Improving measurement of the adenoma detection rate and adenoma per colonoscopy quality metric: the Indiana University experience

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Background: The adenoma detection rate (ADR) is a validated marker of colonoscopy quality. However, the optimal measurement method is unclear.

Objective: The aims of our study were to (1) define benchmarks for the number of adenomas per screening colonoscopy (APC) quality metric; (2) study the association between ADRs for screening, surveillance, and diagnostic indications; and (3) explore the association of the screening ADR with an overall ADR inclusive of all colonoscopy indications.

Design: Retrospective study.

Setting: University hospital and associated ambulatory surgery center endoscopy units.

Patients: Patients aged ≥50 years who underwent colonoscopy for screening, surveillance, or diagnostic indications by 20 endoscopists between January 1, 1999 and April 30, 2012.

Intervention: Colonoscopy.

Main Outcome Measurements: ADR, APC for screening, surveillance, and diagnostic indications.

Results: A total of 21,766 colonoscopies were included. The indication was screening in 7434 (34.2%), surveillance in 8338 (38.3%), and diagnostic in 5994 (27.5%). The screening ADRs and APCs were significantly correlated ($R = 0.91$; $P < .0001$). For men, an ADR of 25% corresponded to an APC of 0.46 (95% confidence interval [CI], 0.35-0.57); for women, an ADR of 15% corresponded to an APC of 0.20 (95% CI, 0.13-0.27). Overall, the ADR stratified by colonoscopy indication was highest for surveillance, followed by screening, then diagnostic. For men, a screening ADR of 25% corresponded to a surveillance ADR of 31.9% (95% CI, 24.8%-38.9%); for women, an ADR of 15% corresponded to a surveillance ADR of 24.3% (95% CI, 18.3%-30.5%). The corresponding diagnostic ADRs were 17.0% (95% CI, 12.4%-21.6%) and 15.4% (95% CI, 11.5%-19.3%), respectively. There was significant correlation between screening ADR and an overall ADR inclusive of all colonoscopy indications.

Limitations: External generalizability, retrospective design.

Conclusion: We propose minimum screening APC detection benchmarks of 0.50 for men and 0.20 for women. ADRs for screening, surveillance, and diagnostic colonoscopy are correlated and can be used to derive a simplified overall ADR inclusive of all colonoscopy indications. (Gastrointest Endosc 2014;79:448-54.)

(footnotes appear on last page of article)

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A fundamental goal of screening colonoscopy is colorectal cancer (CRC) prevention through the detection and removal of precancerous polyps, including adenomas. Several studies have shown a high degree of variability in adenoma detection between different endoscopists.[1-4] The adenoma detection rate (ADR), defined as the proportion of screening colonoscopies in which at least one

adenoma is found, is currently the prime surrogate measure of colonoscopy performance quality,[5] and minimum target detection rates in average-risk individuals are 25% for men and 15% for women.[5] The ADR is a validated predictor of the risk of interval CRC (CRC diagnosed within a few years after colonoscopy): a study based on the Polish CRC screening program showed that patients who underwent colonoscopy by endoscopists with ADRs of $<20\%$ had a 10-fold higher risk for interval CRC than patients whose endoscopists' ADRs were $\geq 20\%$.[6] Analysis of data from the Prostate, Lung, Colorectal, and Ovarian Cancer screening trial showed that adenoma detection is an independent predictor of the risk of distal interval CRC.[7] Although the ADR is a robust quality metric, several unanswered questions remain about the optimal method for measurement. One important concern is the ADR's potential for corruptibility: based on the metric's current definition, an endoscopist who routinely conducts a cursory examination of the colon after finding and removing the first adenoma ("one and done") could have the same ADR as an endoscopist who performs a thorough mucosal inspection and reliably finds and removes more than one adenoma, although it is intuitively obvious that the latter endoscopist's approach will more effectively prevent CRC. A recent study showed that the one and done approach is prevalent and that the standard ADR metric can mask significant variability in total adenoma detection between different endoscopists.[8] Measuring the mean number of adenomas per colonoscopy is thought to be less prone to corruption and to provide a more comprehensive assessment of quality.[9,10] However, the optimal benchmarks for this metric have not been defined. Another important issue with ADR is that the calculation is based on screening colonoscopies, and corresponding detection rates in surveillance and diagnostic examinations have not been well-defined. This is important for 2 reasons: First, the current restriction to screening colonoscopy may limit the uptake of the ADR because the process of deriving and calculating the metric for a subgroup of patients may be perceived as labor intensive. Second, knowledge of the expected ADR in defined non-screening groups and its relationship to the standard ADR might allow expansion of the ADR to include surveillance and diagnostic indications. Practically, this would simplify calculations as well as require a smaller number of patients in order to make an accurate ADR determination. The aims of our study were to (1) define benchmarks for the number of adenomas per screening colonoscopy quality metric; (2) study the correlation between ADRs for screening, surveillance, and diagnostic indications; and (3) explore the association of the screening ADR with an overall ADR inclusive of all colonoscopy indications.

Take-home message

- In this large study, the adenoma detection rate (ADR) and adenoma per colonoscopy (APC) quality metric were strongly correlated.
- The authors propose minimum screening APC detection benchmarks of 0.50 for men and 0.20 for women. ADRs for screening, surveillance, and diagnostic colonoscopy are correlated and can be used to derive a simplified overall ADR inclusive of all colonoscopy indications.

METHODS

The study was approved by the Institutional Review Board at Indiana University–Purdue University at Indianapolis. We conducted a retrospective review of a prospectively updated colonoscopy database maintained at Indiana University Hospital.[11] The database includes procedure indications, patient age and sex, polyp size, location of polyps within the colon, method of polyp removal, and histology. Reports on colonoscopies performed by 38 attending gastroenterologists at the endoscopy units of Indiana University Hospital and an associated ambulatory surgery center between January 1, 1999 and April 30, 2012 were reviewed. Colonoscopies performed on patients aged ≥ 50 years were included and were grouped based on indication in 3 major categories: screening (average-risk, asymptomatic, no first-degree relative with CRC), surveillance (postpolypectomy, post-cancer resection surveillance), and diagnostic (evaluation of symptoms, anemia, occult bleeding).

Colonoscopies performed on patients with inflammatory bowel disease, patients with personal or family histories of polyposis syndrome, and hospitalized patients were excluded. Endoscopists with <40 screening colonoscopies in the study time frame were excluded. The pathology examination of polyps was performed by board-certified pathologists at Indiana University. ADR was defined as the proportion of colonoscopies in which at least one adenoma was detected. The ADR calculation included advanced neoplasms (adenomas with villous histology, high-grade dysplasia, or adenocarcinoma). The mean number of adenomas per colonoscopy (APC) was defined as the total number of adenomas detected divided by the number of colonoscopies. Detection rates were derived overall, for individual endoscopists, and according to indication.

Statistical analysis

For the first study aim, linear regression was used to explore the association between APC and ADR and to estimate the mean APC rates corresponding to a screening ADR of 25% in men and 15% in women, respectively. For the second study aim, a generalized estimating equations model was fit to test for a difference in ADR between indications (screening, surveillance, diagnostic), adjusting for physician. The physician by indication interaction term was found to be not significant ($P = .24$) and was removed from the final model. Pair-wise comparisons that used the Hochberg step-up Bonferroni method for multiple comparisons were done to determine which indications