

Patients with History of Colonoscopy Are Less Likely to Achieve High Quality Preparation After Implementing Split-Dose Bowel Preparation

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Abstract

Background : Anecdotally, we observed that patients who had previous colonoscopies were less likely to follow newly implemented split-dose bowel preparation (SDBP) instructions. We investigated whether the indication for colonoscopy is an independent factor for achieving high quality bowel preparation among patients asked to follow SDBP.

Methods : We performed a retrospective study of data from 1478 patients who received outpatient colonoscopies in 2014 (the year of SDBP implementation) at our Veterans Affairs Medical Center. We collected information related to demographics and factors known to affect bowel preparations. Reasons for colonoscopy were dichotomized into surveillance (previous colonoscopy) vs. non-surveillance (positive occult blood test or screening). Bowel preparation quality was scored using the Boston Bowel Preparation Scale (BBPS), and was categorized as either excellent vs. not excellent (BBPS \geq 7 vs. BBPS<7), or adequate vs. inadequate (BBPS \geq 6 vs. BBPS<6).

Results : Bowel preparation quality was excellent in 60% of colonoscopies and adequate in 84% of colonoscopies. Thirty-six percent (535) were surveillance colonoscopies. In multivariate logistic regression analysis, more patients in the non-surveillance group achieved excellent (OR

0.8 ; 95% CI [0.7-0.8], P <0.0001) and adequate (OR 0.8 ; 95% CI [0.7-0.9], P <0.006) bowel preparation than did patients in the surveillance group.

Conclusion : Patients with a prior colonoscopy might not follow the split-dose bowel preparation instructions. Educational interventions emphasizing the benefits of SDBP in this group of patients may help ensure compliance and prevent the habitual use of day-before preparations. (*Acta gastroenterol. belg.*, 2017, 80, 257-261).

Abbreviations: body mass index (BMI); Boston Bowel Preparation Score (BBPS); Veterans Affairs (VA); Computerized Patient Record System (CPRS)

Board, as the study was deemed no more than minimal risk, given its retrospective nature.

Introduction

Colonoscopy is considered one of the most powerful tools for colorectal screening (1). The incidence of colon cancer is declining, probably as a result of the increased rate of screening and increased utilization of colonoscopy (2). Whether colonoscopy screening will be effective in preventing colorectal cancer is largely based on the successful detection and removal of adenomatous polyps (3, 4).

Quality of colonoscopy depends upon patient's adherence to recommended guidelines for bowel preparation (1). Approximately 25% of colonoscopies have a bowel preparation that is insufficient for proper

mucosal inspection (5). This can increase the risk of missing lesions (6), and increase costs due to aborted exams or the need to repeat colonoscopies at shorter intervals (7). A high-quality bowel preparation is essential for detecting small or flat lesions, particularly those in the proximal colon.

Several factors impact the quality of bowel preparation. Male gender, older age, obesity, constipation, diabetes, dementia, cirrhosis, and the use of narcotics or certain medications are among the elements known to affect the quality of bowel preparation (8-10). Compliance with preparation instructions and split dosing, in which a portion of the preparation is given on the day of the examination, also play a major role. In a survey of 300 patients, 85% answered that they would be willing to get up in the middle of the night for their second bowel preparation dose (11). However, in a prospective study of 462 participants, 1 in 7 patients did not comply with a split-dose bowel preparation (SDBP) (12). Factors like Hispanic race, low income, and early colonoscopy appointment time were found to be related to non-compliance with SDBP (12). Anecdotally, we noticed that patients who had previous colonoscopies were less likely to follow newly implemented SDBP instructions.

The aim of the present study was to investigate whether the reason for colonoscopy is an independent factor for achieving high quality bowel preparation among patients asked to follow SDBP. We hypothesized that experienced patients who previously underwent colonoscopy "surveillance" would be less likely to achieve excellent bowel preparation than would non-experienced patients who had colonoscopies to explore symptoms or for screening or purposes.

