ADR evaluation of screening colonoscopies during 2016–2017 in a private health clinic in Peru

Introduction

Colonoscopy is the principal procedure used for colorectal cancer (CRC) screening in the United States [1] and its use is recommended by the American College of Gastroenterology (ACG) Screening Guidelines [2]. Adenoma detection rate (ADR) is considered to be the most important parameter for evaluating the quality of screening colonoscopy programs, therefore, ADR determination is also beneficial for patients [3].

ADR is defined as the proportion of colonoscopies in which at least one histologically confirmed adenoma is detected and is inversely related to deaths from CRC [4, 5]. Centers responsible for performing screening colonoscopy programs should use appropriate indicators to monitor the quality of their performance [6], particularly in light of possible significant performance variations among colonoscopists [7].

Colorectal adenomas are considered to be the principal risk factor for development of CRC [8] and failure to detect adenomas during a screening colonoscopy has been related to an increased risk of CRC [1]. Kaminsky MF et al. found that an ADR of less than 20% is related to a higher risk of developing interval CRC [5] and for each 1% increase in the ADR there could be a 3% reduction in interval CRC [4]. Current ADR benchmarks recommended by the ACG/American Society for Gastrointestinal Endoscopy (ASGE) are 25% for all patients and sex-specific rates of 30% for males and 20% for females [1, 3]. In addition, ADR

Background and study aims

High-quality colonoscopy is fundamental for preventing colorectal cancer (CRC). The adenoma detection rate (ADR) is a key colonoscopy quality measure. The aim of this study was to establish the screening colonoscopy ADR of a tertiary referral center in Peru, identify the relationship between the ADR and patient age, sex and the colonoscopist, and determine the endoscopic and histopathological characteristics of the lesions found.

Patients and methods

A retrospective observational longitudinal study was undertaken between January 2016 and June 2017.

Results

Eight colonoscopists performed screening colonoscopies on 620 patients scoring ≥6 points on the Boston Bowel Preparation Scale (BBPS); cecal intubation was complete in 595 patients (cecal intubation rate [CIR] 95.9%). The overall ADR was 29.7% (females 25.4%, males 33.1%, P=0.040, 95% CI). The ADR colonoscopist range was 25.0% to 34.4%. The highest ADR (41.2%, P=0.013, 95% CI) was for patients aged 65 to 75 years. Adenoma colon locations were: left 49%, transverse 21.6% and right 29.4%. Adenoma dysplasia grades: low 98%, high 2%. Sixty-three percent of the lesions were 5 mm to 10 mm. Resections performed: 78.5% cold biopsy forceps (CBF), 3.4% cold snare polypectomy (CSP) and 18.1% endoscopic mucosal resection (EMR).

Conclusions

The ADR established was in line with the joint American College of Gastroenterology (ACG)/American Society for Gastrointestinal Endoscopy (ASGE) recommendations and related to patient age and gender but not to the colonoscopist. Colonoscopists should ensure rigorous application of the colonoscopy quality actions. ADR should be evaluated frequently.
could be up to 40% if the screening strategy was initiated with a fecal occult blood test (FOBT) [9].

ADR is dependent on a number of factors, which may be broadly grouped as: patient-specific, relating to the characteristics of each patient, e.g. age, sex, medical history etc.; colonoscopist-specific, relating to the skill and experience of the colonoscopist; and procedural factors, relating to the colonoscopy procedure itself. It is generally accepted that the most important factors affecting ADR are the colonoscopist’s skill and experience [5], cecal intubation rate (CIR), and quality of the colonic preparation, using for example the Boston Bowel Preparation Scale (BBPS) [10] as a measure [9, 11], allowing sufficient colonscope withdrawal time to permit detailed inspection of the colonic mucosa and folds. Patient-specific factors and procedural factors (instruments, techniques, technology) are all associated with improved ADR scores [12]. Examples of procedural actions are: liquid aspiration, position changes, use of butyrscolamine, utilization of a shallow-fitting cap in the end of the endoscope [13] and new technologies (e.g. high-resolution or the “third eye” scope). These procedural actions contribute to improved detection of polyps and adenomas [14, 15] thereby improving ADR.

