The adenoma is the target lesion of screening colonoscopy. In fact, adenoma detection is thought to be the most important indicator of high-quality colonoscopy. This belief is based on data demonstrating that the adenoma detection rate (ADR) is a valid measure of the effectiveness of colonoscopy in colorectal cancer prevention. In a study of screening colonoscopy that used a high-quality national database, Kaminski et al. demonstrated that endoscopists with an ADR less than 20% were more likely to observe an interval cancer arise after screening colonoscopy than were endoscopists with an ADR of 20% or more. The wide variability in ADRs among endoscopists, as much as 10-fold, is proof that there is room for meaningful improvement in the performance of colonoscopy. For example, studies from diverse settings indicate that colonoscopy is less effective in the prevention of proximal cancers compared with distal cancers. Furthermore, although the mortality rate from colorectal cancer in the National Polyp Study was reduced by 53% during a median follow-up time of almost 16 years, 12 patients died of colorectal cancer while under surveillance. An improvement in our understanding of the reasons for such variance in ADRs should make possible further improvements in the quality and effectiveness of colonoscopy.

From an operational perspective, ADR may be affected by endoscopist-related, technical, and patient-related factors. A well-designed study from Berlin used a 2-level mixed linear model to more sharply define the characteristics that affect ADR. A total of 12,134 consecutive colonoscopies, performed by 21 experienced colonoscopists during an 18-month period, were prospectively assessed. Cecal intubation rates and the number of continuing medical education points were the only endoscopist-related variables that correlated with the ADR, whereas the annual volume of screening colonoscopies, withdrawal time, and lifetime experience performing colonoscopy did not correlate with the ADR. Relative to instrument technology, no difference in ADR was observed between the latest generation of instruments and those 1 generation removed, although the use of older colonoscopes did result in lower ADRs. Among patient-related variables, age, sex, and the quality of bowel preparation were significantly correlated with ADR.

The observation that polyp and adenoma detection are affected by the quality of bowel preparation comes as little surprise to most endoscopists. Two recent studies examined the effect of an inadequate bowel preparation on missed lesions. These investigators retrospectively analyzed the findings of repeated colonoscopies performed within 3 years of index examinations that were incomplete because of poor preparation. Lesions detected only during the second examination were deemed “missed lesions.” The per-patient rates of missed adenomas were 25% and 33%, respectively. More impressive, however, were the per-adenoma miss rates of 42% and 48%, respectively. Considering that nearly 1 in 4 colonoscopies have a bowel preparation that is adjudged to be inadequate, it is likely that many adenomas are missed because of poor-quality bowel preparation.

The concept of a split-dose bowel preparation was first proposed in the mid-1990s by Church, who questioned the time-tested tradition of completing the bowel preparation on the evening before examination and speculated that there is a window of time after gut lavage for optimal cleansing of the bowel. Today, there is considerable evidence that a split-dose preparation, with at least part of the preparation consumed within several hours of the examination, provides ideal bowel cleansing, especially within the proximal colon, where flat adenomas and serrated lesions are easily obscured by small amounts of residual debris. A meta-analysis of 5 randomized-controlled trials involving polyethylene glycol (PEG)-based preparations found that split dosing resulted in improved colon cleansing and patient satisfaction when compared with a preparation taken the day before examination. Additionally, several studies have demonstrated increased rates of detection for flat and neoplastic lesions with a split-dose regimen compared with the same purgative administered the day before colonoscopy (also described as a 1-day regimen). It remained unproven,
however, whether a split-dose regimen would improve ADRs compared with a standard bowel preparation.

Accordingly, in this month’s issue of Gastrointestinal Endoscopy, Gurundu et al. report the results of a retrospective analysis of an endoscopic database from an academic center that compared ADRs in 2 patient cohorts. Group 1, composed of 3560 patients, underwent colonoscopy after a 1-day bowel preparation during a 12-month period in 2009. Group 2 was composed of 1615 patients who received a split-dose bowel preparation and underwent colonoscopy during a 6-month period that ended in March 2011. It is noteworthy that the study periods were noncontemporaneous. Furthermore, although all patients received PEG lavage, some individuals within each group received 4 L of PEG solution, whereas others were given 2 L of PEG mixed with ascorbate and sodium sulfate (MoviPrep, Salix Pharmaceuticals, Morrisville, NC). Patients assigned to the 1-day arm were instructed to complete their preparation, either 4 L or 2 L of PEG, the evening before colonoscopy. Patients in the split-dose group drank part of their preparation, either 3 L or 1 L of PEG, starting at 6 PM the evening before examination and they completed the preparation at least 4 hours before the procedure. A total of 21 endoscopists performed examinations: 13 who were present for both study periods, 3 who participated only during period 1 (1-day preparation), and 5 who participated only during period 2 (split-dose preparation). High-definition colonoscopes were standard during all procedures, and most procedures were performed under moderate sedation.

