Screening for Colorectal Cancer

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Table 2. Sensitivity of One-Time Colorectal-Cancer Screening Tests.

Test	Sensitivity		References
	Cancer	Advanced Adenomas*	
	percent		
Stool-based tests			
Standard guaiac fecal occult-blood test (three stool samples)	33–50	11	Mandel et al.,[13] Hardcastle et al.,[14] Kronborg et al.,[15] Imperiale et al.,[16] Ahlquist et al.[17]
Sensitive guaiac fecal occult-blood test (three stool samples)	50–75	20–25	Levin et al.,[2] Whitlock et al.,[4] Ahlquist et al.,[17] Allison et al.[18]
Immunochemical fecal occult-blood test (one–three stool samples)	60–85	20–50	Levin et al.,[2] Whitlock et al.[4]
Old stool DNA test (one stool sample)	51	18	Imperiale et al.[16]
New stool DNA test (one stool sample)	≥80	40	Allison et al.,[18] Itzkowitz et al.[19]
Structural examinations of the colon			
CT colonography	Uncertain; probably >90	90 (if ≥10 mm in diameter)	Johnson et al.[20]
Sigmoidoscopy	>95 (in the distal colon)	70†	Selby et al.,[21] Lieberman et al.[22]
Colonoscopy	>95	88–98	Lieberman et al.,[22] Imperiale et al.,[23] Schoenfeld et al.,[24] Lieberman et al.,[25] Pickhardt et al.,[26] Cotton et al.,[27] Rockey et al.[28]

Colonoscopy

- Lesions that are 10 mm or larger in diameter may be missed in 2 to 12% of patients, and he detection of flat adenomas is especially difficult.

- When colonoscopy is performed by a trained endoscopist, the risk of serious adverse events is 3-5 :1000

- With advancing age and coexisting conditions, the risks associated with colonoscopy increase and the benefit diminishes

Quality Indicators for Colonoscopy and the Risk of Interval Cancer

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Background

- The miss rate of colonoscopy for cancers and adenomatous polyps remains a concern.