The objectives of this study were to: (a) retrospectively establish ADR of the screening colonoscopy program of the Department of Gastroenterology of the Instituto de Enfermedades Digestivas, Clínica Internacional, Lima – Peru (a tertiary referral center) from January 2016 to June 2017, (b) identify the relationship between ADR and patient age and sex and the colonoscopist; and (c) determine endoscopic and the histopathological characteristics of the lesions found.

Clínica Internacional, Lima – Peru is one of the few centers in Peru offering a CRC screening colonoscopy program and this study would provide quality assurance for that program. Given the importance of ADR as a quality measure for reduction of CRC, its actual determination is therefore essential.

Patients and methods

A longitudinal, observational and retrospective study was performed to evaluate the ADR for patients undergoing CRC screening colonoscopies between January 2016 and June 2017 in the Clínica Internacional, Lima, Peru. The colonoscopies were performed by eight colonoscopists, all specialist gastroenterologists, with similar education and training profiles after first establishment of ADR of the screening colonoscopy program of the Department of Gastroenterology of the Instituto de Enfermedades Digestivas, Clínica Internacional, Lima – Peru (a tertiary referral center) from January 2016 to June 2017. (b) identify the relationship between ADR and patient age and sex and the colonoscopist; and (c) determine endoscopic and the histopathological characteristics of the lesions found.

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Results

ADR results for the 620 patients scoring BBPS ≥ 6 points were as follows: 595 patients completed cecal intubation (ccel Intubation rate [CIR] 95.9%) with an overall ADR of 29.7%. The sex-specific ADR was: females 25.4%, males 33.1% (P=0.040, OR: 0.687, 95% CI: 0.479–0.984) [Table 1]. The average age of the 595 patients was 57.6 years ± 5.9 years and the highest ADR was 41.2% (P=0.013, OR: 0.551, 95% CI: 0.343–0.885) for patients in the age band 65 to 75 years [Table 2]. These results indicate the existence of a statistically significant rela-
tionship between ADR and patient age and sex. ADR by colono-
scopist (▶ Table 3) ranged from 25.0 % to 34.4 % and there
was no relationship between ADR and the colonoscopists (P=
0.902, 95 % CI).

A total of 531 lesions were found, the sizes of which were:
< 5 mm 21 %, 5 mm to 10 mm 63 %, 11 mm to 19 mm 13 % and
> 20 mm 3 %. Using the Paris Classification, 529 lesions
were classified as: type 0-Ia 84.8 %, type 0-Ip 1.3 %, type 0-IIa 13.0 %
and type 0-IIIb 0.2 %.

Two hundred seventy-six of the lesions (52 %) were not ade-
nomas and were classified as: hyperplastic polyps 48.8 %, serra-
ted polyps 1.7 %, serrated adenomas 0.75 %, and adenocarcino-
mas 0.75 %.

Two hundred fifty-five adenomas were found and the histo-
pathological analysis showed dysplasia grades of: 98 % low-
grade and 2 % high-grade. Colonic locations of the adenomas
were: left 49 %, transverse 21.6 % and right 29.4 % (▶ Table 4).

Resections performed were: 78.5 % cold biopsy forceps
(CBF), 3.4 % cold snare polypectomy (CSP) and 18.1 % endo-
scopic mucosal resection (EMR).

Discussion

Two principal patient-specific factors determining prevalence
of adenomas are patient age and sex [3]. In this study the ADR
was higher in males than in females (▶ Table 1) and also higher
with increasing patient age (▶ Table 2), confirming the results
reported by others that there exists a relationship between pa-
tient age and sex and ADR [16, 17]. The ADR result for each co-
lonoscopist (▶ Table 3) indicates no relati onship between the
overall ADR and the colonoscopist and this appears to be at var-
iance with other reports [3]. This variance may be because this
study focused on a group of eight colonoscopists all with similar
skill and experience and whose training as specialist gastroen-
terologists had mostly occurred after publication in 2006 of
the initial joint ACG/ASGE Task Force on Endoscopy Quality
Guidelines [3]. Also, their familiarity with similar types of colo-
noscopy instruments was an important factor in the colonosco-
py procedures underlying the ADR result [18] as was the super-
vision provided by the center’s directors.