The study’s primary endpoints were polyp detection rates and ADRs, and the secondary goals were quality of the preparation and cecal intubation rates. The results showed that the polyp detection rates (44.1% vs 49.5%, \( P < .001 \)) and ADR (26.7% vs 31.8%, \( P < .001 \)) were significantly greater during period 2 (split-dose) than during period 1 (1 day). Of the 13 endoscopists who were present for both study periods, the mean ADR improved from 26.6% to 32% (\( P < .001, \) odds ratio 1.3, 95% confidence interval 1.13-1.49) after the split-dose regimen was implemented, and 9 endoscopists showed an improvement in their individual ADR during the split-dose period. The overall bowel preparation quality as well as the cecal intubation rate improved after the introduction of a split-dose preparation.

Because this was a retrospective study, there are several limitations to the study’s findings. For instance, it is impossible to know whether the improvement in ADR between periods 1 and 2 might have resulted from an improvement in endoscopic skills, longer withdrawal times, greater awareness of flat and serrated lesions, or some combination of these factors. In addition, the turnover among participating endoscopists could have affected the observed ADRs. Although these and other issues require evaluation in subsequent studies, the study by Gurundu et al provides further proof of the benefits of split-dose bowel preparation.

Several investigators have attempted to quantify the ideal time interval between the last dose of purgative and the start of colonoscopy. In an observational study, the best bowel preparations were observed in study participants who consumed their second dose of preparation 3 to 5 hours before colonoscopy. Similar findings were observed in a prospective study that observed better-quality bowel preparations among those who began their preparation less than 7 hours and completed their preparation less than 4 hours before colonoscopy. On the basis of the findings of these and other published studies, it seems reasonable to conclude that the ideal window of opportunity for achieving an optimal bowel preparation is 4 to 7 hours before the start of examination.

Few important advances in the area of bowel preparation have occurred during the past 30 years. Arguably, the most notable advance was the development of an electrolyte-balanced lavage solution. The split-dose bowel regimen warrants recognition because it improves the quality of colonoscopy with little additional effort or expense. Some endoscopists have been reluctant to implement a split-dose regimen, however, because of concerns over patient tolerance, patient unwillingness to awaken at night to complete the preparation, long-distance traveling by patients between home and the endoscopy center, or preprocedure fasting guidelines. Randomized studies and a meta-analysis confirm that patient tolerance is greater with a split-dose regimen than with a 1-day regimen. Anecdotally, we have observed that compliance with a split-dose regimen is excellent when patients understand that its purpose is to improve the quality of examination. There will always be some patients who are unwilling to awaken from sleep to complete their preparation. In fact, 26% of patients assigned to the split-dose group in the study by Gurundu et al consumed their entire preparation the evening before the colonoscopy. As expected, the quality of the bowel preparation was significantly better in patients who completed the split-dose regimen than in patients who took the entire preparation the evening before examination. The best option for patients who are either unable or unwilling to complete a split-dose preparation during the night is to schedule them for afternoon colonoscopy. With regard to a split-dose bowel regimen and precolonoscopy fasting, the American Society of Anesthesiology guidelines stipulate that a patient must be fasting at least 2 hours for clear liquids. Consequently, patients should begin their second dose 4 to 7 hours before examination and should be fasting for at least 2 hours.

If your patients are like mine, you’re accustomed to hearing them ask, “If they can put a man on the moon, why can’t they make a better bowel preparation?” I usually respond by explaining that although preparations have improved, the changes may not be evident to them. The...
split-dose bowel regimen is a case in point. Although its importance pales by comparison with the legendary first walk on the moon by Neil Armstrong almost 50 years ago, the split-dose regimen represents a significant advance for colonoscopy and colon cancer prevention. The study by Gurundu et al\textsuperscript{11} confirms that shortening the “runway time” enhances adenoma detection, thereby reducing the risk of an interval carcinoma. The time has come for all endoscopists to assess the quality of their colonoscopies and to decide whether a split-dose bowel regimen might help to improve their ADRs.

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Abbreviations: ADR, adenoma detection rate; PEG, polyethylene glycol.

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