
ORIGINAL ARTICLE

Will An Additional Observer Enhance Adenoma Detection During Colonoscopy?

Ravi K Prakash^{1*}, Nirav Shah¹, Madhusudhan Sanaka¹, Puja Karanth¹, Kevin D Mullen¹,

Roy D Ferguson¹

Division of Gastroenterology, MetroHealth Medical Center, Case Western Reserve University, 2500 MetroHealth Drive, Cleveland, OH 44109, USA.

Abstract:

Background: Due to varied level of experience, the detection rate of adenoma on colonoscopy is different. In presence of both fellows and attending the incidence rates of adenoma are shown to increase in a small study reported by Rogart *et al* [4]. Based on similar hypothesis, a study was undertaken with much larger sample size to improve the power of the study. *Aims and objective:* To know if presence of additional observer will enhance adenoma detection during colonoscopy.

Material and Methods: 2236 consecutive colonoscopies performed at Metro Health Medical Centre, Cleveland, Ohio were included in the study from July 2005 to August 2006. Cases with history of colorectal, surgical resection of colon, inflammatory bowel diseases and hereditary polyposis syndrome were excluded. Inpatient colonoscopies were also excluded. With all usual precautions for colonoscopy and after giving polyethylene glycol electrolyte (PEGEL) colonoscopies were performed by one of the nine experienced staff attending using an Olympus colonoscope and Evis Exera processors. All colonoscopies performed by fellows were supervised by an attending throughout the procedure. Advanced adenomas were defined as adenomas greater than 1 cm size. Statistical analysis was done

using Tall hassee, FL software; Fisher's exact test, unpaired t test and multiple logistic regression analysis were performed. p-value of <0.05 is considered as statistically significant. *Results:* Of the total 2236 colonoscopies included in the study, 1527 were performed by fellows under supervision of attending and 709 by the attending. There was no significant difference in patient demographics, caecal intubation or poor preparation colonoscopies. The mean age of the group was 55 years in both of the groups. There was no statistically significant different in the polyp detection rate (35% Vs 36.8%) as well as overall adenoma detection rate (28.4% Vs 27.7%) between these two groups of performers. However, increased rate of adenoma detection was seen for the adenomas of size 0.5 to 1.00 cm in the fellow and attending group (7.2%) as compared to attending alone group (4.0%). There was no difference in the number of colonoscopies aborted due to poor bowel preparations There was no statistically significant difference in the number of colonoscopies aborted due to poor bowel prep, 91(5.9%) Vs 32(4.5%).

Conclusions: Our retrospective study has shown no improvement in the rate of adenoma detection when fellows performed colonoscopy with a supervising attending in comparison to procedures performed by attending alone. In fact, Adenoma Detection Rate

(ADR) and caecal intubation rates are increasingly seen as important quality measure. We propose that ADR needs to be used as a tool to assess trainee competency and should be a marker to evaluate proper training. These could be evaluated in randomized prospective trials in future.

Introduction:

Colorectal cancer is the third most common cancer in United States and the second leading cause for cancer related death [1-3]. The fundamental goal of screening colonoscopy is to detect neoplasia and its importance cannot be overemphasized. Patients submit themselves to endoscopists with various levels of experience. Hixon *et al* [4] have found out 27% of small adenomas remain undiagnosed using conventional colonoscopy. Rex DK *et al* [5] have found an overall miss rate for adenomas of 24%, 27%, for adenomas < or =5mm, 13% for adenomas 6-9 mm, and 6% for adenomas > or =1cm size. A large proportion of flat lesions are missed. CT colonography and colonoscopy have similar ability to identify individuals with large polyps in patients at increased risk for colorectal cancer [6]. Sensitivity for screening adenomatous polyps was better for virtual colonoscopy than the optical colonoscopy [7]. A careful inspection during a minimum of 8 minutes before withdrawal of colonoscope, significantly improved ADR [8] Gastroenterology fellows in training however are supervised by much experienced attending and the study by Rogart *et al* [9]. showed an increased incidence of adenoma detection when both fellow and attending were present in comparison to procedures done by attending alone. Our

study, based on similar hypothesis, included much larger numbers to improve the power of the study.

