

Endoscopy Nurse Participation May Increase the Polyp Detection Rate by Second-Year Fellows during Screening Colonoscopies

Tae Sun Kim, Dong Il Park, Do Young Lee, Jang Hyuk Yoon, Jung Ho Park, Hong Joo Kim, Yong Kyun Cho, Chong Il Sohn, Woo Kyu Jeon, Byung Ik Kim, and Jae Wan Lim

Department of Internal Medicine, Kangbuk Samsung Hospital, Sungkyunkwan University School of Medicine, Seoul, Korea

Background/Aims: The aim of this study was to assess the effects of endoscopy nurse participation on polyp detection rate (PDR) and adenoma detection rate (ADR) of second-year fellows during screening colonoscopies. **Methods:** This was a single-center, prospective, randomized study comparing a fellow alone and a fellow plus an endoscopy nurse as an additional observer during afternoon outpatient screening colonoscopies. The primary end points were PDR and ADR. **Results:** One hundred ninety-one colonoscopies performed by a fellow alone and 192 colonoscopies performed by a fellow plus an endoscopy nurse were analyzed. The PDR was significantly higher when the nurse was involved (53.1% vs. 41.3%, $p < 0.05$); however, there was no significant difference in the ADR between the two groups (38.5% vs. 29.8%, $p = 0.073$). There was no difference in the percentage of patients with ≥ 2 polyps, advanced adenomas, polyp size, polyp location, and polyp shapes between the two groups. There was no difference in the PDR according to the level of experience of the endoscopy nurse. **Conclusions:** Endoscopy nurse participation as an additional observer during screening colonoscopy performed by second-year fellow increases the PDR; however, the level of experience of the nurse was not an important factor. (**Gut Liver 2012;6:344-348**)

Key Words: Colonoscopy; Polyp detection rate; Adenoma detection rate

INTRODUCTION

Colorectal cancer (CRC) is one of the most common malignancies in Western countries, and the incidence of CRC appears to be increasing in Asian countries.¹⁻⁴ Colonoscopy is widely

considered the gold standard for detection of CRC.⁵ The success of colonoscopy depends on the search for and removal of adenomatous polyps that are precursors to CRC.⁶ While the benefits of colonoscopy are well-established, the accuracy of colonoscopy is rarely questioned. Several studies have demonstrated that experienced gastroenterologists miss up to 11% of advanced adenomas and 26% of all adenomas.^{7,8} Thus, there are several studies that have focused on improving the detection of polyps and adenomas during colonoscopy. Factors reported to affect polyp and adenoma detection include the colonoscopy withdrawal time, the adequacy of the bowel preparation, and the time spent cleaning the colonic mucosa of excess fluid.⁹⁻¹²

Due to the increased demand of screening colonoscopy and the limited number of qualified colonoscopists, many screening colonoscopies are performed by gastroenterology fellows without supervision by attending physicians in South Korea. It has been our clinical experience that all aspects of the procedure may be facilitated by experienced endoscopy nurses, especially colonoscopy performed during gastroenterology fellowship training. Furthermore, trainees or a second, non-physician (nurse or technician) participation as an additional observer may be associated with polyp and adenoma detection.¹³⁻¹⁵ A previous retrospective study reported that procedures staffed by nurses with ≤ 6 months of endoscopy nursing experience had 1.26-fold likelihood of not detecting a polyp compared with nurses with more experience.¹³ However, there are no prospective studies which have assessed the effects of nurse participation as an additional observer on the polyp detection rate (PDR) and adenoma detection rate (ADR). Therefore, the aim of this study was to assess the effects of an endoscopy nurse as an additional observer on the PDR and ADR of second-year gastroenterology fellows during screening colonoscopies.

Correspondence to: Dong Il Park

Department of Internal Medicine, Kangbuk Samsung Hospital, Sungkyunkwan University School of Medicine, 29 Saemunan-ro, Jongno-gu, Seoul 110-746, Korea

Tel: +82-2-2001-2059, Fax: +82-2-2001-2049, E-mail: diksmc.park@samsung.com

Received on June 26, 2011. Revised on December 6, 2011. Accepted on December 30, 2011.

pISSN 1976-2283 eISSN 2005-1212 <http://dx.doi.org/10.5009/gnl.2012.6.3.344>

© This is an Open Access article distributed under the terms of the Creative Commons Attribution Non-Commercial License (<http://creativecommons.org/licenses/by-nc/3.0>) which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

MATERIALS AND METHODS

This was a single-center, prospective, randomized study comparing a fellow alone and a fellow plus an endoscopy nurse as an additional observer for afternoon outpatient screening colonoscopies. The study protocol was approved by the Institutional Review Board of Kangbuk Samsung Hospital, which confirmed that the study was in accordance with the ethical guidelines of the Declaration of Helsinki. All participants provided written informed consent.

