Maximizing Bowel Preparation for Colonoscopy: The Patient Component

Lawrence B. Cohen, MD, FACP, FASGE, AGAF
Clinical Professor of Medicine
Division of Gastroenterology
Icahn School of Medicine at Mount Sinai
New York, New York

Introduction
It has been demonstrated that colonoscopy is the most effective strategy employed in clinical practice for the prevention and early detection of colorectal cancer (CRC). The systematic detection and removal of colon adenomas during colonoscopy is estimated to prevent 53% of deaths that would otherwise be associated with progression of polyps to colon cancer.1 However, success using this highly technical procedure is dependent on a host of variables working in concert, including the operator, the operator’s experience with colonoscopy, and the appropriate use of surveillance and screening intervals.2 Closely related with the success of colonoscopy is the quality of bowel preparation.2 Inadequate bowel preparation is estimated to occur in 20% to 25% of cases and results in a reduction in adenoma detection rate (ADR), and often, the need for a second attempt at bowel preparation and colonoscopy (Figure 1).2,3 This phenomenon can contribute to higher direct as well as indirect costs of care related to lost physician appointment time, time spent by patients and their escorts, and sometimes, the need for a second procedure.4

The revised 2012 United States Multi-Society Task Force Guidelines on Colorectal Cancer suggest monitoring the quality of bowel preparation with the goal of achieving preparations adequate for detection of lesions greater than 5 mm in size. The adequacy of bowel preparation should be assessed after efforts to clean the mucosa during examination have been completed. Furthermore, the guidelines state that patients found to have poor bowel preparation during colonoscopy should undergo repeat examination within 1 year.2 However, the guidelines do not provide direction in terms of how to optimize bowel preparation for patients with a history of poor bowel preparation or for those at high risk for poor bowel preparation.

Factors Related to Poor Colonoscopy Preparation
Identification of factors that could predict poor colonoscopy preparation would help target additional education or proactive interventions toward the appropriate population. Nguyen et al studied 300 consecutive patients who underwent screening colonoscopy and who were instructed to use a standard preparation of 2,000 mL of polyethylene glycol bowel preparation.6 Approximately 15% of patients had inadequate bowel preparation, and the majority of patients (n=45) with poor colonoscopy preparation (86.7%) reported either failure to complete the preparation or failure to follow written instructions concerning timing or dietary restrictions.6 Multivariate analysis showed the primary contributors to poor colonoscopy were single status, an interpreter requirement, Medicaid insurance, and having more than 8 active prescriptions.6

Additionally, Borg et al studied the adequacy of bowel preparation in 1,588 unique colonoscopy procedures at a tertiary referral center.7 The authors reported that body mass index (BMI) of at least 25 kg/m² was an independent predictor of inadequate bowel preparation.7 In fact, each unit increase in BMI increased the likelihood of an inadequate composite outcome score by 2.1%.7 In their review of bowel preparation failure, Romero et al found that patient-related factors, such as increased age, male gender, presence of a comorbidity (particularly diabetes mellitus, stroke, and dementia), and lower patient socioeconomic status, were associated with poor bowel preparation among adults undergoing routine outpatient colonoscopy.8 Procedure-related factors, such as poor adherence to bowel preparation instructions, erroneous timing of bowel purgative administration, and longer appointment waiting times for colonoscopy were associated with poor bowel preparation (Table).8 Lastly, Hassan et al studied 2,811 consecutive patients who underwent colonoscopy examinations. They determined that factors associated with inadequate bowel preparation included obesity (odds ratio [OR], 1.1), male gender (OR, 1.2), previous colorectal surgery (OR, 1.6), cirrhosis (OR, 5), Parkinson’s disease (OR, 3.2), and diabetes (OR, 1.8).9

Despite these data, however, no group yet has validated a predictive algorithm with high sensitivity and specificity for the identification of patients who would experience poor bowel preparation. For example, Hassan et al studied a predictive model that included older age, male gender, increased BMI, Parkinson’s disease, and previous colorectal surgery. Their algorithm for predicting a poor preparation was only 60% sensitivity, 59% specificity, 41% positive predictive value, and 76% negative predictive value for the prediction of patients who would experience poor preparation.9

