

## The impact of exclusion criteria on a physician's adenoma detection rate

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**Background:** The adenoma detection rate (ADR) is a validated and widely used measure of colonoscopy quality. There is uncertainty in the published literature as to which colonoscopy examinations should be excluded when measuring a physician's ADR.

**Objective:** To examine the impact of varying the colonoscopy exclusion criteria on physician ADR.

**Design:** We applied different exclusion criteria used in 30 previous studies to a dataset of endoscopy and pathology reports. Under each exclusion criterion, we calculated physician ADR.

**Setting:** A private practice colonoscopy center affiliated with the University of Illinois College of Medicine.

**Patients:** Data on 20,040 colonoscopy examinations performed by 11 gastroenterologists from July 2009 to May 2013 and associated pathology notes.

**Main Outcome Measurements:** ADRs across all colonoscopy examinations, each physician's ADR, and ADR ranking.

**Results:** There were 28 different exclusion criteria used when measuring the ADR. Each study used a different combination of these exclusion criteria. The proportion of all colonoscopy examinations in the dataset excluded under these combinations of exclusion criteria ranged from 0% to 92.2%. The mean ADR across all colonoscopy examinations was 39.1%. The change in mean ADR after applying the 28 exclusion criteria ranged from -5.5 to +3.0 percentage points. However, the exclusion criteria affected each physician's ADR relatively equally, and therefore physicians' rankings via the ADR were stable.

**Limitations:** ADR assessment was limited to a single private endoscopy center.

**Conclusion:** There is wide variation in the exclusion criteria used when measuring the ADR. Although these exclusion criteria can affect overall ADRs, the relative rankings of physicians by ADR were stable. A consensus definition of which exclusion criteria are applied when measuring ADR is needed. (*Gastrointest Endosc* 2015;82:668-75.)

In 2015, in almost 140,000 Americans, colorectal cancer (CRC), the second-leading cause of cancer mortality in the United States, will be diagnosed.<sup>1</sup> Effective screening can prevent a large proportion of CRC cases. Colonoscopy

is the most widely used screening modality in the United States,<sup>2</sup> but the effectiveness of colonoscopy is limited by variation in the quality of physician performance. Previous research has observed a two- to threefold

*Abbreviations:* ADR, adenoma detection rate; CI, confidence interval; CRC, colorectal cancer; NLP, Natural Language Processing.

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discrepancy in the adenoma detection rate (ADR) across physicians and an inverse relationship between ADR and the incidence of subsequent interval CRC.<sup>3,4</sup>

The ADR has become the primary measure of colonoscopy quality. Clinical experts<sup>5</sup> and the American Society for Gastrointestinal Endoscopy<sup>6</sup> have recommended that physicians regularly measure ADR. The Centers for Medicare and Medicaid Services<sup>7</sup> incorporated ADR, as measured by Gastrointestinal Quality Improvement Consortium,<sup>8</sup> as a quality measure for the 2014 Physician Quality Reporting System. Based on expert opinion, the American Society for Gastrointestinal Endoscopy/American College of Gastroenterology Taskforce on Quality in Endoscopy proposed that the minimum acceptable ADR is 25% or higher in men and 15% in women for healthy asymptomatic patients undergoing screening colonoscopy examinations.<sup>6</sup>

When measuring a physician's ADR, there is notable variation in which colonoscopy examinations are included and excluded. Because the proposed minimum standards for the ADR focus on the first-time screening ADR, some studies exclude nonscreening colonoscopy examinations such as surveillance studies, diagnostic colonoscopy examinations (eg, those done for GI bleeding), or colonoscopy examinations performed on patients whose age is outside the typical range for CRC screening.<sup>6,9,10</sup> Other studies omit incomplete cases (eg, inadequate preparation).<sup>10-12</sup> Exclusion criteria have also been used to address differences in patient populations across physicians. For example, some physicians specialize in the care of inflammatory bowel disease, and some studies exclude colonoscopy examinations of patients with inflammatory bowel disease to allow for a more homogeneous comparison across physicians.<sup>11,13,14</sup>

The aim of this study was to explore the effect of various exclusion criteria on physician ADR. We first surveyed the literature to identify previously used exclusion criteria. We then applied each of these exclusion criteria to a dataset of approximately 20,000 colonoscopy reports from 11 gastroenterologists at a private endoscopy center and assessed the following: (1) what proportion of colonoscopy examinations were excluded, (2) the change in overall ADR across all physicians, and (3) the relative physician ranking by ADR.

## METHODS

### Identifying different definitions of denominator for ADR

Previous work has used various combinations or sets of exclusion criteria to evaluate physician ADR. To identify commonly used exclusion criteria, we identified a convenience sample of previous studies; we did not think that it was critical to identify every study that uses the ADR because our goal was to illustrate the impact of common exclusion criteria on the ADR. Given their importance for quality measurement, we did include the ADR definitions used by

Gastrointestinal Quality Improvement Consor<sup>15</sup> and the American Gastroenterological Association. In total, we examined the exclusion criteria used in 30 previous studies.

We categorized the exclusion criteria by age, previous colonoscopy, incomplete colonoscopy, and indication. Indications were categorized as routine screening, high-risk screening (defined as family history, history of polyposis), surveillance procedures, and diagnostic procedures (defined as cases in which the patient had any symptoms reported, including cases in which screening or surveillance was another indication).

### Setting

We applied the various exclusion criteria used in the literature to data from the Central Illinois Endoscopy Center, which is a private endoscopy center with 11 gastroenterologists in Peoria, Illinois and affiliated with the University of Illinois College of Medicine at Peoria. All 11 gastroenterologists are generalists who do not subspecialize. We obtained all 20,040 colonoscopy and associated pathology reports from colonoscopy examinations performed between July 2009 and May 2013 at the endoscopy center. July 2009 was the earliest date available because this was when a new electronic health record was introduced. The reports were a combination of structured data and free text. Inpatient colonoscopy examinations were not included because they were not captured in the electronic health record.

### Abstracting relevant information from colonoscopy and pathology reports

Relevant data from the reports were abstracted by using the previously developed Natural Language Processing (NLP) software application.<sup>15</sup> Details of the development and testing of this tool are reported elsewhere.<sup>15,16</sup> In brief, NLP is a field of computer science in which a computer "reads" unstructured text to extract relevant data. The accuracy of the NLP program was confirmed by comparing the ADRs in 453 colonoscopy and associated pathology reports that were analyzed by the NLP program and manually abstracted by physicians.<sup>15</sup>

The NLP program extracted the following variables from each colonoscopy report: patient age, family history of colon cancer, documentation of whether the cecum was reached, documentation of whether there was a previous colonoscopy and the timing of any previous colonoscopy, and indication for procedure (as many as 3). From the pathology reports, the NLP program identified whether an adenoma was reported.

### Analyses

For each exclusion criterion, we calculated the proportion of cases in the Central Illinois Endoscopy Center reports that would be excluded and the average ADR among the excluded cases and the remaining cases. We assessed what proportion of colonoscopy examinations were excluded because it is important from a statistical

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