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Effect of a polyp detection poster on detection of sessile serrated lesions: a prospective controlled study

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Bibliography
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ABSTRACT

Background and study aims Colonoscopy is effective in reducing the incidence of colorectal cancer, but interval cancers remain a concern and their occurrence mainly is thought to be due to poor detection of sessile serrated lesions (SSLs) and advanced neoplasia (AN). Currently there are no low-cost, easy-to-implement tools to improve detection of difficult-to-detect polyps. Our aims were to compare the detection rate for SSLs and AN between two groups of endoscopists at a large community practice, one of which received an intervention of a polyp detection poster displayed over the monitor in their endoscopy suite for 6 months. We compared preintervention and post-intervention detection rates in the intervention and control groups.

Methods This was a convenience case control quality improvement project. For 6 months, a 2'×3' poster of pictures of SSLs and advanced neoplasia was displayed over the monitor for 44 endoscopist in a large community gastroenterology practice in the Minneapolis/St.Paul area, while another 44 physicians performed colonoscopy in the usual fashion without the poster. The endpoints were improvement in detection rates for SSLs and AN preintervention and post-intervention between the control and intervention groups.

Results During the study, 88 endoscopists performed 54,861 colonoscopies. At least one adenoma was detected in 41.3% of patients, one or more SSLs in 11.4%, and AN in 10.6%. During the intervention period, the SSL detection rates were 10.9% and 12.3% for the control and intervention groups and for AN, the detection rates were 10.4% and 10.75% for the two groups, respectively. Exposure to the polyp detection poster significantly changed SSL detection for the intervention group relative to the control group (likelihood ratio test $P<0.001$). No significant effect of the intervention was observed for detection of AN, right-sided AN or left-sided AN, or adenoma detection rate.

Conclusions Placement of a polyp detection poster above the endoscopy video monitor increased detection of SSL but not AN.

Introduction

Approximately 15 million colonoscopies are performed annually in the United States, and polyps are detected in about 30 % to 60 % of the procedures. Goals of a high-quality colonoscopy include reducing the incidence of CRC through detection and removal of adenomas and sessile serrated lesions (SSLs). However, there is wide variation in the quality of colonoscopy across endoscopists in the United States, and a large unmet need for low-cost, easy-to-implement interventions that target quality indicators where there is known underperformance, such as detection of SSLs and advanced neoplasia (AN), particularly in the proximal colon [1].

Adenoma detection rate (ADR) is a validated quality indicator for screening colonoscopy [2] and prior studies have indicated large variability in ADRs across endoscopists in the same practice [3]. Physicians with a lower ADR may fail to detect SSLs, advanced adenomas, and cancers [4, 5]. We have previously reported that there is large inter-physician variability in ADR among endoscopists in a single large community practice in the twin cities of Minneapolis/St. Paul, and that multiple systematic interventions, including financial rewards and penalties, failed to change the individual ADRs [6]. There is evidence in behavioral economics that outcomes can be influenced by small changes in the environment [7]. This suggests the need for micro-changes in the environment of the endoscopist, which do not require costly equipment or training and can improve endoscopist performance, almost subconsciously. Building upon prior work, in the current study, we aimed to study the effect of a poster with pictures of SSLs and advanced adenomas to improve detection rates for SSLs and AN. Our hypothesis was that placing a large poster next to the monitor, within the immediate view of the endoscopist, would largely unconsciously draw the endoscopist's attention back to focusing on looking for and detecting similar lesions in the colon.

Methods

We conducted a prospective concurrent-control study at MNGI Digestive Health P.A. and Colon & Rectal Surgery Associates between March 2019 and March 2020. All colonoscopies were performed by 88 endoscopists at six ambulatory endoscopy centers (ASC) serving the metropolitan areas of Minneapolis and St. Paul, Minnesota. All six ASCs used identical equipment: Olympus CF HQ190 L and PCF H190 DL colonoscopes, Sharp Aquos 32-inch high-definition video screens, and NextGen report generator with integrated Crystal report viewer.

