COLON CANCER

A prospective study of colonoscopy practice in the UK today: are we adequately prepared for national colorectal cancer screening tomorrow?

C J A Bowles, R Leicester, C Romaya, E Swarbrick, C B Williams, O Epstein

Aim: To study the availability and quality of adult and paediatric colonoscopy in three National Health Service (NHS) regions.

Method: A prospective four month study of colonoscopies in North East Thames, West Midlands, and East Anglia.

Patients: Subjects undergoing colonoscopy in 68 endoscopy units.

Results: A total of 9223 colonoscopies were studied. The mean number of colonoscopies performed over the four month period was 142 in district general hospitals and 213 in teaching hospitals. Intravenous sedation was administered in 94.6% of procedures, but 2.2% and 11.4% of “at risk” patients did not have continuous venous access or did not receive supplemental oxygen, respectively. Caecal intubation was recorded in 76.9% of procedures but the adjusted caecal intubation rate was only 56.9%. Reasons for failing to reach the caecum included patient discomfort (34.7%), looping (29.7%), and poor bowel preparation (19.6%). A normal colonoscopy was reported in 42.1%. The most common diagnosis was polyps (22.5%) followed by diverticular disease (14.9%). Inflammatory bowel disease was recorded in 13.9% and carcinoma in 3.8%. Only half of the patients remembered being told of possible adverse events prior to the procedure. Rectal bleeding requiring admission following colonoscopy was reported in six patients. The overall perforation rate was 1:769 and colonoscopy was considered a possible factor in six deaths occurring within 30 days of the procedure. Only 17.0% of colonoscopists had received supervised training for their first 100 colonoscopies and only 39.3% had attended a training course.

Conclusion: There is serious under provision of colonoscopy service in most NHS hospitals. Endoscopy sedation guidelines are not always adhered to and there is a wide variation in practice between units. Colonoscopy is often incomplete and does not achieve the target 90% caecal intubation rate. Serious complications of colonoscopy were comparable with previous studies. Training in colonoscopy is often inadequate and improved practice should result from better training.

In the UK, there is no information on who performs colonoscopy and how they were trained. A survey conducted in 1987 indicated that only one in six of English hospitals offered an appropriate colonoscopy service.6 The completeness of colonoscopy was also highly variable, ranging from 55% to 97%. In 1999, MacFarlane et al reported that only half of the endoscopy units provided an adequate colonoscopy service.7

There have been six large prospective studies of complications following diagnostic and therapeutic colonoscopy,8–13 and four retrospective studies of at least 10 000 patients.14–17 These studies provide helpful benchmarks for assessing complications.

The purpose of this large multicentre prospective study was to assess the availability and quality of colonoscopy in a cross section of gastroenterology centres in the UK. The study provides a platform for recommending standards of practice and methods for achieving safe high quality colonoscopy.

METHODS

All hospitals in three representative National Health Service (NHS) regions were approached to participate in the study.
change of bowel habit (14.6%), diarrhoea (11.8%), abdominal bleeding (19.9%) followed by polyp follow up (16.5%), indications for colonoscopy were investigation of rectal was recorded in 36% of patients. The most common 6.8%, and surveillance for 40.3%. More than one indication 14.1% were 75 years or older.

The ages of undergoing colonoscopy are indicated in table 2. The ages of 34/41 (82.9%) units. In the remainder, individual colonoscopists determined their preferred regimen. Most units favoured a single agent bowel preparation. Sodium picosulphate (Picolax) was used in 36.8% of examinations, polyethylene glycol preparations (Klean Prep) in 20.7%, and sodium phosphate (Fleet) in 15.6%.

### Sedation practice, reversal agents, and antispasmodics

Prior to sedation, the functional status of all patients was recorded according to the American Society of Anaesthesiology (ASA) classification of physical status (table 2). Patients are classified as “at risk” if they are in ASA class 3 or above. ASA class 3 or 4 was recorded in 3.4% of patients. Continuous intravenous access was established in 93.1% of patients. In those with continuous intravenous access, a plastic cannula was used in 7470/8583 (87%), an indwelling needle (“butterfly”) in 935/8583 (10.9%), and a central line in 62/8583 (0.7%) patients. In sedated patients, supplemental oxygen therapy was administered in 6266/8721 (71.8%) and pulse oximeter monitoring was used in 8200/8721 (94.0%). Continuous intravenous access was not established in 7/316 (2.2%) ASA class 3 and 4 patients and supplemental oxygen was not administered to 36/316 (11.4%) “at risk” patients.