1. Subjects

Average risk patients ≥ 50 years of age scheduled to undergo outpatient afternoon screening colonoscopy at Kangbuk Samsung Hospital were eligible to participate. Subjects were excluded if they met any of the following criteria: 1) symptoms of lower gastrointestinal tract disease, including rectal bleeding, changes in bowel habits, or lower abdominal pain; 2) family history of CRC in first-degree relatives; 3) personal history of CRC, polyps, or inflammatory bowel disease; or 4) history of a colorectal examination (including colonoscopy or barium enema) within the previous 5 years, or colorectal surgery. In addition, subjects in whom the colonoscopy failed to reach the cecum were excluded from the analysis.

2. Study design

All patients underwent a standard bowel preparation with 4 L of polyethylene glycol electrolyte lavage solution on the day of colonoscopy. The randomization process was performed just before colonoscopy in a closed exam room by an investigator not involved in the colonoscopy procedure. Using a table of random numbers generated by a computer program, eligible patients were assigned to a fellow alone or a fellow plus an endoscopy nurse as additional observer. The results of the randomization were kept blinded from the endoscopist and the endoscopy nurse until starting colonoscopy.

Colonoscopy was performed under conscious sedation with midazolam and meperidine by one of eight second-year GI fellows who had performed >500 colonoscopies during the first-year of GI fellowship training. Bowel preparation quality, cecal intubation time, and withdrawal time, as well as the polyp size, shape, and location, were prospectively recorded by the endoscopist. The time taken for biopsy, polypectomy, or other maneuvers was excluded from the withdrawal time. The quality of bowel preparation was rated by endoscopists on the basis of the following four criteria: excellent, good, fair, and poor.¹⁶ The endoscopist estimated the size of each polyp with a calibrated open biopsy forceps, which was 7 mm in diameter. All polyps were removed during colonoscopy and sent for histologic evaluation.

Six endoscopy nurses with variable levels of experience (range, 3 months to 5 years) participated in this study. The endoscopy

nurses were not assigned to a specific endoscopist or specific endoscopy room. Endoscopists and endoscopy nurses rotated between cases and rooms in no set order. The endoscopy nurse assigned to the fellow only group assisted the colonoscopy procedure as usual, and did not communicate the endoscopic findings (especially polyps) with the endoscopist. The endoscopy nurse assigned to a fellow plus an endoscopy nurse as an additional observer noted the endoscopic findings carefully in an effort to detect more polyps.

3. Histology

Polyps were placed into the following histologic categories: 1) hyperplastic polyps, 2) adenomas, and 3) advanced adenomas or cancers. An advanced adenoma was defined as a lesion >10 mm in diameter, lesions with a villous component, or lesions with high-grade dysplasia. Patients with inflammatory polyps were classified as having normal colonoscopic findings for the purpose of analysis.

4. Statistical analysis

We assumed that participation by an endoscopy nurse would increase the ADR by at least 15% during a screening colonoscopy compared with that in the fellow-alone group. This was based on the result of a retrospective study that reported 14% improvement in the ADR by including fellows as second observers.¹⁵ Considering a 5% dropout rate, the estimated sample sized per group was <200 with an α -value of 0.05 and a power of 80%.

Quantitative data was compared using Student's t-test with the results expressed as the mean \pm SEM. All of the other qualitative data comparisons used a chi-square test.

Multivariate analyses were performed using logistic regression to assess the relationship between nurse involvement and polyp and adenoma detection during screening colonoscopies, adjusting for age, gender, withdrawal time, insertion time, and bowel preparation quality. A $p < 0.05$ was considered statistically significant. All of the analyses were performed using SPSS version 11.5.0 (SPSS Inc., Chicago, IL, USA).

RESULTS

Between October 2009 and January 2010, 400 average-risk patients ≥ 50 years of age who were scheduled to undergo outpatient afternoon screening colonoscopy agreed to participate. Ten patients withdrew before bowel preparation (eight patients canceled the procedures and two patients did not want to continue participating in the study). Of 390 patients, 195 patients each were randomly assigned to the fellow-only or fellow plus an endoscopy nurse group. Seven patients (four in the fellow-only and 3 in the fellow plus an endoscopy nurse group) with a poor bowel preparation were excluded from the analysis (Fig. 1).

