A prospective study of endoscopist-blinded colonoscopy withdrawal times and polyp detection rates in a tertiary hospital

Gary Lim, Sharon K Viney, Bruce A Chapman, Frank A Frizelle, Richard B Gearry

Abstract

Background Studies have suggested that a colonoscopy withdrawal time of at least 6 minutes is associated with an increased adenoma detection rate in patients undergoing colorectal cancer screening.

Aims We aimed to determine colonoscopy withdrawal time and rate of polyp detection in a blinded study—conducted at Christchurch Hospital (Christchurch, New Zealand)—to determine if there was a relationship.

Methods All 16 consultant endoscopists performing colonoscopy in a tertiary hospital had their withdrawal time from the caecum prospectively timed over 208 consecutive procedures between 11 April 2007 and 19 May 2007. The following data was collected: indication for procedure, final diagnosis, polypectomy rate, procedures performed and withdrawal time were recorded. Histology results were reviewed for all patients.

Results 111 (53%) of colonoscopies were performed for symptom assessment and 97 (47%) for surveillance. There was significant heterogeneity between colonoscopists’ withdrawal times (p<0.001). Polyps were diagnosed in 65 of all colonoscopies (31.3%). Of the screening colonoscopies polyps were found in 38 (39.1%) of which 14 were adenomas (adenoma detection rate of 14%). The median colonoscopy withdrawal time was 3 minutes 16 seconds when no polyps were found (range 5 seconds to 11 minutes 50 seconds). The median colonoscopy time when polyps were found was 8 minutes 31 seconds which included time taken for procedures (range 2 minutes 7 seconds to 35 minutes 40 seconds), p<0.001.

Conclusions This study confirms that more adenomas were found by those endoscopists who had slower withdrawal times. Also colonoscopy withdrawal times are inherently much faster than recommended and highlights the importance of regular adenoma detection rate and withdrawal time auditing.

Colonoscopy is widely regarded as the best test for lower gastrointestinal investigation for colorectal cancer.\textsuperscript{1,2} Whilst there is a clear benefit from colonoscopy in preventing left-sided tumours, colonoscopy has been shown to be less effective in preventing right-sided cancers.\textsuperscript{3–5}

Adenoma detection rate (ADR) is an accepted method of measuring colonoscopy efficacy and as it has shown in the screening situation that for an individual endoscopist an ADR rate below 20.0% was significantly associated with an increased risk of interval colorectal cancer.\textsuperscript{6} Many factors have been shown to affect ADR such as quality of bowel preparation, insertion to caecum and technique\textsuperscript{7} It is well known...
that ADR's vary between endoscopists and there is a significant association between ADR and colonoscopy withdrawal time.\(^8\)

A United States Multi-Society Task Force in 2002 recommended that colonoscopy withdrawal time should average at least 6–10 minutes.\(^9\) These recommendations were developed following a tandem colonoscopy study examining adenoma miss rates. The miss rates were 17 and 48% for the two endoscopists. The endoscopist with the lower miss rate had a significantly higher score on 4 quality criteria (examining the proximal sides of flexures, folds and valves; cleaning and suctioning; adequacy of distension; adequacy of time spent viewing) as well as a significantly longer withdrawal time (median of 8 minutes 55 seconds versus 6 minutes 41 seconds).\(^7\)

Subsequent studies have confirmed these findings, with a significant difference in adenoma detection in screening colonoscopy shown in gastroenterologists with mean withdrawal times of less than 6 minutes compared to those with mean withdrawal times of 6 minutes or more.\(^8,10\)

Given the above recommendations, we aimed to evaluate the withdrawal times in our hospital. Christchurch Hospital is a tertiary hospital located in the South Island of New Zealand. It is the largest tertiary, teaching hospital in the South Island with 650 beds. The Endoscopy Unit performs approximately 5000 colonoscopies annually for diagnostic, therapeutic and surveillance purposes.

**Methods**

**Study design**—All patients undergoing colonoscopy (regardless of the indication) were included in the study. Sixteen consultant endoscopists (seven gastroenterologists and nine surgeons) were included. Procedures where the caecum was not reached were excluded. Three endoscopists were aware that the study was taking place while all other endoscopists were unaware that their withdrawal times were being recorded.

Once the caecum or terminal ileum had been reached, a nurse used a stop watch to record the withdrawal time which ceased when the colonoscope was removed from the rectum. The stop watch was not paused at any stage during the withdrawal phase for any procedures performed. All patients received conscious sedation with a combination of intravenous midazolam and/or fentanyl. Patients received oral sodium picosulfate with bisacodyl as bowel preparation. Procedures took place with or without registrars. The study took place from 11 April 2007 to 19 May 2007 over 208 consecutive procedures.

