflecting the high yield of neoplasia detection when using the ASGE guidelines. Family physicians at the extensive primary care centers networks can help health decision-makers extend CRC screening all over Saudi Arabia. Future research should involve prospective multicenter and referrals from family physicians outside tertiary care hospitals. Furthermore, future researchers should investigate why our patients hesitate to proceed with colonoscopies.

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