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Materials and Methods

Population Description

This study was a retrospective review conducted at the Oklahoma City Veterans Affairs Medical Center (VAMC) in Oklahoma City, Oklahoma. Consecutive patients who underwent a colonoscopy in 2014 (the year of SDBP implementation) were considered for inclusion. The study was approved by the University of Oklahoma Institutional Review Board (IRB) and the Oklahoma City VAMC Research and Development Committee. Patients were identified in a prospectively maintained endoscopic report system. All colonoscopies are entered into the database at the time of the procedure. During generation of the report, the endoscopist is prompted to enter the Boston Bowel Preparation Score (BBPS). Procedures were performed and reports were completed by one of seven attending gastroenterologists, with or without a gastroenterology fellow. Subjects were eligible for inclusion if they underwent elective outpatient colonoscopy during the study period. Exclusion criteria included prior colon resection, incomplete colonoscopies for reasons other than inadequate preparation, colonoscopies that were repeated within the study period due to poor bowel preparation, inpatient colonoscopies, and colonoscopies with no BBPS documentation.

Bowel Preparation Description

All patients were instructed to receive split-dose bowel preparation, in which 2 L were consumed the evening before the procedure and the remaining 2 L were taken 4 hours before the colonoscopy. All patients were advised to follow a clear liquid diet for two days before their colonoscopy.

Data Collection

The VA Computerized Patient Record System (CPRS) includes demographic and clinical information. The endoscopy reports are generated using the Provation endoscopic reporting system (Provation MD; Provation Medical, Minneapolis, MN) and are linked to CPRS. We collected demographics, including age, sex, race, weight, height, and BMI; comorbidities, like diabetes, hypertension, dementia, stroke, chronic constipation, hypothyroidism, and cirrhosis, and; pertinent medication use, i.e. narcotics, calcium channel blockers, iron supplements, tricyclic antidepressants, and anti-muscarinics (first-generation antihistamines and typical/atypical antipsychotics). We also collected information about the colonoscopy procedure, including the type of bowel preparation used and the indication. Indications for colonoscopy were dichotomized into surveillance (previously had colonoscopy) vs. non-surveillance (positive occult blood test or screening). Quality of bowel preparation based on the validated Boston Bowel Preparation Score (BBPS), and colonoscopy findings,

such as the presence of polyps, number, size, location, and histology, were recorded. The BBPS is a segmental scoring system with scores of 0-3 applied specifically to the left colon, transverse colon, and right colon. These three scores are summed for a final range of total scores from 0 through 9. (13) "Excellent" bowel preparation was defined as BBPS \geq 7, with no individual segment scoring <2. Adequate bowel preparation was defined as BBPS \geq 6, with no individual segment scoring <2. Poor bowel preparation was defined as BBPS \leq 3.

Statistical Analysis

Subjects were categorized into two groups based on their colonoscopy BBPS score: "excellent" preparation (BBPS \geq 7), or "not excellent" preparation (BBPS<7). Continuous variables were reported as means \pm SD. Categorical variables were reported as percentages. Two-sided *t*-tests were used to compare the means of continuous variables. Chi-square tests were used to compare the categorical variables. A *P* value of <0.05 was considered statistically significant. Multivariable stepwise logistic regression analysis was performed to calculate adjusted odds ratio (OR) by entering all variables with at least a modest correlation (*P*<0.1) into a model.

Results

During the study period, 1608 colonoscopies were performed. However, 9% were excluded based on the aforementioned exclusion criteria. In the final analysis, 1478 patients were included. The mean patient age was 61.1 years \pm 10.2; 94% were male. Seventy-one percent were White. Colonoscopies were performed for colorectal cancer screening in 222 patients (15%), and for surveillance in 535 patients (36%). The remaining 721 (49%) were diagnostic colonoscopies, including 406 (28%) that were conducted for positive fecal immunochemical tests (FIT) and 315 (21%) for symptoms that warranted colonoscopy. The mean BBPS score among the whole group was 6.7 \pm 1.7. When bowel preparation quality was dichotomized, 84% of patients (*n* = 1236) had an adequate bowel preparation with a BBPS \geq 6. Sixty percent of patients (*n* = 884) had excellent bowel preparation with a BBPS \geq 7.