There were no significant differences in patient age, gender,

cecal intubation time, withdrawal time, and bowel preparation quality between the two groups (Table 1). When the endoscopy nurse was involved in the colonoscopy, at least 1 polyp was found in 53.1% of the patients compared with 41.3% in the fellow-only group ($p < 0.05$) (Table 2). The PDR was significantly higher when the nurse was involved. However, there were no significant differences in the ADR between the two groups (29.8% vs 38.5%, $p = 0.073$). Multiple regression analysis was performed controlling for age, gender, insertion time, withdrawal time, and bowel preparation quality (Table 3). After controlling for all these variables, the PDR was significantly higher when the endoscopy nurse was involved as an additional observer (adjusted odds ratio [OR], 1.54; 95% confidence interval [CI], 1.00 to 2.36).

There was no difference in the percentage of patients with two or more polyps between the two groups (Table 4). The number of patients with advanced adenomas did not differ significantly between the two groups (4.1% vs 7.8%, $p = 0.196$). Table 5 shows the characteristics of the polyps detected. A total of 326

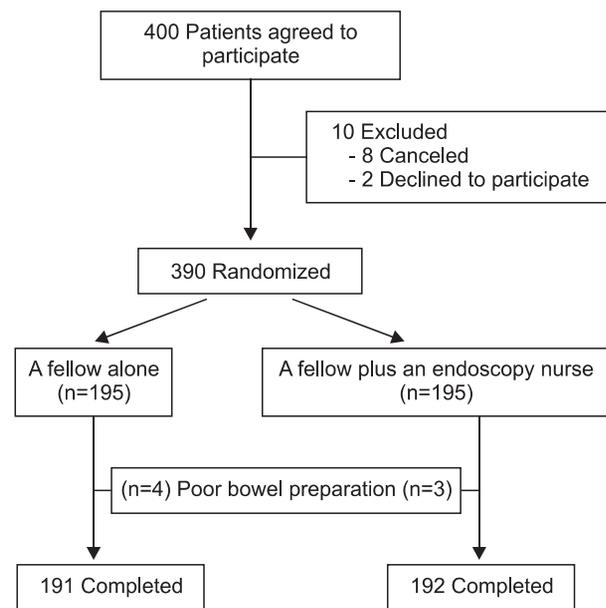


Fig. 1. Study flow diagram.

Table 1. Clinical Characteristics of the Study Subjects (n=383)

Characteristic	Fellow alone (n=191)	Fellow and nurse (n=192)	p-value
Men	115 (60.2)	120 (62.5)	NS
Age, yr	56.4±6.1	57.3±6.0	NS
Cecal intubation time, min	7.1±5.7	7.1±5.6	NS
Withdrawal time, min	8.5±3.5	8.8±3.5	NS
Bowel preparation (excellent or good)	153 (80.1)	151 (78.6)	NS

Data are presented as mean±SD or number (%). NS, not significant.

polyps were removed. There was no difference in polyp size, location, and shape between the two groups.

The characteristics of additional polyps that fellows did not detect, but endoscopy nurse could detect is summarized in Table 6.

Nurse experience as an additional observer was dichotomized at 12 months. Of 192 patients in the fellow plus endoscopy nurse group, 98 of the colonoscopies (54.1%) were attended by nurses with ≤12 months of GI nursing experience (Table 7). There was no difference in the PDR based on the level of experience of the endoscopy nurse.

DISCUSSION

In the current study, the PDR was significantly higher when

Table 2. Detection Rates of Polyps and Adenomas in the Two Study Groups

	Fellow alone (n=191)	Fellow and nurse (n=192)	p-value
Polyp detection (≥1 polyp)	79 (41.3)	102 (53.1)	0.021
Adenoma detection (≥1 adenoma)	57 (29.8)	74 (38.5)	NS (0.073)
Polyp size, mm	4.21±3.08	4.19±2.86	NS
Adenoma size, mm	4.48±3.24	4.71±3.21	NS

Data are presented as mean±SD or number (%). NS, not significant.

Table 3. Multivariate Analysis of Nurse Involvement on the Polyp Detection Rate and Adenoma Detection Rate

	Fellow alone, % (n=191)	Fellow and nurse, % (n=192)	Adjusted OR (95% CI)	p-value
Polyp detection	41.3	53.1	1.54 (1.00-2.36)	<0.05
Adenoma detection	29.8	38.5	1.42 (0.90-2.22)	0.131

Adjusted for age, gender, insertion time, withdrawal time, and quality of bowel preparation. OR, odds ratio; CI, confidence interval.