Every physician was assigned a primary ASC. The colonoscopies were direct referrals and scheduled based on patient convenience. Physicians assigned to an ASC in the eastern twin cities metro area (N = 44) were designated the intervention group and those assigned to an ASC in the western twin cities metro area (N = 44) were designated the control group. This was a convenience design for this quality improvement project. During the study period, for the intervention group, a 2' × 3' polyp sizing poster with pictures of SSLs and advanced adenomas was displayed in each endoscopy room, above the endoscopist monitor (▶ **Fig. 1**). Although physicians mostly perform colonoscopies at their primary ASC, they occasionally travel to other MNGI ASCs. Schedules were carefully monitored by one of the investigators (JBC) to ensure that the intervention group always had the polyp detection poster present and that the control group was not allowed to see the poster. We collected data on all colonoscopies performed over 6 months between March 2019 and September 2019 as preintervention or baseline. Posters were hung for 6 months, from October 2019 through March 2020 for the intervention group. Colonoscopies performed in any intervention ASC during this time were considered intervention. AN was defined as adenomas or SSLs ≥ 10 mm, adenoma with villous histology or high-grade dysplasia, traditional serrated adenoma or ≥ 5 adenomas or SSLs in any combination [8]. Diagnosis of polyp pathology was based on histology as reported by the pathologists who were unaware of the study. Each endoscopist performed an average of 103 colonoscopies per month for the 6 months of the study.

▶ **Fig. 1** Polyp detection poster displayed above the screen in the endoscopy room.

Endoscopists had previously signed a partnership agreement that acknowledged that the results of their procedures would be monitored for quality purposes and agreed to participate in quality improvement initiatives. To ensure patient and provider privacy, the researchers were blinded to personal identifiable information for physicians and patients. The study was deemed a quality improvement initiative and declared IRB exempt by the University of Minnesota.

Statistical analyses

Means and standard deviations were calculated for continuous variables, and counts and percentages were calculated for categorical variables. Comparisons of endoscopist and patient characteristics between intervention groups were made using chi-square tests for categorical variables and independent *t*-tests for continuous variables. To estimate the differences between the intervention and control groups in changes in detection rates for SSLs and AN from the preintervention to the intervention period while accounting for potential preintervention differences in detection rates between the two groups, we fit a mixed-effects proportional odds model with main effects for

▶ **Table 1** Characteristics of patients and procedure by intervention group (N = 54,861).

	Control group (n = 26092)	Intervention group (n = 28769)	*P* value
Patient mean age in years (SD)	57.5 ± 12.2	57.5 ± 12.6	0.33
Sex			0.62
▪ Male	13932 (53.4 %)	15118 (52.5 %)	
▪ Female	12160 (46.6 %)	13651 (47.5 %)	
Indication			0.81
▪ Screening	10572 (40.5 %)	12269 (42.6 %)	
▪ Surveillance	9495 (36.4 %)	10456 (36.3 %)	
▪ Diagnostic	6025 (23.1 %)	6044 (21.0 %)	
Findings at colonoscopy[1]			0.55
▪ Normal or no finding	13596 (52.1 %)	13779 (47.9 %)	
▪ Adenoma	10330 (39.6 %)	12233(42.5 %)	
▪ Advanced adenoma	2764 (10.6 %)	3055 (10.6 %)	
▪ SSL	2843 (10.9 %)	3447 (11.9 %)	
▪ Cancer	14 (0.05 %)	13 (0.05 %)	
Endoscopists	44	44	
Average Withdrawal time (minutes)	10.8 min	10.2 min	0.94
Adequate bowel preparation	98.2 %	98.7 %	0.89

SD, standard deviation.
[1] Individuals with multiple types of polyps counted more than once.

▶ **Table 2** Detection rates for advanced neoplasia and SSL by study group preintervention and during intervention period.

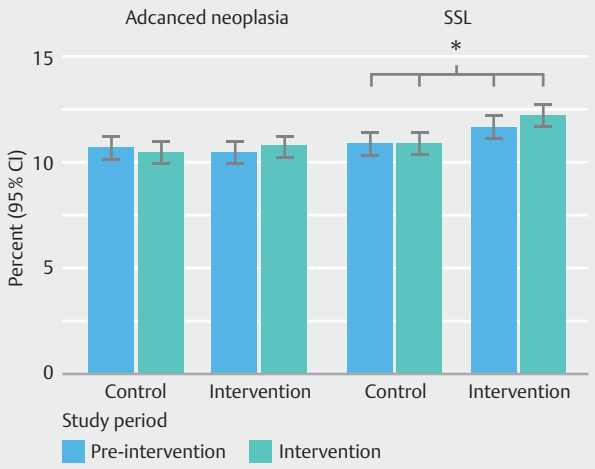
	Preintervention		Intervention		*P* value[1]
	Control group	Intervention group	Control group	Intervention group	
Detection of ≥ 1 AN	10 %	10 %	10 %	11 %	0.32
Detection of ≥ 1 right- sided AN	3.8 %	3.85 %	4.0 %	4.2 %	0.41
Detection of ≥ 1 left-sided AN	7.5 %	7.3 %	7.2 %	7.4 %	0.41
Detection of ≥ 1 SSL	10.9 %	11.7 %	10.9 %	12.23 %	< 0.001
ADR[2]	37 %	40 %	38 %	40 %	0.39