Patients with excellent bowel preparation quality were more likely to be male. Patient with either excellent or adequate bowel preparation were less likely to have had a colonoscopy for surveillance purposes (Table 1).

Patients with diabetes, using narcotics, or with a history of cirrhosis, constipation, or stroke were less likely to achieve excellent bowel preparation. In addition, patients on narcotics were less likely to have adequate bowel preparation (Table 2).

Multivariable logistic regression analysis found that surveillance indication was an independent risk factor for both excellent (OR 0.8; 95% CI [0.7-0.8], *P* <0.0001) and adequate bowel preparation quality (OR 0.8; 95%

Table 1. — Participant characteristics, stratified by bowel preparation quality.

	Excellent (n=884)	Not excellent (n=592)	P value	Adequate (n=1236)	Inadequate (n=240)	P value
Age, mean± SD	61.6± 9.7	61.7±10.2	0.77	61.6± 9.8	61.6±10.8	0.97
Male sex, n (%)	847 (95.6)	546 (92.2)	0.006	1169 (94.6)	222 (92.5)	0.21
Caucasian race, n (%)	554 (62.6)	387 (65.5)	0.26	786 (63.6)	154 (64.4)	0.80
BMI, mean± SD	30.9±6.9	30.6±6.3	0.15	30.9±6.8	30.3±6.3	0.21
Indication (surveillance), n (%)	283 (31.9)	252 (42.6)	<0.0001	437 (35.4)	97 (40.4)	0.12

Table 2. — Participant comorbidities and medications, stratified by bowel preparation quality.

Comorbidities and medications	Excellent (n=884)	Not excellent (n=592)	P value	Adequate (n=1236)	Inadequate (n=240)	P value
Comorbidities						
Diabetes, n (%)	220 (24.9)	170 (28.7)	0.09	315 (25.5)	73 (30.4)	0.11
Dementia, n (%)	5 (0.56)	4 (0.68)	0.79	6 (0.49)	3 (1.3)	0.16
Cirrhosis, n (%)	6 (0.68)	17 (2.87)	0.0008	17 (1.38)	6 (2.5)	0.19
Constipation, n (%)	70 (7.9)	83 (14.04)	0.0001	123 (9.9)	29 (12.1)	0.31
Hypothyroidism, n	71 (8.02)	43 (7.28)	0.59	93 (7.5)	21 (8.8)	0.51
Stroke, n (%)	0 (0)	5 (0.84)	0.006	3 (0.24)	2 (0.8.3)	0.14
Medication use						
Narcotics, n (%)	173 (19.5)	141 (23.8)	0.048	243 (19.7)	71 (29.6)	0.0006
Calcium channel blocker, n (%)	191 (21.6)	149 (25.2)	0.11	276 (22.3)	63 (26.3)	0.19
Tricyclic anti-depressant, n (%)	31 (3.5)	21 (3.6)	0.97	41 (3.3)	11 (4.6)	0.33
Iron supplement, n (%)	69 (7.8)	55 (9.30)	0.31	96 (7.8)	27 (11.3)	0.07

CI [0.7-0.09], $P < 0.006$; Table 3, Table 4). In addition, diabetes, cirrhosis, and constipation were found to be inversely related to excellent bowel preparation quality (Table 3). Narcotics use was found to be an independent predictor for inadequate bowel preparation (Table 4).

Discussion

Our findings suggest that extra attention should be devoted to those patients who previously had a colonoscopy and are due for surveillance colonoscopy, as some may not pay attention to the new recommendations regarding SDBP. This is the first study to highlight the possible relationship between experienced patients and bowel preparation quality.