The increased attention paid to the ADR measure post-2006
probably focused the attention of the colonoscopists on the
underlying colonoscopy quality factors. For example, Abdul-
Baki H. et al. found a variation between ADR results obtained
prior to the introduction of public reporting of colonoscopy
quality (ADR 34.3 %) and those obtained once the transition to
public reporting was completed (ADR 39.2 %) [19]. The overall
ADR result of the current study is reasonably in line with those
reported by others for screening colonoscopies, for example; in
the United States 35.9 % [20] and in Brazil 27.1 % (females 25.3
% and males 30.6 %) [16]. In Peru there were two reports of
ADRs for colonoscopies with indications other than screening:
10 % [21] and 27 %. [22]. The variability of these reported
ADRs from Peru could be due to a number of factors of which
the colonoscopists’ skill and experience could be a major one
[20]; other factors could be: the number of unsupervised/train-
ing/teaching colonoscopies, colonoscopies performed with in-

<table>
<thead>
<tr>
<th>Patient sex</th>
<th>n</th>
<th>ADR (%)</th>
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</thead>
<tbody>
<tr>
<td>Female</td>
<td>260</td>
<td>25.4 %</td>
</tr>
<tr>
<td>Male</td>
<td>355</td>
<td>33.1 %</td>
</tr>
<tr>
<td>Total</td>
<td>595</td>
<td>29.7 %</td>
</tr>
</tbody>
</table>

P = 0.040, OR: 0.687 (95 % CI: 0.479 – 0.984)

<table>
<thead>
<tr>
<th>Patient age</th>
<th>n</th>
<th>ADR (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>50 – 64</td>
<td>510</td>
<td>27.8 %</td>
</tr>
<tr>
<td>65 – 75</td>
<td>85</td>
<td>41.2 %</td>
</tr>
<tr>
<td>Total</td>
<td>595</td>
<td>29.7 %</td>
</tr>
</tbody>
</table>

P = 0.013, OR: 0.551 (95 % CI: 0.343 – 0.885)

<table>
<thead>
<tr>
<th>Colonoscopist</th>
<th>n</th>
<th>ADR (95 % CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>8</td>
<td>25.0 % (8.0 – 58.2)</td>
</tr>
<tr>
<td>2</td>
<td>90</td>
<td>34.4 % (26.8 – 43.3)</td>
</tr>
<tr>
<td>3</td>
<td>92</td>
<td>31.5 % (23.9 – 40.6)</td>
</tr>
<tr>
<td>4</td>
<td>109</td>
<td>29.4 % (22.4 – 37.8)</td>
</tr>
<tr>
<td>5</td>
<td>63</td>
<td>27.0 % (18.3 – 38.3)</td>
</tr>
<tr>
<td>6</td>
<td>84</td>
<td>32.1 % (24.2 – 41.6)</td>
</tr>
<tr>
<td>7</td>
<td>108</td>
<td>25.0 % (18.2 – 33.5)</td>
</tr>
<tr>
<td>8</td>
<td>41</td>
<td>29.3 % (18.7 – 43.4)</td>
</tr>
<tr>
<td>Total</td>
<td>595</td>
<td>29.7 % (26.6 – 33.2)</td>
</tr>
</tbody>
</table>