SSL sessile serrated lesion; AN, advanced neoplasia; ADR, adenoma detection rate.
[1] Comparing change in control versus intervention group.
[2] Average ADR over physicians, n = 44 in each group.

the intervention and timing (preintervention/intervention) and an interaction between the two. The model controlled for patient age, sex, baseline detection rates of the endoscopists, and indication for colonoscopy. The likelihood ratio was used to test the joint significance of the main intervention group effect and its interaction with the intervention period. When possible, a random effect for endoscopist was included to account for the correlation among multiple patients examined by the same endoscopist.

Results

There were 54,861 colonoscopies performed by 88 endoscopists during the study period. The characteristics of patients that underwent colonoscopy were similar between the two groups, with median age 57.5 years, 52.9 % women, and the indication for the exam of screening (41.7 %), surveillance (36.3 %), or diagnostic (22.0 %). At least one adenoma was detected in 41.3 % of patients, one or more SSL in 11.4 % and AN in 10.6 %. ▶ **Table 1** summarizes the patient and colonoscopy characteristics in the two groups. In the preintervention period,



▶ **Fig. 2** Detection of SSL and AN for the control group and intervention group in the preintervention and intervention periods. *Likelihood ratio test for effect of group assignment (exposure to polyp detection poster) on detection of SSLs adjusting for baseline differences between control and intervention groups: $P<0.001$.

detection rates for SSL and AN were very similar in the control and intervention groups: 10.9% vs. 11.7% for the SSLs and 10.7% vs 10.4% for AN for the control and intervention groups, respectively. The location of AN was similar between the control and intervention groups: 7.5% and 7.3% of cases had at least one proximal AN and 3.8% and 3.8% had at least one distal AN for the control and intervention groups, respectively, in the preintervention period. During the intervention period, the SSL detection rates were 10.9% and 12.3% and AN detection rates were 10.4% and 10.75% for the control and intervention groups, respectively. During the intervention period, the detection rates for proximal and distal AN detection were 7.2% and 7.34% for proximal AN and 4.0% and 4.2% for distal AN for the control and intervention groups, respectively (▶ **Table 2**, ▶ **Fig. 2**).

Exposure to the polyp detection poster significantly changed SSL detection for the intervention group relative to the control group (likelihood ratio test $P<0.001$). No significant effect of the intervention was observed for detection of AN, right-sided AN or left-sided AN between the two groups (▶ **Table 3**). In sensitivity analysis, the findings did not change when restricted to exams for a screening indication only.

The average ADRs in the preintervention period were 37% and 42% in the control and intervention groups, respectively. The ADRs did not change for the two groups in the intervention period: 38% and 40% for the control and intervention groups, respectively ($P=0.39$).

Discussion

We sought to determine the effectiveness of a simple, low-cost intervention of displaying polyp detection posters aimed at improving detection of SSLs and AN, which are challenging to detect as they occur on the right side, are flat or sessile, and in the case of SSLs, often have irregular borders and an overlaying mucosa cap [9]. Detecting these lesions requires rigorous withdrawal technique and high vigilance for looking for them. There is increasing evidence in the behavioral economics field that outcomes can be influenced by small changes in the environment within which a person acts [7]. These ideas have been made popular by the book Nudge [10] which describes interventions designed to "nudge" people's behaviors. In a previous study [6], we hypothesized that the increase in ADR may have been due to the polyp sizing poster continually and unconsciously refocusing the endoscopist's attention back to examining the colonic mucosa for adenomas to measure. In the current study, we used this behavioral "nudge" to try to improve detection of SSLs and AN.

▶ **Table 3** Mixed effects model for association of factors with advanced adenoma or SSL.

