

Procedure Delays and Time of Day Are Not Associated With Reductions in Quality of Screening Colonoscopies

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Q3 BACKGROUND & AIMS:

There have been conflicting results from studies to determine whether factors unrelated to endoscopist skill, such as fatigue, affect the quality of screening colonoscopy. We studied the effects of human and system factors on screening colonoscopy withdrawal time and likelihood of detecting an adenoma in a large cohort of patients.

METHODS:

We performed a retrospective analysis of data on operational and quality improvements in colonoscopies performed at single academic medical center from November 2012 through February 2014. We collected data from the Northwestern Medicine Enterprise Data Warehouse on endoscopy procedure reports, patient demographics, and pathology reports of all patients undergoing endoscopy. We identified all screening colonoscopies during the study period and determined whether an adenoma was identified in each screening colonoscopy procedure. Our study included data from 7004 screening colonoscopies of patients 50–75 years old performed by endoscopists who performed at least 100 screening colonoscopies during the study period (n = 18).

RESULTS:

Approximately 27% of procedures began on time; the median colonoscope insertion time was 5.9 minutes (interquartile range, 4.0–8.6). In multivariable logistic regression analysis adjusting for covariates and endoscopist-level clustering, adenoma detection was not associated with procedure delay ($P = .48$), hour of day ($P = .40$), or performing the second of 2 colonoscopy blocks in 1 day ($P = .88$). Adenoma detection was associated with insertion time overall ($P = .006$), but there was no consistent directional relationship across insertion quintiles.

CONCLUSIONS:

Procedure delays and measured factors associated with fatigue, including time of day and multiple procedure blocks, do not reduce the odds of detecting an adenoma. Adenoma detection varies widely among providers, so efforts to improve adenoma detection should focus mainly on optimizing physician skill.

Keywords: Screening Colonoscopy; Quality; Fatigue; Delays.

Colonoscopy with removal of neoplastic lesions is associated with a reduction in colorectal cancer incidence and mortality.^{1,2} However, the magnitude of this cancer risk reduction varies by colonoscopy effectiveness, most frequently measured as the endoscopist adenoma detection rate (ADR).^{3,4} Efforts to improve physician ADR have largely focused on feedback in the form of report cards,⁵ novel technology,⁶ and endoscopist training or retraining.^{7,8} Comparatively little is known about other human and system factors that may impact colonoscopy effectiveness.

Several factors unrelated to endoscopist skill that are proposed to potentially impact the effectiveness of the screening colonoscopy include queue position,^{9–11} fatigue,¹² procedure delays,¹³ and prolonged insertion time.^{14,15} Available data are conflicting and limited by inclusion of few endoscopists and/or small patient

volume. Because endoscopist skill accounts for the majority of screening colonoscopy variability,^{5,16} most studies are unable to account for all other potential factors impacting colonoscopy quality. Thus, it remains unclear whether factors beyond endoscopist skill significantly impact screening colonoscopy quality.

This study was conducted to identify the impact of factors apart from endoscopist skill on screening colonoscopy withdrawal time and likelihood of detecting an adenoma in a large cohort of endoscopists and patients.

Abbreviations used in this paper: ADR, adenoma detection rate; CI, confidence interval; OR, odds ratio.

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We hypothesized that delays in procedure start time and colonoscopy insertion time would be associated with reduced colonoscopy quality, potentially because of the endoscopist trying to “catch up” by decreasing withdrawal time.

Methods

Study Design

This study was approved by the Northwestern University Institutional Review Board. This was a retrospective patient-level analysis of operational and quality improvement data at a single academic medical center during a 16-month time period (November 1, 2012–March 1, 2014).

Study Population

The Northwestern Medicine Enterprise Data Warehouse is a single, integrated database of clinical and research data from all patients receiving treatment through Northwestern University healthcare affiliates. The Enterprise Data Warehouse was used to integrate endoscopy procedure reports, patient demographics, and associated pathology reports of all patients undergoing endoscopy at our institution. We identified all screening colonoscopies, as determined by International Classification of Diseases, 9th Revision coding, during the study period and whether an adenoma was identified in each screening colonoscopy procedure. Only screening colonoscopies (ie, no documented history of colon neoplasia) in patients aged 50–75 years were selected for inclusion.

Only procedures performed by an endoscopist with a minimum of 100 screening colonoscopies during the study period were included. Only procedures performed by using moderate sedation, which represent >95% of procedures at our institution, were included for analysis. Incomplete colonoscopies (ie, not reaching the cecum) were excluded from analysis.

Measures

Procedure delay and insertion time were defined as categorical variables by using time data. A procedure delay was a priori defined as an endoscope insertion time >10 minutes after the scheduled start time; this was done to account for time needed to obtain patient consent and obtain adequate sedation. Insertion time was defined as the elapsed time from endoscope insertion to reaching the cecum. After linking administrative time stamp data on insertion time with scheduled start times, we stratified procedure delay in 15-minute increments (accounting for a 10-minute delay to obtain consent and begin sedation) up to 1 hour (no delay, >0–15, >15–30, >30–45, >45–60, and >60 minutes).

Cecal insertion times were empirically categorized as quintiles.

Other measures included bowel preparation quality, which was defined as high when the bowel preparation was described as “good” or “excellent” on the Aronchick scale or a Boston Bowel Preparation Scale score ≥ 6 . Hour of day (determined by the colonoscopy insertion time) was assessed as a continuous variable. On the basis of procedure start time, colonoscopies were also classified as either AM (commencing before 12 PM) or PM (commencing after 12 PM) blocks. We further assessed for potential cumulative fatigue from a full day of endoscopy through a binary (0/1) indicator of whether the procedure took place during a PM block after the physician had completed an AM block earlier that day. Demographic variables included patient age, sex, and race/ethnicity. Withdrawal time was defined as the time between reaching the cecum and removal of the colonoscope and was analyzed only in patients who did not have any pathology associated with the colonoscopy (ie, normal colonoscopies).

Statistical Analysis

We estimated a multivariable linear regression model, adjusting for covariates described above, to investigate differences in withdrawal times across categories of delay and insertion time. We also conducted a sensitivity analysis in which withdrawal time was modeled by using a log link to account for a right-skewed outcome distribution (ie, very high withdrawal times among outlier observations).

We investigated differences in adjusted odds of adenoma detection by estimating a multivariable logistic regression model. The model included both categorical key predictors (delay, insertion) and adjusted for other covariates described above.

Multilevel mixed-effects regression models tested for patient-level fixed effects and included endoscopist-level random effects to account for clustering of patients within endoscopists. Because delay and insertion time were both modeled as categorical variables, we used Wald tests to assess the overall statistical significance of these predictors. We used a 2-sided *P* value of .05 to determine statistical significance. Analyses were conducted by using Stata, version 12.1 (College Station, TX).

Results

Eighteen gastroenterologists in practice for a median of 19 years (range, 1–43 years) performed at least 100 screening colonoscopies during the study period. In total, 7004 screening colonoscopies were performed by these 18 endoscopists and included for analysis. The majority of patients were female (56.2%), with a median age of 57 years (interquartile range, 52–63) (Table 1). The quality of the bowel preparation was rated high in the majority

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