Material and Methods:

This study was approved by Institutional Review Board at Case Western Reserve University at Metro Health Medical Center campus, Cleveland, Ohio. We included 2236 consecutive colonoscopies performed at our center between July 2005 and August 2006. Cases were excluded from the study if patients had a previous colorectal cancer, surgical resection of any part of the colon, history of inflammatory bowel disease or hereditary polyposis syndrome. Also, inpatient colonoscopies were excluded from the study as they are known to have a higher incompleteness rate. All colonoscopies were performed by one of the nine experienced staff attending (range 1000-10,000 colonoscopies previously performed) using an Olympus colonoscope with Evis Exera processors. All patients received polyethylene glycol electrolyte (PEGEL)-based bowel preparation in the evening prior to the day of the scheduled colonoscopy. The day prior to the colonoscopy, patients were advised to take a liquid diet and were instructed to drink one gallon of standard PEGEL preparation over a period of 4 h starting at 5 PM. Patients were instructed to drink 6-8 ounces of PEG-EL every 10-15 min and they were allowed not only to refrigerate the PEG-EL but also to choose a flavor of their choice. Bowel preparation was recorded based on Aronchik Scale [14] as excellent, good, fair or poor. Poor preparation was defined as semi-solid stool that could not be suctioned or washed away and less than 90% of surface seen.

A complete colonoscopy was defined as reaching the cecum, which was determined by visualization of the ileocecal valve and appendiceal orifice along with or without trans-illumination in the right lower quadrant. As standard of care, all colonoscopies performed by gastroenterology fellows were supervised by an attending throughout the procedure. Data recorded included person performing colonoscopy, level of experience (if performed by gastroenterology fellow), patient demographics, and indication for colonoscopy, completion status, adequacy of preparation, polyp size, shape, location and histology. Advanced adenomas were defined as adenomas greater than 1 cm in size, presence of any villous component, high grade dysplastic changes or carcinomatous changes.

Statistical Analysis:

We used Statistix 8 statistical software (Tallahassee, FL) to conduct the analyses in this study. Fisher's exact test was used to test the non-random associations between the two independent groups and other categorical variables. To compare the means of continuous variables between the two groups two-sample *t*-tests was

used. Also, multiple logistic regression analysis was used to identify the possible factors affecting endoscopic findings and patient outcomes in both the groups. Computed P value of less than 0.05 was considered statistically significant.

Results:

We included 2236 colonoscopies in our study of which 1527 were performed by our fellows under attending supervision and 709 by attending. 47% of colonoscopies were performed by second year fellows, 26% each by first and third year fellows. Baseline patient demographics and procedure characteristics have been depicted in table 1. There were no significant differences in patient demographics, caecal intubation or poor preparation colonoscopies. The mean age for presentation was 55 yrs in both groups. It was seen that patients with rectal bleeding as an indication for colonoscopy were more likely to have a fellow perform the procedure. Screening was the most common indication for colonoscopy in both groups. There were no serious complications of the procedure reported in either group.

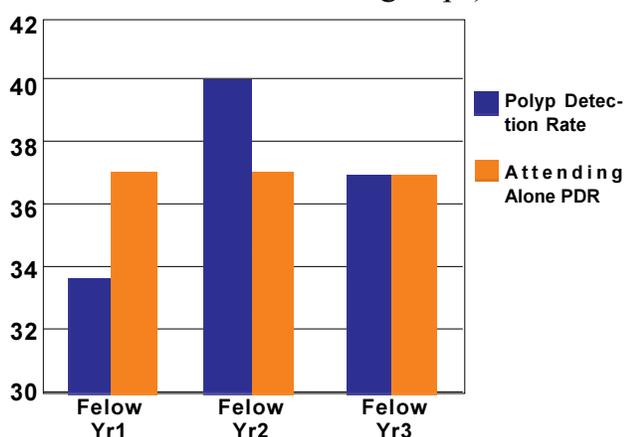
Table 1: Patient Demographics and Procedure Characteristics

	Fellow & Attending (N=1527)	Attending alone (N=709)	p value
Age	55.6 ± 12.7	55.7 ± 12.1	NS
Men (%)	578 (37.9)	252 (35.5)	NS
Indication (%) Screening	587(38.5)	289(40.8)	NS
Rectal bleeding	380(24.9)	118(16.6)	<0.0001
Heme +ve stool	152(10.0)	67(9.5)	NS
Anemia	281(18.4)	142(20.1)	NS
Other	127(8.3)	93(13.1)	<0.005
Cecal Intubation (%)	1436(94)	677(95.5)	NS
Adequate bowel preparation (%)	1253(82.1)	587(82.8)	NS