Sedation was administered in 94.6% of the procedures. A range of sedative and analgesic regimens were reported. The most common combination was pethidine and midazolam (57.8% of colonoscopies) and there was a wide range of doses. The mode dose of midazolam was 5.0 mg (range 0.5– 20.0), with 1956/7707 (25.4%) receiving greater than 5 mg. The mode dose of diazemuls was 10 mg (range 1.0–30.0), with 76,901 (8.4%) receiving greater than 20 mg. The mode dose of pethidine was 50 mg (range 10–100). In patients receiving combined sedation and analgesia, the benzodiazepine was administered prior to the opiates in 2087/7533 (27.7%) patients.

In paediatric units, 65.6% of colonoscopies were performed under general anaesthetic. In adults, colonoscopy under general anaesthesia was reported in 1.3% of private, 0.3% of DGH, and 0.2% of teaching hospital patients.

Reversal agents (for example, flumazenil and naloxone) were administered in 34.4% of procedures. Indications for reversal included “routine use”, “slow to recover”, “end of list”, “respiratory depression”, and “unresponsiveness”. Hyoscine butylbromide (Buscopan) was administered in 20.6% of procedures and almost always as a 20 mg dose.

### The colonoscopic examination

#### Caecal intubation

A “complete colonoscopy” refers to the passage of the colonoscope to the caecum or terminal ileum. The endoscopist assessed completion of the colonoscopy by using one or more landmarks to identify the caecum. These included transillumination (34.7%), tri-radiate fold (70.0%), appendiceal orifice (42.7%), ileoceleal valve (67.9%), intubation of

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### Table 1 National Health Service regions and classification of centre

<table>
<thead>
<tr>
<th>Region</th>
<th>Participating hospital units</th>
<th>Teaching hospitals</th>
<th>District general hospitals</th>
<th>Private hospitals</th>
<th>Paediatric units</th>
</tr>
</thead>
<tbody>
<tr>
<td>West Midlands (WM)</td>
<td>31</td>
<td>5</td>
<td>18</td>
<td>7</td>
<td>1</td>
</tr>
<tr>
<td>East Anglia (EA)</td>
<td>15</td>
<td>1</td>
<td>11</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>North East Thames (NET)</td>
<td>17</td>
<td>4</td>
<td>10</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Other</td>
<td>5</td>
<td>6</td>
<td>14</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Total*</td>
<td>68</td>
<td>10</td>
<td>39</td>
<td>14</td>
<td>5</td>
</tr>
</tbody>
</table>

*Three NET and one WM hospital failed to provide adequate data for inclusion.
Colonoscopy practice in the UK

### Table 2 Age, sex ratio, and functional (ASA) status of patients

<table>
<thead>
<tr>
<th>Age of patient (y)</th>
<th>No in age group</th>
<th>Sex (M:F)</th>
<th>ASA grade 1 (% of age group)</th>
<th>ASA grade 2 (% of age group)</th>
<th>ASA grade 3 (% of age group)</th>
<th>ASA grade 4 (% of age group)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paediatric (aged &lt;16)</td>
<td>169 (1.8%)</td>
<td>103:65</td>
<td>144 (85.2%)</td>
<td>15 (8.9%)</td>
<td>1 (0.6%)</td>
<td>1 (0.6%)</td>
</tr>
<tr>
<td>Adult</td>
<td>7513 (81.5%)</td>
<td>3773:3700</td>
<td>5835 (77.7%)</td>
<td>1188 (15.8%)</td>
<td>157 (2.1%)</td>
<td>24 (0.3%)</td>
</tr>
<tr>
<td>Elderly care (aged &gt;75)</td>
<td>1297 (14.1%)</td>
<td>618:669</td>
<td>518 (39.9%)</td>
<td>580 (44.7%)</td>
<td>118 (9.1%)</td>
<td>12 (0.9%)</td>
</tr>
<tr>
<td>Unknown age</td>
<td>244 (2.6%)</td>
<td>120:115</td>
<td>176 (72.1%)</td>
<td>44 (18.0%)</td>
<td>3 (1.2%)</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>9223 (100%)</td>
<td>4614:4549</td>
<td>6673 (72.4%)</td>
<td>1827 (19.8%)</td>
<td>279 (3.0%)</td>
<td>37 (0.4%)</td>
</tr>
</tbody>
</table>

*Sex not recorded in 60/9223 (0.7%) patients.
†American Society of Anesthesiology (ASA) grade unknown in 407 (4.4%) patients.