Table 4. Detection Rates and Number of Polyps in the Two Study Groups

	Fellow alone (n=191)	Fellow and nurse (n=192)	p-value
≥1 Polyp	79 (41.3)	102 (53.1)	<0.05
≥2 Polyps	39 (20.4)	48 (25)	NS
≥3 Polyps	14 (7.3)	20 (10.4)	NS
≥1 Advanced adenoma	8 (4.1)	15 (7.8)	NS (0.196)

Data are presented as number (%). Advanced adenoma was defined as lesions >10 mm in diameter, lesions with a villous component, or lesions with high-grade dysplasia. NS, not significant.

Table 5. Characteristics of the Detected Polyps

Characteristic	Fellow alone (polyps=142)	Fellow and nurse (polyps=184)	p-value
Polyp size, mm	4.21±3.08	4.19±2.86	NS
Size <5 mm	104 (73.2)	132 (71.7)	NS
Size 5-9 mm	25 (17.6)	33 (17.9)	NS
Size ≥10 mm	13 (9.2)	19 (10.3)	NS
Sessile shape	116 (81.7)	156 (84.8)	NS
Location			
Proximal colon	72 (50.7)	88 (47.8)	NS
Distal colon	70 (49.3)	96 (52.1)	NS
Adenoma, n	86	122	NS
Advanced adenoma, n	11	19	NS

Data are presented as mean±SD or number (%).

The distal colon was defined as the rectum, sigmoid colon, and descending colon.

NS, not significant.

a nurse was involved as an additional observer in screening colonoscopy performed by second-year fellows. Further, this effect persisted after controlling for age, gender, withdrawal time, insertion time, and bowel preparation quality, which is known to be associated with polyp detection.^{4,9-12} Our results confirmed the common sense expression, “two pairs of eyes are better than one.” This is the first prospective study that reports higher PDR by the participation of an endoscopy nurse as an additional observer.

Many screening colonoscopies are performed by fellows in South Korea. Attending physicians are present during the entire procedure for supervision when the 1st-year fellows perform screening colonoscopies. As is our standard practice, the attending physician may perform difficult parts of the procedure (difficult intubation or polypectomy), then allow the fellow to complete the remainder of the examination. However, due to an increased demand of screening colonoscopy and a limited number of qualified colonoscopists, many screening colonoscopies were performed by second-year fellows without supervision. In this situation, active participation by an endoscopy nurse as an additional observer may provide some help to struggling fellows.

So, how does the involvement of a nurse improve the PDR? Wallace¹⁷ suggested that there are three scenarios for a missed adenoma. First, the polyp is not detected. A polyp is not present in the field of endoscopic view due to anatomic location, such as behind a fold or near the anal verge. Second, a polyp is recognizable, but not recognized. Some polyps are within the field of view of a passing endoscope, but are not recognized by the endoscopist at the time of the procedure. Third, a polyp is in the field of view, but not recognizable. Some polyps are within the field of view, but have no distinguishing features compared with surrounding normal tissue, and are thus unrecognizable without

Table 6. Characteristics of the Additional Polyps that the Endoscopy Nurse Detected

Characteristic	Size, mean (range), mm	Location, proximal:distal
Hyperplastic polyp (n=12)	4.33 (2-10)	5:7
Adenoma (n=22)	3.68 (2-8)	17:5
Advanced adenoma (n=10)	12.5 (8-20)	5:5
High grade dysplasia (n=1)	15	1:0
Tubulovillous or villous (n=2)	14 (8-20)	0:2

Table 7. Polyp Detection Rate Based on the Experience Level of the Nurse

	0-12 mo experience (n=98)	>12 mo experience (n=94)	p-value
≥1 Polyp, n (%)	53 (54.1)	49 (52.1)	NS

NS, not significant.

supplemental methods. The current study suggests that more efficient and effective visual scanning and recognition may be achieved by adding a second observer to improve detection of recognizable, but missed polyps. Visual recognition research has consistently demonstrated why polyps that are in the field of view may not be “seen.”¹⁸

Despite the misconception that most recognizable, but missed polyps are small, flat, and of uncertain clinical significance, the current study showed that the size and shape of the detected polyps did not differ between the groups. An increase in the PDR with nurse participation could be attributed to an increased detection of hyperplastic, rather than adenomatous lesions by a second set of eyes. Then, why does nurse participation not increase the ADR? A 29.8% ADR achieved by the 2nd-year fellow alone is sufficient, thus an additional observer cannot provide statistically significant improvement. Furthermore, a fellow may expect a lower ADR without nurse participation and probably tries to find more polyps by themselves.

Endoscopy nurses usually focus on performing their responsibilities, such as monitoring the patient, administering sedation under physician supervision, assisting with polypectomies, and other technical aspects of the procedure. All aspects of the endoscopic procedure may be facilitated by an experienced nurse. A previous retrospective study showed that an experienced nurse increased the PDR compared with an inexperienced nurse.¹³ The endoscopy nurse may be asked to participate in another important task as an additional observer to improve the quality of screening colonoscopy. Also, the methods for maximizing polyp detection should be a part of endoscopy nurse training programs.