Withdrawal time was recorded, as were indication for the procedure, diagnosis and procedures performed. The withdrawal time included time taken to perform procedures such as biopsies or polypectomy. Colonoscopy data was gathered from the Endoscribe v2.25.09 database as entered by the endoscopist including patient gender, inpatient status, endoscopist, registrar if present, bowel preparation quality, biopsies, polypectomy, size of polyps, location and number of polypectomies. Subsequent histology was later reviewed using a separate electronic database.

**Statistical analysis**—Statistical analysis was performed using R. v2.11.2010-07-27 (R Foundation for Statistical Computing, Vienna, Austria). Chi-squared or Fisher’s exact test were used for categorical variables and Wilcoxon rank sum test for continuous variables.

**Results**

208 colonoscopies were performed during the study period. 111 (53%) were for symptom assessment and 97 (47%) were for screening. The mean age was 53 years and 43% were male (Table 1). Altogether, polyps were found in 66 patients (31%), of which 21 were adenomas (10%).
Table 1. Patient demographics

<table>
<thead>
<tr>
<th>Variables</th>
<th>N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years), mean (SD)</td>
<td>53 (18–92)</td>
</tr>
<tr>
<td>Male sex (%)</td>
<td>87 (43%)</td>
</tr>
<tr>
<td>Outpatient</td>
<td>185 (89%)</td>
</tr>
<tr>
<td>Indication</td>
<td></td>
</tr>
<tr>
<td>– Screening</td>
<td>97 (47%)</td>
</tr>
<tr>
<td>– Symptoms</td>
<td>111 (53%)</td>
</tr>
</tbody>
</table>

In the 97 colonoscopies which were performed for screening purposes, polyps were found in 38 (39.1%), of which 14 were adenomas (14%). There was one low rectal cancer found which occurred in a 59-year-old male undergoing colonoscopy for rectal bleeding on a background of longstanding Crohn’s colitis. Registrars were involved in 17 (8%) of the total colonoscopies.

There was significant heterogeneity between colonoscopists' withdrawal times (Figure 1) (p<0.001). The median colonoscopy time was 3 minutes 16 seconds when no polyps were found (range 5 seconds to 11 minutes 50 seconds). The median colonoscopy time when polyps were found was 8 minutes 31 seconds (range 2 minutes 7 seconds to 35 minutes 40 seconds) p<0.001.

Figure 1. Colonoscopy withdrawal times
Fourteen out of 16 endoscopists had median withdrawal times less than 6 minutes. The quickest median withdrawal time was 12 seconds (Endoscopist 13 over 6 procedures).

Overall, 12 colonoscopies were performed with withdrawal times less than 1 minute. Another 27 colonoscopies were performed with withdrawal times of 1-2 minutes. In the screening only group when no polyps were found, 49 out of 59 colonoscopies (83%) had withdrawal times less than 6 minutes (Figure 2).

Figure 2. Withdrawal times (surveillance group without polypectomy)

Screening-only group—Endoscopists performed 0-16 screening colonoscopies. Individual ADR was 0-40% (Table 2). 45% of polyps removed were < 5mm in size. 47% of polyps were 5-10mm in size and 8% greater than 10mm in size.

Two trainees (registrars) performed 7 of the 97 surveillance colonoscopies with individual ADR of 33% and 50%. Withdrawal times when no polyps were found were 6 minutes 37 second for one trainee and 2 minutes 35 seconds for the second trainee. The presence of a registrar made no significant difference to the supervising endoscopist’s withdrawal time or ADR.

Gastroenterologists performed 64 (66%) of the surveillance colonoscopies and the surgeons performed 33 (34%). ADR for the gastroenterologists was 15.6%, compared to 12% for the surgeons (p=0.65). When colonoscopies plus procedures were excluded, the gastroenterologists performed 30 colonoscopies with a mean withdrawal time of 190 seconds.

The surgeons performed 17 colonoscopies with a mean withdrawal time of 127 seconds (p=0.007). 41% of these cases performed by the surgeons had previous colonic resection compared to 20% for the gastroenterologists.
Table 2. Polyp detection rate and adenoma detection rate (surveillance group only)

<table>
<thead>
<tr>
<th>Endoscopist</th>
<th>Number of procedures</th>
<th>Polyp detection rate</th>
<th>Adenoma detection rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>8</td>
<td>75%</td>
<td>25%</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
<td>100%</td>
<td>33%</td>
</tr>
<tr>
<td>3</td>
<td>16</td>
<td>12%</td>
<td>6%</td>
</tr>
<tr>
<td>4</td>
<td>10</td>
<td>60%</td>
<td>40%</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>6</td>
<td>13</td>
<td>31%</td>
<td>8%</td>
</tr>
<tr>
<td>7</td>
<td>9</td>
<td>33%</td>
<td>11%</td>
</tr>
<tr>
<td>8</td>
<td>2</td>
<td>50%</td>
<td>0%</td>
</tr>
<tr>
<td>9</td>
<td>7</td>
<td>71%</td>
<td>0%</td>
</tr>
<tr>
<td>10</td>
<td>0</td>
<td>No surveillance</td>
<td>No surveillance</td>
</tr>
<tr>
<td>11</td>
<td>1</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>12</td>
<td>2</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>13</td>
<td>5</td>
<td>0%</td>
<td>0%</td>
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<td>14</td>
<td>5</td>
<td>80%</td>
<td>40%</td>
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<td>4</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>16</td>
<td>7</td>
<td>57%</td>
<td>29%</td>
</tr>
</tbody>
</table>