In 2.3% of procedures, no indication was given as to the extent of the examination. One or both of identifying landmarks of caecal intubation were recorded in 76.9% of procedures. The intubation rate for DGHs was 4326/5805 (74.5%), teaching hospitals 1632/2130 (76.6%), private hospitals 1046/1166 (89.7%), and paediatric hospitals 90/122 (73.8%). Only 13/68 (19.1%) units achieved a 90% intubation rate (one DGH, three teaching, six private and three paediatric).

Intubation of the terminal ileum or visualisation of the ileocaecal valve are the only reliable landmarks of complete colonoscopy. When either or both of these two landmarks was recorded to define a complete procedure, only 5251/9223 (56.9%) colonoscopies could be objectively confirmed as complete. Using this adjusted caecal intubation rate, only two hospitals achieved a 90% caecal intubation rate.

The caecal intubation rates for patients of ASA status 1, 2, 3, and 4 were 5367/6673 (80.4%), 1342/1827 (73.5%), 185/279 (66.3%), and 24/37 (64.9%), respectively. When three age groups were considered independently (<16 years, 17–75 years, and >75 years), caecal intubation rates were 131/169 (77.5%), 5867/7513 (78.1%), and 917/1297 (70.7%), respectively. When sex was analysed, caecal intubation for males was 3712/4614 (80.5%) and 3341/4549 (73.4%) for females. Completion rate for single agent bowel preparation was 1180/1438 (82.1%) for sodium phosphate (Fleet), 2473/3398 (72.8%) for sodium picosulphate (Picolax), and 1542/1906 (80.9%) for polyethylene glycol preparations (Klean prep). The caecal intubation rate was similar whether or not hyoscine butylbromide was given (1529/1901 (80.4%) versus 5565/7322 (76.9%).

The caecal intubation rate was lower in the presence of a stricture. Caecal intubation was reported in only 6/30 (20%) malignant strictures and 36/98 (36.7%) benign strictures. In patients with non-stricturing tumours, the caecal intubation rate was 173/319 (54.2%). Completion rate in the presence of polyposis was 1713/2072 (82.7%), diverticular disease 1053/1376 (76.5%), and inflammatory bowel disease 1010/1285 (78.6%). The proportion of normal examinations that were complete recorded in 13.9% and carcinoma in 3.8%.

Therapeutic colonoscopy

Polyps were reported in 2072/9923 (22.5%) colonoscopies. Polypectomy was undertaken in 1880/2072 (90.7%). All polyps were judged completely removed in 1440/1880 (76.6%). In 340/1880 (18.1%) colonoscopies where polypectomy was undertaken the polypectomy was incomplete. Where polyps were identified, the caecal intubation rate was 1713/2072 (82.7%).

Training of colonoscopists

It is recommended that trainees should be closely supervised for their first 100 colonoscopies.14 Of the 234 colonoscopists responding to the endoscopic questionnaire, only 17.0% had received supervised training for their first 100 colonoscopies. The percentage of initial procedures supervised for consultant gastroenterologists, physicians, and paediatricians was 93.8%, consultant coloproctologists and general surgeons 92.7%, and staff grade, associate specialists, and general practitioners 19.9%. Medical trainees performed 14.5% of colonoscopies and surgical trainees 3.7%.

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Status of the colonoscopists

Consultants performed the majority of colonoscopies. Consultant gastroenterologists, physicians, and paediatricians performed 42.1% of procedures, consultant coloproctologists and general surgeons 22.7%, and staff grade, associate specialists, and general practitioners 10.9%. Medical trainees performed 14.5% of colonoscopies and surgical trainees 3.7%.