P = 0.902, 95 % Confidence Interval

<table>
<thead>
<tr>
<th>Number of adenomas</th>
<th>Left</th>
<th>Transverse</th>
<th>Right</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>59</td>
<td>25</td>
<td>34</td>
<td>118</td>
</tr>
<tr>
<td>2</td>
<td>42</td>
<td>21</td>
<td>23</td>
<td>86</td>
</tr>
<tr>
<td>3</td>
<td>18</td>
<td>7</td>
<td>14</td>
<td>39</td>
</tr>
<tr>
<td>4</td>
<td>6</td>
<td>2</td>
<td>4</td>
<td>12</td>
</tr>
<tr>
<td>Total (% of total)</td>
<td>125  (49 %)</td>
<td>55 (21.6 %)</td>
<td>75 (29.4 %)</td>
<td>255 (100 %)</td>
</tr>
</tbody>
</table>
dictions other than screening, i.e. being higher for follow-up colonoscopies [23]. The importance of the colonoscopist’s experience in performing screening program colonoscopies has been found to relate directly to other colonoscopy quality parameters [9]. The colonoscopists in this study also perform colonoscopies in other tertiary referral centers in Lima, Peru and this contributes to improving their individual and collective practice experience and promotes higher ADRs. For example, Do A. et al. in a study of patients in an academic medical center observed that to obtain a reliable evaluation of the ADR by endoscopist it was important to have large sample sizes, e.g. 500 colonoscopy procedures, to narrow the confidence interval (CI) when evaluating the ADR [24] and implying that colonoscopy centers are better located in the larger urban population centers.

Other factors affecting the ADR include withdrawal time of the colonoscope, colonic preparation and the degree of thoroughness of the examination of the right colon. These factors were taken into account by the colonoscopists in this study, which most likely positively influenced the final ADR [3, 9, 11 – 14]. Adherence to the BBPS ≥ 6 [10] for colonic preparation also may have contributed positively to the ADR result in this study [11]. Current literature indicates that adequate colonic preparation should be to the level of BBPS ≥ 6. The patients in this study were in a state of conscious sedation even though the sedation dose was greater than that reported in Performance Indicator of Colonic Intubation (PICI) [25]. None of the procedure reports indicated that colonoscopies had to be suspended because of patient discomfort, nor were there any indications of any interruption to cecal intubation. It is generally accepted that adequate CIR values to be achieved should be ≥ 90% for general colonoscopies and ≥ 95% for screening colonoscopies [3, 11]. That was achieved for the screening colonoscopies in this study and is probably a reflection of the training and experience of the colonoscopists [9].

To prevent CRC, all colonoscopies should ensure a complete evaluation of the colonic mucosa and complete removal of polyps found. This highlights two critical actions: first, the need for thorough characterization of lesions prior to their excision and second, choice of method for lesion retrieval to ensure complete removal. Distribution by lesion type found in this study, excluding the adenocarcinomas (0.75% of the total found), was similar to the findings reported by others [26]. As regards the Paris Classification, a search of the recent research literature did not produce useful Paris Classification data on which to base a comparative discussion of this study’s findings, indeed the suitability of the Paris Classification appears to be under scrutiny [26, 27].

Of the adenomas found, 51% were located in the proximal colon, whereas others have reported finding the majority in the distal colon [9, 11, 16, 18]. This difference could be due to there being a causal relationship with respect to the personal characteristics of the patient populations sampled, in addition to factors related to the degree of colonic preparation and colonoscopist experience, e.g. methods of examination and evaluation of the proximal colon [11]. The higher number of adenomas in the left colon could be related to a predominance of the adenoma production pathway (suppressor) that more frequently affects the distal colon [28]. In addition to the 0.75% of malignant lesions (adenocarcinomas), other polyps or adenomas were detected, i.e. 2.45% which had high premalignancy potential (serrated polyps and adenomas). Given the relationship between serrated lesions and CRC it is important to correctly characterize all the lesions found and determine their appropriate treatment [29]. Abdeljawad et al. [30] summarized nine studies on sessile serrated lesion detection rates, with one study presenting a detection rate of 13.8% and eight others ranging from 0.6% to 5.3%; three of these studies reported detection rates between 0.6% and 1.7% which are lower than the detection rate of 2.45% found in this study. Higher detection rates for serrated lesions observed in other studies could be due to the experience of the reporters in detecting sessile serrated lesions. For example, Abdeljawad et al. reported a detection rate of 8.1% for 1910 screening colonoscopies by a colonoscopist with an already high detection rate for serrated lesions and an experienced pathologist [30]. Mishra G. et al. commented that “knowledge and familiarity of their appearance are key to the detection of these lesions” [29].