Discussion

Colonoscopy has been shown to decrease the incidence of colorectal cancer but the effectiveness of colonoscopy depends upon finding and removing adenomatous polyps. Polyp detection rates, more particularly adenoma detection rates, are an accepted means of assessing the quality of colonoscopy. In 2006 the ASGE published several factors shown to affect the quality of a colonoscopy procedure. These include preprocedure, intraprocedure and postprocedure measures.

Intraprocedure measures included caecal intubation rate, detection of adenomas in asymptomatic individuals, withdrawal times, biopsy specimens in chronic diarrhoea, biopsy samples in UC/IBD and endoscopic resection of polyps <2 cm. Other factors include the proceduralist—non-gastroenterologists are more likely than gastroenterologists to miss cancer although our local data would suggest otherwise. Other factors suggested to influence the ADR are the role of fatigue and time of day, place on the list and timing of the endoscopy list have also been implicated.

This study demonstrates that more adenomas were found when colonoscopy took longer. Also that when proceduralists are not aware that they are being timed, colonoscopy withdrawal times are significantly faster than recommended. Furthermore, for colonoscopies where polypectomy was not performed, only 17% of withdrawal times were greater than 6 minutes. This would imply that a possible reason why longer withdrawal times (greater than 6 minutes) have been associated with increased adenoma pick up rate may at least in part, be the self fulfilling way some studies have been undertaken, namely that the withdrawal time includes the time to remove polyps. However our study is still consistent with previous data showing increased adenoma detection with withdrawal times of greater than 6 minutes.
The adenoma detection rate varied from 0 to 40% between proceduralists. This may not be a good reflection of individual performance, due to the low numbers of procedures performed by several endoscopists. However, it does demonstrate marked heterogeneity and, overall, too rapid a withdrawal time for most procedures. The overall adenoma detection rate in the surveillance group of 14% is lower than most studies\textsuperscript{8,19}. Reasons for this may include the small number of patients in the study, but may also be a reflection of the fast withdrawal times.

In the present study there was a slightly higher proportion of females, who have a lower prevalence of adenomatous polyps. Due to the lack of a primary screening colonoscopy program in New Zealand\textsuperscript{20} and limited resources, our Unit can only offer surveillance to high risk groups - patients with previous polyps, strong family of colorectal cancer and possible hereditary non-polyposis colorectal cancer families. However one would have expected that surveillance of a group with higher than average risk of colorectal cancer would have even higher adenoma detection rates than average risk patients.

This was a baseline quality assurance/withdrawal time study performed in our department prior to any intervention. Most importantly, it was blinded, giving a true reflection of withdrawal times rather than having artificially lengthened withdrawal times when colonoscopists are aware they are being timed. Other studies have shown a non-significant increase in polyp detection when clinicians are informed that withdrawal time is being monitored,\textsuperscript{21} as well as increased inspection time and improved technique when blinded video assessment becomes unblinded.\textsuperscript{22}

The weakness of this study includes the small numbers of colonoscopies, (especially when looked at per endoscopist) and the short time period over which the study was undertaken. Also the fact that the polyp removal time was included in the withdrawal time, therefore creating an time bias in the study i.e. if you had an adenoma then your colonoscopy would take longer as it had to be removed or biopsied.

Christchurch Hospital has now been chosen as a pilot site in New Zealand for the Endoscopy Global Rating Scale (GRS). This is a web-based self assessment tool that provides a standard for accreditation and framework for service improvement. Factors monitored include clinical quality, patient experience, workforce and training.\textsuperscript{23} Hopefully the introduction of this will lead to improved colonoscopy throughout New Zealand.

In conclusion, our study confirms that colonoscopy withdrawal times prior to any intervention are much faster than recommended. Auditing of adenoma detection and colonoscopy withdrawal times should take place at regular intervals in all Units performing colonoscopy.

**Competing interests:** None declared.

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References:

15. Gurudu SR, Ratuapli SK, Leighton JA, et al. Adenoma detection rate is not influenced by the timing of colonoscopy when performed in half-day blocks Am J Gastroenterol 2011. [Epub ahead of print].