Causes of failure to complete the procedure

In 1913/9223 (20.7%) procedures the endoscopist was unable to complete the colonoscopy. A planned limited examination was the sole reason for incomplete colonoscopy in only 1.1% of procedures. One or more reason were given for aborting the procedure. The most common cause was patient discomfort (34.7%) followed by uncontrollable looping (29.7%), poor bowel preparation (19.6%), diverticulosis (9.5%), and adequate delineation of subtotal colitis (2.0%). The caecum had been resited in 138/1913 (7.2%) patients, and in 107/1913 (5.6%) patients a tumour prevented proximal inspection of the colon. In 55/1913 (2.9%) patients, reasons for failing to complete the procedure included bradycardia, nausea and vomiting, hypoxia, and hypotension.

Diagnosis

A diagnosis was not recorded in 3.7% of questionnaires. A normal colonoscopy to the point of maximum insertion was reported in 42.1% of procedures. A single diagnosis was reported in 39.4% and more than one diagnosis in 14.9%. The most common diagnosis was polyps (22.5%) followed by diverticular disease (14.9%). Inflammatory bowel disease was recorded in 13.9% and carcinoma in 3.8%.

Complications

Postcolonoscopy bleeding was reported in 761/9223 (8.3%) patients. Of these, 5.6% were actively bleeding. In 12/761 (1.6%) patients the bleeding was fatal. The most common complication was postcolonoscopy infection (1.0%). A diagnosis of infection was not recorded in 349/761 (45.7%) patients. Postcolonoscopy bleed was associated with a malignancy in 255/761 (33.5%) patients.
common reasons for admission were abdominal pain (23.7%), malignancy (8.8%), angina or myocardial infarction (7.0%), general deterioration (7.0%), observation (5.3%), cerebrovascular accident (3.5%), and pneumonia (2.6%). Of these 114 patients, 39 (34.2%) were admitted for elective surgery, both related and unrelated to colonoscopy.

**Bleeding following colonoscopy**

Bleeding after colonoscopy was reported in 13 patients. Six patients were admitted with rectal bleeding. One patient with bleeding had diverticular disease at colonoscopy and went on to have angiography but no bleeding point was identified. One patient who had undergone gastroscopy and a normal colonoscopy for iron deficiency was readmitted with melena, indicating upper rather than lower gastrointestinal bleeding. The other four patients had undergone snare polypectomy, cold biopsy, and cold biopsy with snare. In all of these patients, the bleeding stopped without intervention or need for transfusion.

There were a further seven reports of bleeding. Five of these had either cold biopsy or polypectomy, and in three of these patients rectal bleeding was the original indication for colonoscopy. One patient on warfarin had a polyp identified at colonoscopy but there was no record of intervention and a further patient underwent colonoscopy for rectal bleeding and the patient again reported bleeding after the colonoscopy although no pathology had been identified.

A further 21 patients had bleeding requiring active intervention at the time of colonoscopy. This followed snare polypectomy, hot biopsy, cold biopsy, hot biopsy and snare without cautery, and hot biopsy and snare with cautery. Interventions to stop bleeding included diathermy, adrenaline injection, and stalk snaring.

**Perforation during colonoscopy**

Perforation was reported in 12 patients (seven males and five females, age range 30–93 years). The overall perforation rate was 1:769. In six patients the perforation was recognised at the time of colonoscopy. In two patients the complication was recognised prior to anticipated discharge and the remainder presented 1, 7, 16, and 24 days after the procedure. The site of perforation was recorded in four of the 12 patients (two rectal and two sigmoid). Only four of the perforations followed intervention. Two were associated with snare polypectomy, one with hot biopsy, and one with hot biopsy and snare polypectomy. A hot biopsy or other therapeutic procedure was undertaken in 20.0% of colonoscopies and in these, the perforation rate was 4/1841 (1:460). No cold biopsy was complicated by perforation. In 80.0% of colonoscopies, no intervention or only cold biopsies were performed. In this “non-interventional group” the perforation rate was 8/7382 (1:923).

**Deaths following colonoscopy**

Ten deaths were reported within 30 days of the procedure (age range 53–88 years). In five of these patients the colonoscopy was normal. A polyp or tumour was present in three patients and melanosis coli and angiodysplasia were diagnosed in two patients. Colonoscopy was considered a possible factor in six patients while carcinoma was thought to have been the cause of death in three patients. One patient died in the 30 day period following repair of an aortojejunal fistula.