Several previous studies have reported independent risk factors for inadequate bowel preparation (14, 15). Some variations may be related to study designs, population, or definition of inadequate bowel preparation. The present study assessed SDBP and evaluated independent factors related to both adequate and excellent bowel preparation. Few published studies have examined independent predictors in SDBP (10, 16-19). Similar to our findings here, others reported that diabetes, narcotics use and history of constipation were independent predictors for inadequate bowel preparation. However, some of other reported risk factors, such as BMI, history of dementia and use of tricyclic anti-depressant were not independently associated with inadequate bowel preparation in our study (10, 16). Other researchers found that the time of

Table 3. — Independent factors for excellent bowel preparation quality.

Variable	OR	95% CI	P value
Narcotics	0.8	0.6-1.1	0.12
Constipation	0.6	0.4-0.8	0.002
Diabetes	0.8	0.6-0.98	0.03
Cirrhosis	0.2	0.1-0.5	0.001
Indication	0.8	0.7-0.8	<0.0001
Male sex	1.9	1.3-3.1	0.003

Table 4. — Independent factors for adequate bowel preparation quality.

Variable	OR	95% CI	P value
Narcotics	0.6	0.4-0.8	0.0008
Stroke	0.3	0.05-1.7	0.16
Diabetes	0.8	0.6-1.0	0.09
Indication	0.8	0.7-0.9	0.006
Iron	0.7	0.5-1.2	0.18

preparation for colonoscopy was significantly associated with satisfactory bowel preparation, which suggests the importance of education and patients following instructions to improve bowel preparation quality (17).

In the present study, we identified that the reason for colonoscopy is an independent predictor for both excellent and adequate bowel preparation. Those patients undergoing colonoscopy for surveillance purposes were less likely to have adequate and excellent bowel preparation, which may suggest that those patients elected not to follow the SDBP instructions, possibly because they had undergone colonoscopy before and did not look at the new instructions, or they chose not to follow the instructions, perhaps under the assumption of “if it worked before, why should I change?” Menees et al. prospectively compared those who were compliant vs. non-compliant with SDBP; the index colonoscopy was the first colonoscopy in 63% of the compliant group vs. 55% of the non-compliant group, although this difference was not statistically significant, likely due to the small sample size (12). Similarly, when subjects were offered the choice of SDBP or day-before regimens, despite emphasizing the superiority of split regimen on colonoscopy outcomes. The number of colonoscopies performed for screening purposes was much higher among patients who chose SDBP (61%) than among those who chose the day-before regimen (38%) (20).

Many practices still rely on single-dose bowel preparations (18%); only 42% of endoscopy units report relying on split dosing exclusively (21). Prior to colonoscopy, patients usually receive instructions about how to prepare for their procedure, including dietary restrictions, alterations in the use of their usual

medications, and how to ingest their bowel purgatives. Patients’ reasons for deviating from the instructions are diverse and may be intentional or inadvertent. It is important to make the patient aware of recent changes to bowel preparation and of the importance of following the new instructions. At our institution, we have implemented a warning box on the bowel preparation kit that alerts subjects to the changes to bowel preparation. We have anecdotally noticed some improvement in compliance with the new recommendations since adding the warning.

The present study has several unique features. Most notable is that a large cohort of patients was evaluated over one year. In addition, multivariable regression analysis was used to control for any possible known confounders.

Limitations include the possibility of incomplete adjustment for confounders. Although we were able to adjust for many factors potentially associated with bowel preparation quality, there may be other factors involved. Inter-observer variation among physicians reporting BBPS is another potential limitation. However, the consistency of physicians practicing during the study and the fact that BBPS had been used at our institution for several years before the initiation of the study makes the possibility of a systematic bias in BBPS rating less likely. There is also a possibility of information bias related to misclassification, as we used the reason for colonoscopy as a surrogate to define those who are experienced vs. those who are not. Another potential limitation is that this was a single-center study conducted at Veterans Affairs hospital involving mainly white males, which may affect the generalizability of the results and might limit any conclusion related to male sex as independent predictor for excellent bowel preparation.

In conclusion, patients with a prior colonoscopy may not follow the split-dose bowel preparation instructions. Educational interventions emphasizing the benefits of SDBP in this group of patients may help ensure compliance and avoid the habitual use of day-before preparations.

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