Data are mean ± SD or N (%), NS = Not statistically significant

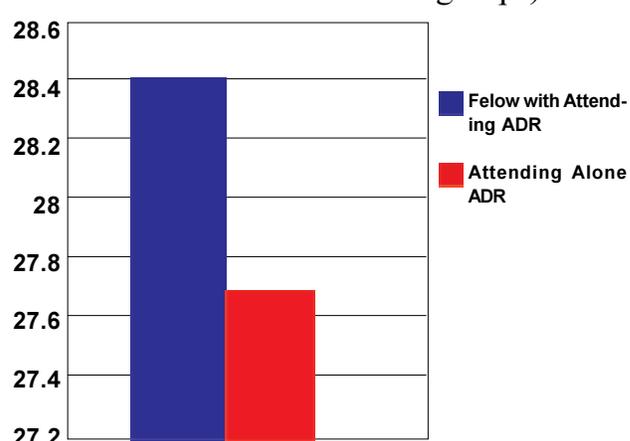
Polyp detection rate in colonoscopies performed by fellows with the attending was 35% in comparison to the attending alone group in which was 36.8%. Figure 1 shows a graphic representation of polyp detection rate at various levels of training of fellows in comparison to the attending alone group. There was no significant difference between the two. Figure 2 shows adenoma detection rate which did not

Fig. 1 – Crude Detection Rate (No significant difference between the groups)



differ between the two groups (28.4% vs. 27.7%). A multilogistic regression analysis was performed controlling for age, gender, bowel preparation and cecal intubation. This analysis did not uncover any statistical difference in the two groups. Also, there was no statistically significant difference in the adenoma or polyp detection rate based on the level of training of fellows (Fig 1&2).

Fig. 2 – Adenoma Detection Rate (No significant difference between the groups)



It was noted that detection rate of more than one adenoma or advanced adenoma (7.5% vs. 6.6%, P=0.36) were similar in both groups (Table 2). Also, rate of cancer detection was similar (1.4% vs. 1.2%, P=0.78).

Table 2: Detection Rates and Number of Adenoma in the two study groups (Incomplete colonoscopies and Inadequate preparation excluded)

	Fellow & Attending (N=1230)	Attending alone (N=574)	p value
Detection Rates (%)	349(28.4)	159(27.7)	NS
One Adenoma	168(13.7)	74(12.9)	NS
Two Adenoma	71(5.8)	41(7.1)	NS
Three Adenoma	55(4.5)	20(3.5)	NS
>3 Adenoma	55(4.5)	24(4.2)	NS
Advanced Adenoma (%)	92(7.5)	38(6.6)	
>1cm polyp	47(3.8)	17(3.0)	NS
Tuberculous	15(1.2)	10(1.7)	NS
Dysplasia	13(1.1)	4(0.7)	NS
Cancer	17(1.4)	7(1.2)	NS

Table 3 shows an increased rate in detection of adenomas of size 0.5-1.0cm in the fellow and attending group as compared to the attending alone group (7.2% vs. 4.0%, P 0.008). The rates of left sided and right sided adenomas were similar in both the groups (28.4% vs. 27.7%, P 0.35).

Table 3: Characteristics of Detected Adenoma

	Fellow & Attending (N=1230)	Attending alone (N=574)	p value
<0.5cm (%)	213 (17.3)	119 (20.9)	NS
0.5 – 1.0 cm (%)	89 (7.2)	23 (4.0)	0.008
>1cm (%)	47 (3.8)	17 (3.0)	NS
Left sided (%)	174 (14.2)	70 (12.2)	NS
Right sided (%)	175 (14.2)	89 (15.5)	NS

Table 4 analyzes the reasons for incomplete colonoscopic examination in the two groups. There was no difference in the number of colonoscopies aborted due to poor bowel preparation (25.3% vs. 18.8%, P=0.45), technical difficulties (34.1% vs. 37.5%, P=0.73), inadequate sedation (20.9% vs. 21.9%, P=0.91) or colonic pathology (9.9% vs. 18.8%, P=0.19).

Table 4: Reasons for Incomplete Examination

	Fellow & Attending (N=91)	Attending alone (N=32)	p value
Poor Preparation	23 (25.3)	6 (18.8)	NS
Technique	31 (34.1)	12 (37.5)	NS
Inadequate Sedation	19 (20.9)	7 (21.9)	NS
Colonic torsion	9 (9.9)	6 (19.8)	NS
Other	9 (9.9)	1(3.1)	NS

Discussion:

Adenoma Detection Rate (ADR) is an increasingly used surrogate to measure the quality of colonoscopy as well as to evaluate the performance of endoscopists [10,11]. At our center we did not appreciate a significant improvement in polyp or adenoma detection when an attending supervises a fellow performing the procedure in comparison to when the attending performs the procedure alone. US Multi-Society Task Force has recommended that endoscopists

detect adenomas in at least 25% men and 15% women aged 50 and above, regardless of the indication [12,13]. We observed that the adenoma detection rate was higher in both groups; 28.4% in fellow with attending group vs. 27.7% in attending alone group. The rate of advanced adenomas in our study was 7.5% and 6.6%. This is indicative of the quality and training of the endoscopists in our institution.