In those patients where the colonoscopy might have been a factor in the patient’s death, four were inpatients at the time of colonoscopy. The causes of death were stroke, bronchopneumonia, myocardial infarction, and bronchopneumonia with septicaemia, respectively. One patient died at home from left ventricular failure following a myocardial infarct and a further patient was admitted 19 days after colonoscopy and died of bronchopneumonia, cirrhosis, and cardiac failure.

**Patient questionnaire**

Of the 1200 questionnaires sent to patients, 599 (49.9%) were returned for analysis. Written information explaining the procedure was received by 81.5%. Written consent was obtained in the procedure room in 54.8% of procedures and 29.9% were consented immediately prior to the colonoscopy but outside the procedure room. Written consent was obtained in the outpatient department in 10% of patients and 5.3% could not remember where they had provided consent. Information on possible adverse events was recalled by 54.9% and mention of “bleeding” and “perforation” were recalled in 95/329 (28.9%) and 96/329 (29.2%), respectively.

**DISCUSSION**

The potential of colonoscopy can only be realised if the procedure is completed safely with good visualisation of the mucosa. This multicentre study is the first large scale prospective evaluation of colonoscopy practice in a cross section of teaching hospitals, DGHs, private hospitals, and paediatric units.

Over the past 15 years, there has been an increasing demand for colonoscopy in the UK. In 1987, it was recommended that 160 colonoscopies should be provided annually for a population of 100 000. In 1990, the BSG recommended that approximately 200 colonoscopies per annum would be required to provide a service for a population of 100 000. In 2001, the BSG working party suggested that the average DGH should plan for an annual workload of 800–1000 lower gastrointestinal procedures per 100 000 population. This represents a fivefold increase in expectation over 15 years.

In this study, 39 DGHs performed a mean of 149 colonoscopies over the four month period (equating to 447 per annum). The 10 teaching hospitals performed a mean of 213 procedures (equating to 639 per annum). Many hospitals participating in the study serve populations well over 100 000, indicating that there is serious under provision of colonoscopy in most hospitals.

Approximately two thirds of colonic disease is within reach of a 60 cm flexible sigmoidoscope and many diagnoses are within range of a rigid sigmoidoscope. In this study, only half of the patients found to have a malignant looking tumour at colonoscopy had previously undergone rigid or flexible sigmoidoscopy.

Excellent bowel preparation is a prerequisite for good quality colonoscopy. Poor bowel preparation is associated with prolonged intubation time. Bowel preparations usually include sodium phosphate (for example, Fleet), magnesium salts (for example, Picolax), or polyethylene glycol (for example, Klean prep). A meta-analysis of sodium phosphate in one study and a similar preparation with sodium picosulphate showed better preparation and was better tolerated by patients than polyethylene glycol. Two studies comparing magnesium salt with sodium picosulphate (Picolax) and polyethylene glycol showed sodium picosulphate to be better tolerated by patients. Sodium picosulphate also gave better bowel preparation. Two studies comparing sodium phosphate with sodium picosulphate showed better preparation with sodium phosphate in one study and a similar outcome from both preparations in the other. Despite these publications, sodium phosphate was the least used preparation in our study. Sodium picosulphate was the most commonly used cleansing agent followed by polyethylene glycol. It is of interest that the caecal intubation rate was higher for sodium phosphate than for sodium picosulphate.
(82% and 73%, respectively) and that the polyethylene glycol preparation was similar to sodium phosphate.

Endoscopy guidelines recommend the routine placement of an intravenous plastic cannula prior to the procedure. Use of a “butterfly” needle is considered unsafe. Prior to colonoscopy, 87% of patients were cannulated with a plastic cannula and in 11% a “butterfly” needle was used for venous access. Continuous intravenous access was not established in 2.2% of high risk patients.

Supplemental oxygen is recommended when patients are sedated. Oxygen was administered to 72% of patients who received sedation but 11.4% of high risk patients did not receive supplemental oxygen.