Improving Bowel Preparation Quality
Although identification of patients who are at risk for poor-quality bowel preparation is an important step toward improving outcomes, a key question remains: What interventions might help improve the quality of bowel preparation in these patients? One important determinant of bowel preparation success is the type and degree of communication when instructing patients regarding a bowel preparation regimen.10 Patients should be instructed as to the clear relationship among compliance with the prescribed bowel preparation regimen, adequacy of bowel preparation, and the subsequent safety and efficacy of the colonoscopy procedure. Furthermore, each aspect of the bowel preparation, including timing, dietary restrictions (with specific examples), expected side effects, and office contacts in the event that the patient has questions, should be reviewed explicitly and in detail. All members of the clinical team and office staff, including nurses, medical assistants, and appointment scheduling, should be prepared to answer questions and guide patient efforts during clinical visits or when contacted by patients with questions or requests for guidance.

For today’s busy clinician, conveying this depth of information can be challenging. Durable educational materials and instructions with simple checklists can be useful. For example, a booklet produced by the University of California, Los Angeles and US Veterans Affairs health systems entitled “Preparing for Your Colonoscopy” provides detailed instructions with pictures, diagrams, and answers to common patient questions. The booklet also contains a

Figure 1. Colonic lesion detection rates according to preparation quality.

simple checklist detailing the steps patients should take the day before and the day of the scheduled colonoscopy.\textsuperscript{11} In a study of the effect of this booklet on the adequacy of bowel preparation, a “good” bowel preparation was achieved in 76% of patients who received standard counseling plus the booklet compared with 46% of patients who received standard counseling alone.\textsuperscript{12}

The American Gastroenterological Association also has produced a video that explains what patients can expect before, during, and after colonoscopy, including information regarding bowel preparation.\textsuperscript{13} The video can be viewed in the doctor’s office or at home via the Internet, and may be particularly helpful for patients with lower degrees of literacy.

Some patients who are provided a booklet or access to a video may not take advantage of this information, and thus may require additional motivation and reminders. Liu et al studied the effect of telephone-based re-education the day before colonoscopy. The telephone call included a review of the importance of bowel preparation and its directions for use and side effects, the proper food type to be eaten before the procedure, and the start time of the procedure. Patients in the control group received education and a booklet the day of the appointment only.\textsuperscript{14} Adequate bowel preparation was more common in the group that received the telephone-based education (81.6%) compared with those who received standard counseling and a booklet (70.3%).\textsuperscript{14}

Compliance and tolerability of the prescribed regimen also has a marked effect on the success of bowel preparation. The revised 2012 US Multi-Society Task Force Guidelines on Colorectal Cancer state that there is substantial evidence that splitting the dose of bowel preparation results in better quality, and they strongly encourage use of this strategy.\textsuperscript{5,15} Split-dosing preps might be associated with better compliance and increased tolerability and hence can improve the rate of successful bowel preparation (Figure 2).\textsuperscript{16}

**Conclusion**

Improving bowel preparation may lead to an increased ADR, decreased rate of complications, and decreased costs of care. Identification of patients who are at risk for poor bowel preparation and institution of intensive education are important, potenti ally preventative tactics to ensure bowel preparation quality improvement.

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**Table. Factors Predictive of Bowel Preparation Quality Independent of Colon-Cleansing Agent Used**

<table>
<thead>
<tr>
<th>Patient-Related Factors</th>
<th>Procedure-Related Factors</th>
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<tbody>
<tr>
<td>Age $&gt;65$ y</td>
<td>Bowel preparation instruction adherence</td>
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<tr>
<td>Male gender</td>
<td>Purgative administration timing</td>
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<tr>
<td>Presence of comorbidity: Dementia</td>
<td>Waiting time until appointment</td>
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<tr>
<td>Diabetes</td>
<td>Prior gastrointestinal and/or pelvic surgery</td>
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<tr>
<td>Inpatient status</td>
<td>Low socioeconomic status</td>
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**Figure 2. Adequacy of bowel preparation with a single-dosing (group A) versus split-dosing (group B) strategy.**


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**References**


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**Disclosures**

Dr. Cohen reported that he is a consultant for and has received speaker fees from Braintree and Salix.