Comparing screening colonoscopy detection rates for sessile serrated lesions in the absence of a generally accepted benchmark is very challenging, particularly because factors that influence the detection rate are numerous, which in turn complicates reconciliation of detection rates from different studies. The British Society of Gastroenterology (BSG) [31] in a 2017 position statement included 17 colonoscopy studies evaluating detection rates for serrated lesions covering the period 2006 to 2014 of which five retrospective studies for screening colonoscopies evaluated detection rates for sessile serrated adenomas 1.4% to 9%, traditional serrated adenomas < 0.1% to 2.3% and serrated polyps 17.5% to 40%. The BSG’s position statement suggested that colonoscopists in assessing “their proximal serrated polyp detection rate might aim for > 5%” [31].

In summary, the significant variations in detection rates for sessile serrated adenomas are very likely due to a combination of: (a) patient-specific factors, possibly related to, for example, genotypic and phenotypic heterogeneity present in particular populations and related to the risk of suffering CRC; (b) colonoscopy-related factors, such as the type of colonoscopy, (screening or follow-up or other), colonoscopy procedural decisions, (white light, use of magnification etc), the skill and experience of the colonoscopist in the identification and characterization of these lesions; and (c) confusion over classification of serrated lesions to be considered when evaluating detection rate.

In this study, the most frequent treatment for management of polyps or adenomas was excision with CBF (78.5% of all lesions found) with the remainder excised with CSP; this was to be expected given that 84% of the total lesions were ≤ 10 mm in size. At the time the colonoscopies in this study were performed, the usual practice in various colonoscopy centers in Peru was to use CBF for polyps or adenomas up to 7 mm and CSP for those between 8 mm and 9 mm. This provided a good
safety profile and sample recovery, however, the complete resection rate is lower when compared to that with CSP for lesions between 5 mm and 7 mm [32]. This approach was consistent with the then European guidelines (2010) which recommended "the use of either snare or forceps polypectomy for lesions ≥ 5 mm; the use of forceps resection was recommended only for lesions <5 mm" [33]. Various studies have evaluated use of CBF in resection of very small polyps observing high retrieval rates of 100% compared to 39% to 90.7% for complete histological resection [34].

Directors of colonoscopy centers and screening program colonoscopists must regularly evaluate ADR and quality actions and parameters that will influence it [1, 9], considering for example ADR, patient bowel preparation, withdrawal time, CIR, the number of unsupervised/training colonoscopies, type of sedation, rate of colonoscopic perforations, bleeding rates post-polypectomy, description and characterization of polyps, endoscopic extirpation of pendunculate and sessile/polypus up to size 20 mm and rate of extirpated polyps recovered [9, 11].

The limitations of this study were its retrospective nature, performance in just one center, and variation in numbers of colonoscopies per colonoscopist.

**Conclusion**

The ADR of the tertiary referral center under study from January 2016 to June 2017 was in line with recommendations of the joint ACG/ASGE Task Force on Quality in Endoscopy [3]. ADR was related to patient age and sex but there was no relationship with the colonoscopists. There was limited variation in ADR among individual colonoscopists, most likely because of their similar training, experiences and awareness of colonoscopy quality guidelines.

Colonoscopy centers should seek to maintain ADR at levels equal to, or higher than, those recommended by consistent and diligent application of all the colonoscopy quality factors, such as patient bowel preparation, CIR and withdrawal time. ADR evaluation should be performed frequently and accompanied by open discussion amongst colonoscopists about the reasons for variations, if any, from previous ADR determinations.

**Competing interests**

None

**References**


[34] O’Connor S, Brooklyn T, Dunckley P et al. High complete resection rate for pre-lift and cold biopsy of diminutive colorectal polyps. Endosc Int Open 2018; 06: E173 – E178