Prior to colonoscopy, most patients receive a combination of intravenous sedation and analgesia. Midazolam is generally the sedative of choice for short term sedation. Midazolam plus pethidine is the most frequently used preparation for synchronous lesions.29 When combined sedation and analgesia is administered, pethidine should be injected before the benzodiazepine as this allows safer titration of the sedative drug.31 In this study, the definition of a colonoscopy did not require a further colonoscopy to examine the proximal colon in 76.9% of procedures. However, in patients with a tumour but no stricture, the caecal intubation rate was only 54%; therefore half will require a further colonoscopy to examine the proximal colon for synchronous lesions.

Polyps were discovered in 22.5% of patients and polypectomy was attempted in the majority. Incomplete polypectomy was reported in one in five colonoscopies. Failure to deal effectively with polyps leaves diagnostic uncertainty and the need to repeat the procedure. The high rate of incomplete polypectomy requires further analysis but may relate to issues of skills training.

The colonoscopy judged caecal intubation and there was no independent verification. Caecal intubation based on landmarks other than visualisation of the ileocecal valve or terminal ileal intubation almost certainly overestimate completion rates. Restricting a complete colonoscopy to only those reports that positively identified the ileocecal valve or intubated the terminal ileum provides an objective measure of completion and the adjusted intubation rate is considerable cause for concern. The difference between the overall and adjusted caecal intubation rate may reflect subjective optimism by the endoscopist who fails to recognise the importance of ileocaecal valve identification.

Completion rates were markedly reduced in the presence of a benign or malignant stricture (37% and 20%, respectively). However, in patients with a tumour but no stricture, the caecal intubation rate was only 54%; therefore half will require a further colonoscopy to examine the proximal colon for synchronous lesions.

Previous studies have identified colonoscopy as more difficult in females. This is reflected in our study where caecal intubation rates for men and women were 81% and 73%, respectively.

Using their own criteria for caecal intubation, colonoscopists reported failure to reach the caecum in 21% of cases. The commonest reasons for incomplete colonoscopy were patient discomfort (35.3%), looping (30.3%), and poor bowel preparation (19.8%). There was considerable scope for addressing each of these complications. Patient discomfort and looping often reflect poor technique. Scrupulous attention to preparation should also reduce the number of failed procedures.
recorded (0.1%) and in “interventional” colonoscopies, four perforations were recorded (0.2%).

Of the 10 deaths occurring within 30 days of the procedure, four were considered to be due to severe comorbid disease rather than the procedure itself. It is likely that these patients were extremely ill at the time of colonoscopy. The procedure related mortality was 1:1537. Overall, the bleeding and perforation rates were within the expected range but the mortality rate was higher than previously quoted.37 The increased mortality rate might be attributed to the design of the study as no other study has specified a 30 day follow up period.

The patient questionnaire indicates that most had received some form of written instruction and/or explanation prior to the procedure but the majority of patients were unaware of the major risks associated with colonoscopy. Despite recommendations that consent is sought before the patient arrives for the procedure, most patients are asked to provide consent immediately prior to the procedure and often in the endoscopy room.14 It should be possible for the consent procedure to be reassessed and changed in those units not compliant with best practice.

In summary, this cross sectional study of colonoscopic practice indicates that there is currently under provision of colonoscopy in the NHS. Screening of high risk individuals is already recommended in the UK and it has been estimated that this will require 1.25 colonoscopy sessions per week for a DGH (assuming six colonoscopies per session and a population of 250 000).14 It has been estimated that introduction of a faecal occult blood screening programme would require at least one extra colonoscopy session per week in a DGH.16 Unless there is a dramatic increase in manpower and resources available for lower gastrointestinal investigations, the introduction of a national screening programme would rapidly overburden already inadequate facilities.

A national agenda is necessary to address the shortfalls in current colonoscopic practice. The unacceptably low caecal intubation rate and inadequate polyp removal rate can be improved with better training. Accessible and ongoing training should be made available to both trainees and more experienced endoscopists. Teaching colonoscopy requires considerable skill and the recent establishment of “training the trainers” courses is a critical innovation which should ultimately improve performance.

In conclusion, this study of colonoscopic practice indicates that while there are centres where practice is of the highest quality, considerable effort is required to raise the overall quality of colonoscopy. High calibre early training, regular refresher courses, peer review, and continuous audit of standards at local and national levels must emerge from this study as a priority for all endoscopists performing colonoscopy.

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