Advanced neoplasia detection[1]	
	OR (95%CI)
Patient age	1.027 (1.024, 1.029)
Patient sex Female vs. male	1.242 (1.174, 1.314)
Indication	
▪ Diagnostic	1.00
▪ Screening	0.91 (0.844, 0.983)
▪ Surveillance	0.9 (0.831, 0.975)
Group Control vs. poster Intervention	0.938 (0.707, 1.245)
Time period Baseline vs. Intervention	1.004 (0.926, 1.089)
SSL detection[1]	
	OR (95% CI)
Patient age	1.006 (1.003, 1.008)
Patient sex Female vs. male	0.849 (0.804, 0.897)
Indication	
▪ Diagnostic	1.00
▪ Screening	1.343 (1.241, 1.453)
▪ Surveillance	1.584(1.459, 1.72)
Group Control Poster intervention	0.914 (0.693, 1.206)
Time period Baseline vs. intervention	0.99 (0.913, 1.073)

SSL, sessile serrated lesion; OR, odds ratio; CI, confidence interval.
[1] Likelihood ratio test for effect of group assignment (exposure to polyp detection poster) on detection of lesion adjusting for baseline differences between control and intervention groups: $P=0.32$ for advanced neoplasia; $P<0.001$ for SSL.

Our study found that a polyp detection poster has a small benefit in improving detection of SSLs, but not AN or physician ADR. It is possible that given the high detection rate for AN for the group at baseline, the sample size required would be much larger to see a change in AN, but detection of right-sided lesions, which are predominately SSLs, had room for improvement. Note that even a small difference is worthwhile when the intervention is simple, non-disruptive, and low-cost, as is this one.

With an average gastroenterologist performing close to 600 colonoscopies per year, it requires additional effort to stay focused for each and every one of those exams. Simple low-cost tools can help focus attention and be a constant reminder about what to look for on the video screen. Future studies to confirm this finding could also investigate the design of interventions to enhance their effectiveness. Our findings are relevant for other large gastroenterology practices as well as for training programs. A reference polyp detection poster like ours may be a helpful tool in this regard.

Our study has several limitations. First, the period for the intervention was 6 months, and whether the changes are long-term or if they increase over time is not known. We do not know the mechanism by which the poster improves withdrawal technique or attention to the video monitor. There is a possibility of a Hawthorne effect. The study was not randomized, so there is a chance of uncorrected confounding. Finally, generalizability is unknown. The strengths of our study include having data from an unusually large community-based practice. The patients seen in this practice represent community-dwelling individuals, which is the target population for all screening programs, and systematic collection of both colonoscopy and pathology reports, which give polyp location, size, and histology. Another strength is that the polyp detection poster was unobtrusively displayed above the video monitor and the investigators did not instruct the endoscopists to use it. In addition, there was no reporting required by the endoscopists. The endoscopists were passive participants and went about their usual work, which best simulates the real-world work environment.

Conclusions

In conclusion, we found that in a community practice, displaying a practical, low-cost polyp sizing poster improved detection of SSL modestly, but did not affect AN detection or ADR.

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Competing interests

The authors declare that they have no conflict of interest.

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References

[1] Kahi CJ, Hewett DG, Norton DL et al. Prevalence and variable detection of proximal colon serrated polyps during screening colonoscopy. Clin Gastroenterol Hepatol 2011; 9: 42–46

[2] Rex DK, Petrini JL, Baron TH et al. Quality indicators for colonoscopy. Am J Gastroenterol 2006; 101: 873–885

[3] Shaukat A, Oancea C, Bond JH et al. Variation in detection of adenomas and polyps by colonoscopy and change over time with a performance improvement program. Clin Gastroenterol Hepatol 2009; 7: 1335–1340

[4] Kaminski MF, Regula J, Kraszewska E et al. Quality indicators for colonoscopy and the risk of interval cancer. N Engl J Med 2010; 362: 1795–1803

[5] Corley DA, Jensen CD, Marks AR et al. Adenoma detection rate and risk of colorectal cancer and death. N Engl J Med 2014; 370: 1298–1306

[6] Shaukat A, Shamsi N, Menk J et al. Polyp sizing poster improves polyp measurement but not adenoma detection rates by endoscopists in a large community practice. Clin Gastroenterol Hepatol 2019; 17: 2034–2041

[7] Dolan P, Hallsworth M, Halpen D. The mindspace way. J Econ Psychol 2012; 33: 264–277

[8] Gupta S, Lieberman D, Anderson JC et al. Recommendations for Follow-Up After Colonoscopy and Polypectomy: A Consensus Update by the US Multi-Society Task Force on Colorectal Cancer. Am J Gastroenterol 2020; 115: 415–434

[9] Rex DK, Ahnen DJ, Baron JA et al. Serrated lesions of the colorectum: review and recommendations from an expert panel. Am J Gastroenterol 2012; 107: 1315–1329

[10] Thaler RH, Sunstein CR. Nudge: Improving Decisions about health wealth and Happiness. London: Penguin Books; 2009