Our study had a limitation. Observer bias may have occurred. Endoscopists might be more aggressive in polyp detection than usual when they are aware that the PDR is monitored. Fellows may expect a lower PDR without nurse participation and prob-

ably try to find more polyps by themselves.

In conclusion, this prospective study has shown that endoscopy nurse participation as an additional observer in screening colonoscopy performed by second-year fellows increases the PDR. However, the level of experience of a nurse was not an important factor. We have initiated another study to assess the effect of nurse participation on the PDR during screening colonoscopy performed by experienced attending physicians.

CONFLICTS OF INTEREST

No potential conflict of interest relevant to this article was reported.

REFERENCES

1. Jemal A, Siegel R, Xu J, Ward E. Cancer statistics, 2010. *CA Cancer J Clin* 2010;60:277-300.
2. Ji BT, Devesa SS, Chow WH, Jin F, Gao YT. Colorectal cancer incidence trends by subsite in urban Shanghai, 1972-1994. *Cancer Epidemiol Biomarkers Prev* 1998;7:661-666.
3. Muto T, Kotake K, Koyama Y. Colorectal cancer statistics in Japan: data from JSCCR registration, 1974-1993. *Int J Clin Oncol* 2001;6:171-176.
4. Park HW, Byeon JS, Yang SK, et al. Colorectal neoplasm in asymptomatic average-risk Koreans: the KASID prospective multicenter colonoscopy survey. *Gut Liver* 2009;3:35-40.
5. Davila RE, Rajan E, Baron TH, et al. ASGE guideline: colorectal cancer screening and surveillance. *Gastrointest Endosc* 2006;63:546-557.
6. Winawer SJ, Zauber AG, Ho MN, et al. Prevention of colorectal cancer by colonoscopic polypectomy: the National Polyp Study Workgroup. *N Engl J Med* 1993;329:1977-1981.
7. Heresbach D, Barrioz T, Lapalus MG, et al. Miss rate for colorectal neoplastic polyps: a prospective multicenter study of back-to-back video colonoscopies. *Endoscopy* 2008;40:284-290.
8. van Rijn JC, Reitsma JB, Stoker J, Bossuyt PM, van Deventer SJ, Dekker E. Polyp miss rate determined by tandem colonoscopy: a systematic review. *Am J Gastroenterol* 2006;101:343-350.
9. Overholt BF, Brooks-Belli L, Grace M, et al. Withdrawal times and associated factors in colonoscopy: a quality assurance multicenter assessment. *J Clin Gastroenterol* 2010;44:e80-86.
10. Rex DK. Maximizing detection of adenomas and cancers during colonoscopy. *Am J Gastroenterol* 2006;101:2866-2877.
11. Rex DK, Petrini JL, Baron TH, et al. Quality indicators for colonoscopy. *Am J Gastroenterol* 2006;101:873-885.
12. Froehlich F, Wietlisbach V, Gonvers JJ, Burnand B, Vader JP. Impact of colonic cleansing on quality and diagnostic yield of colonoscopy: the European Panel of Appropriateness of Gastrointestinal Endoscopy European multicenter study. *Gastrointest Endosc* 2005;61:378-384.
13. Dellon ES, Lippmann QK, Sandler RS, Shaheen NJ. Gastrointestinal endoscopy nurse experience and polyp detection during screening colonoscopy. *Clin Gastroenterol Hepatol* 2008;6:1342-1347.
14. Peters SL, Hasan AG, Jacobson NB, Austin GL. Level of fellowship training increases adenoma detection rates. *Clin Gastroenterol Hepatol* 2010;8:439-442.
15. Rogart JN, Siddiqui UD, Jamidar PA, Aslanian HR. Fellow involvement may increase adenoma detection rates during colonoscopy. *Am J Gastroenterol* 2008;103:2841-2846.
16. Aronchick CA, Lipshutz WH, Wright SH, Dufrayne F, Bergman G. A novel tableted purgative for colonoscopic preparation: efficacy and safety comparisons with Colyte and Fleet Phospho-Soda. *Gastrointest Endosc* 2000;52:346-352.
17. Wallace MB. Improving colorectal adenoma detection: technology or technique? *Gastroenterology* 2007;132:1221-1223.
18. Yotsumoto Y, Sekuler R. Out of mind, but not out of sight: intentional control of visual memory. *Mem Cognit* 2006;34:776-786.