In contrast to Rogart *et al*, our study elucidated that involving a fellow is not likely to influence outcome during colonoscopy. There are several

reasons to suggest that the results of this study are likely to be widely acceptable. First, there is significant evidence to suggest that adenoma detection rate was linked with withdrawal time at colonoscopy. A minimum withdrawal time of 6 minutes has shown to increase the rate of adenoma detection [14]. Although, in this study we don't have withdrawal times noted, we hypothesize that with fellow involvement the withdrawal time may be increased. Secondly, adenoma detection rate is directly proportional to the cecal intubation rates [15]. Cecal intubation rates in our study groups were comparable to each other and were established by a photograph of appendiceal orifice or of the terminal ileum following intubation of the ileo-cecal valve. It is recommended to photo-document cecal intubation by taking one photograph of the appendiceal orifice surrounded by cecal strap fold and a second photograph of the cecum from just distal to the ileo-cecal valve [11]. This influencing factor was well balanced between the two groups. Thirdly, as our study was retrospective, the bias of a non-blinded study on the participant was eliminated (Hawthorn effect). Fourthly, endoscopy technique adopted by fellows is likely to be very similar to those practiced by the attendings, hence the observed outcome. Therefore, though presence of an additional observer was thought to enhance outcome by countering factors such as "inattention blindness" and "change blindness", our results failed to support it.

It is interesting to note that there was an increase in the detection of polyps of the size between 0.5 – 1.0 cm in the fellow with attending group. However, the combined ADR for

polyps less than or equal to 1 cm was nearly similar in both groups (24.5% in fellow with attending group vs. 24.9% in the attending alone group). Currently polyp size is estimated by comparing it with the distance between the prongs of the biopsy forceps which is 7 mm. This suggests there may be a tendency for fellows to overestimate the size of diminutive polyps. This phenomenon has not been translated to the greater than 1 cm polyp (3.8% vs. 3.0%), thereby not influencing the surveillance schedule for patients.

Other factors which enhance adenoma detection rate are adequate bowel preparation [11], morning vs. afternoon colonoscopies [17], longer withdrawal times [18, 14], and adoption of newer imaging techniques like chromo endoscopy [19]. One of the limitations of our study is that the withdrawal times were recorded only for the latter half of the study group. Therefore we did not include it in our analysis. Also, we excluded inpatient colonoscopies and patients with poor bowel preparation for data analysis. Data was unavailable for other colon polyp risk factors like family history, aspirin use, diabetes etc.

In summary, our retrospective study has shown no improvement in the rate of adenoma detection when fellows performed colonoscopy with a supervising attending in comparison to procedures performed by attending alone. In fact, ADR and caecal intubation rates are increasingly important as a quality measure. We propose that ADR needs to be used as a tool to assess trainee competency and should be a marker to evaluate proper training. These could be evaluated in randomized prospective trials

in future.

Reference:

1. United States Cancer Statistics: 1999–2005 Incidence and Mortality Web-based Report. Atlanta: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention and National Cancer Institute; 2009.
2. Winawer SJ, Zauber AG, Ho MN, O'Brien MJ, Gottlieb LS, Sternberg SS, Waye JD, Schapiro M, Bond JH, Panish JF, Ackroyd F, Shike M, Kurtz RC, Lewis LH, Gerdes H, Stewart ET, and the National Polyp Study Workgroup. Prevention of colorectal cancer by colonoscopic polypectomy. The National Polyp Study Work Group. *N Engl J Med* 1993; 329:1977–81.
3. U.S. Preventive Services Task Force. Screening for colorectal cancer: U.S. Preventive Services Task Force recommendation statement. *Ann Intern Med* 2008 Nov 4; 149(9):627-37. Epub 2008 Oct 6.
4. Hixson LJ, Fennerty MB, Sampliner RE, Garewal HS. Prospective blinded trial of the colonoscopic miss-rate of large colorectal polyps. *Gastrintest Endosc* 1991; 37:125–7.
5. Rex DK, Cutler CS, Lemmel GT, Rahmani EY, Clark DW, Helper DJ, Lehman GA, Mark DG. Colonoscopic miss rates of adenomas determined by back-to-back colonoscopies. *Gastroenterology* 1997; 112:24–8.
6. Van Gelder RE, Nio CY, Florie J, Bartelsman JF, Snel P, De Jager SW, Van Deventer SJ, Laméris JS, Bossuyt PM, Stoker J. Computed tomographic colonography compared with colonoscopy in patients at increased risk. *Gastroenterology* 2004; 127:41-48.
7. Pickhardt PJ, Choi R, Hwang I, Butler JA, Puckett ML, Hildebrandt HA, Wong RK, Nugent PA, Mysliwiec PA, Schindler WR. Computed tomographic virtual colonoscopy to screen for colorectal neoplasia in asymptomatic adults. *N Engl J Med* 2003; 349:2191–200.
8. Barclay RL, Vicari JJ, Greenlaw RL. Effect of a time-dependent colonoscopic withdrawal protocol on adenoma detection during screening colonoscopy. *Clin Gastroenterol Hepatol* 2008; 6(10): 1091-8.
9. Jason N Rogart, Uzma D Siddiqui, Priya A Jamidar And Harry R Aslanian, Fellow Involvement May Increase Adenoma Detection Rates During Colonoscopy fellows Improve Adenoma Detection Rates, *The American Journal Of Gastroenterology Nov. 2008*; 103, 2841-2846.
10. Millian MS, Gross P, Manilich E, Church JM. Adenoma Detection Rate: the real indicator of quality in colonoscopy. *Dis Colon Rectum* 2008; 51(8):1217-20. Epub 2008 May 24.
11. Rex DK. Maximising detection of adenomas and cancers during colonoscopy. *Am J Gastroenterology* 2006; 101: 2866-77.
12. Rex DK, Bond JH, Winawer S, Levin TR, Burt RW, Johnson DA, Kirk LM, Litlin S, Lieberman DA, Waye JD, Church J, Marshall JB, Riddell RH; U.S. Multi-Society Task Force on Colorectal Cancer. Quality in the technical performance of

- colonoscopy and the continuous quality improvement process for colonoscopy. Recommendations of the U.S Multi-Society Task Force on Colorectal Cancer. *Am J Gastroenterology* 2002; 97:1296-308.
13. Winawer SJ, Zauber AG, Fletcher RH, Stillman JS, O'Brien MJ, Levin B, Smith RA, Lieberman DA, Burt RW, Levin TR, Bond JH, Brooks D, Byers T, Hyman N, Kirk L, Thorson A, Simmang C, Johnson D, Rex DK; US Multi-Society Task Force on Colorectal Cancer; American Cancer Society. Guidelines for colonoscopy surveillance after polypectomy: A consensus update by the US Multi-Society Task Force on Colorectal cancer and the American Cancer Society. *Gastroenterology* 2006; 130: 1872-85.
 14. Sanchez W, Harewood GC, Peterson BT. Evaluation of polyp detection in relation to procedure time of screening or surveillance colonoscopy. *Am J Gastroenterol* 2004; 99:1941-5.
 15. Imperiale TF, Wagner DR, Lin CY, Larkin GN, Rogge JD, Ransohoff DF. Risk of advanced proximal neoplasms in asymptomatic adults according to the distal colorectal findings. *N Engl J Med* 2000; 343:169-74.
 16. Rostom A, Jolicoeur E. Validation of a new scale for the assessment of bowel preparation quality. *Gastrointest Endosc* 2004; 59(4):482-6.
 17. Sanaka MR, Shah N, Mullen KD, Ferguson DR, Thomas C, McCullough AJ. Afternoon colonoscopies have higher failure rates than morning colonoscopies. *Am J Gastroenterol* 2006; 101(12):2726-30.
 18. Barclay R, Vicari JJ, Johanson JF, Doughty AS, Greenlaw RL. Variation in adenoma detection rates and colonoscopic withdrawal times during screening colonoscopy. *Gastrointestinal endoscopy* 2005; 100:AB107.
 19. Brooker J, Saunders B, Shah S, Thapar CJ, Thomas HJ, Atkin WS, Cardwell CR, Williams CB. Total colonic dye-spray increases the detection of diminutive adenomas during routine colonoscopy: A randomized controlled trial. *Gastrointest Endosc* 2002; 56:333-8.

***Author For Correspondence:** Ravi K Prakash, Division of Gastroenterology, MetroHealth Medical Center, Case Western Reserve University, 2500 MetroHealth Drive, Cleveland, OH 44109, USA.
 Phone- 14403917088, Fax-12167788227, Email: kevin.mullen@case.edu
 Email: rprakash@metrohealth.org