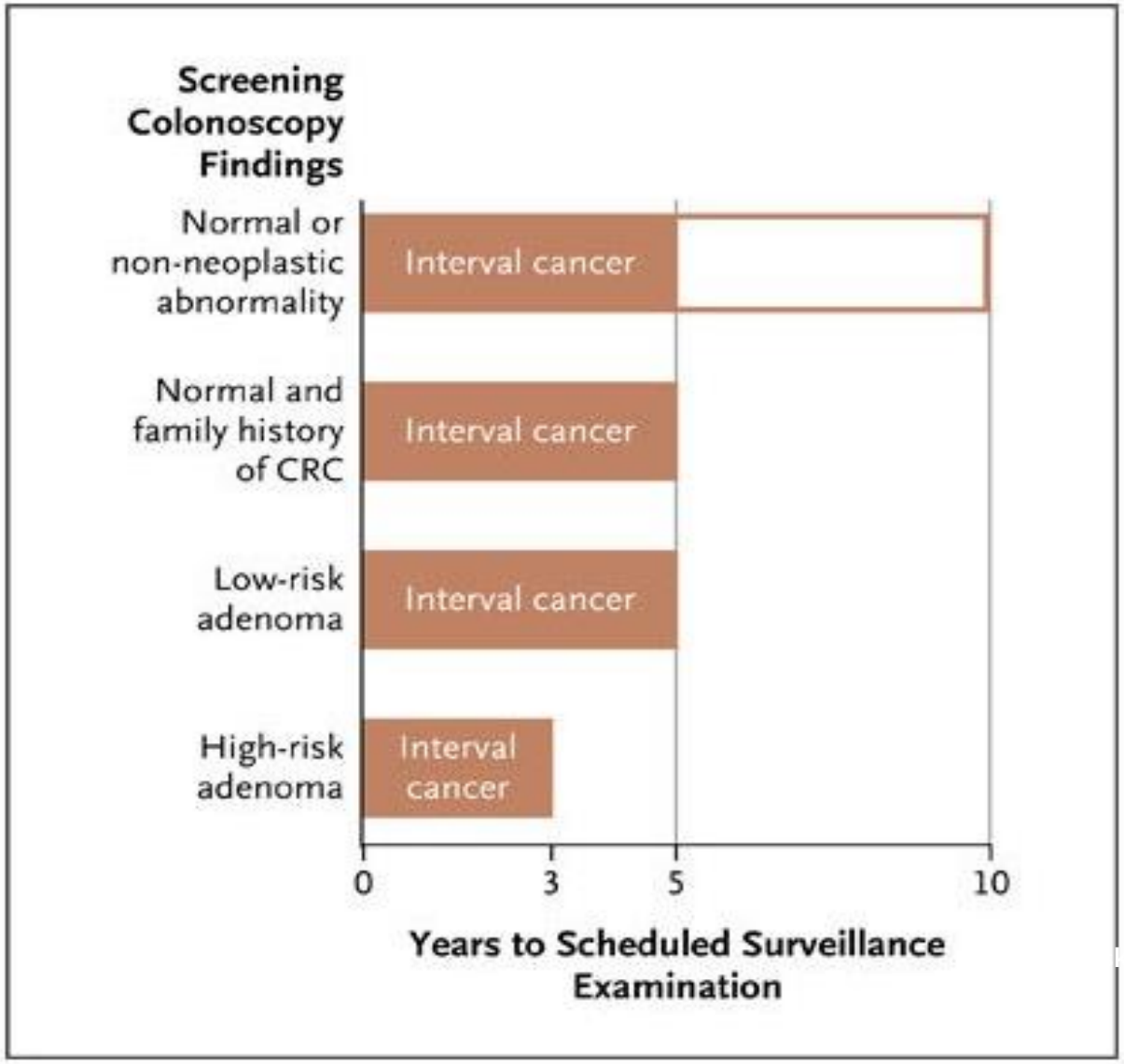
- The most commonly used quality-assessment indicators are the rates of **adenoma detection** and **cecal intubation**.

- It is not known whether these measurements improve screening efficacy

Methods

- 50,148 subjects
- Age 40 - 66 years
- Quality indicators for colonoscopy- **rates of adenoma detection and cecal intubation.**
- **Interval cancer** - colorectal adenocarcinoma that was diagnosed between the time of screening colonoscopy and the scheduled time of surveillance colonoscopy,
- Cancer was considered interval only when the involved bowel segment was visualized at the screening colonoscopy and bowel preparation was adequate.

Intervals between Screening Colonoscopy and Scheduled Surveillance Examination, as Recommended by the U.S. Multisociety Task Force on Colorectal Cancer and the American Cancer Society



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Methods

- **Adenoma detection rate** - proportion of screened subjects in whom at least one adenomatous lesion was identified

- **Cecal intubation** - the passage of the colonoscope tip to a point proximal to the ileocecal valve and visualization of the entire cecum. The examination was considered to be complete when identification of cecal landmarks or intubation of the terminal ileum was recorded by the endoscopist in the colonoscopy report.

Methods (cont.)

- Statistical Analysis- use of a multivariate Cox proportional hazards regression model to assess the influence of the quality measurements for each endoscopist on the risk of interval cancer.
- The following variables were included in the model: adenoma detection, cecal intubation rate, sex of patient, age of patient, family history of CRC, sex of the endoscopist, age of the endoscopist, and specialty of the endoscopist (gastroenterology, internal medicine or no specialty, or surgery of any kind).
- A P value of less than 0.05 was considered to indicate statistical significance.

Results

Excluding criteria:

- Inadequate bowel preparation
- Detection of CRC on screening
- A screening colonoscopy performed by an endoscopist who registered fewer than 30 examinations with the screening

- The remaining 45,026 subjects were followed in cancer registries for a median of 52.1 months for the occurrence of interval cancer

Results – Interval Colorectal Cancers

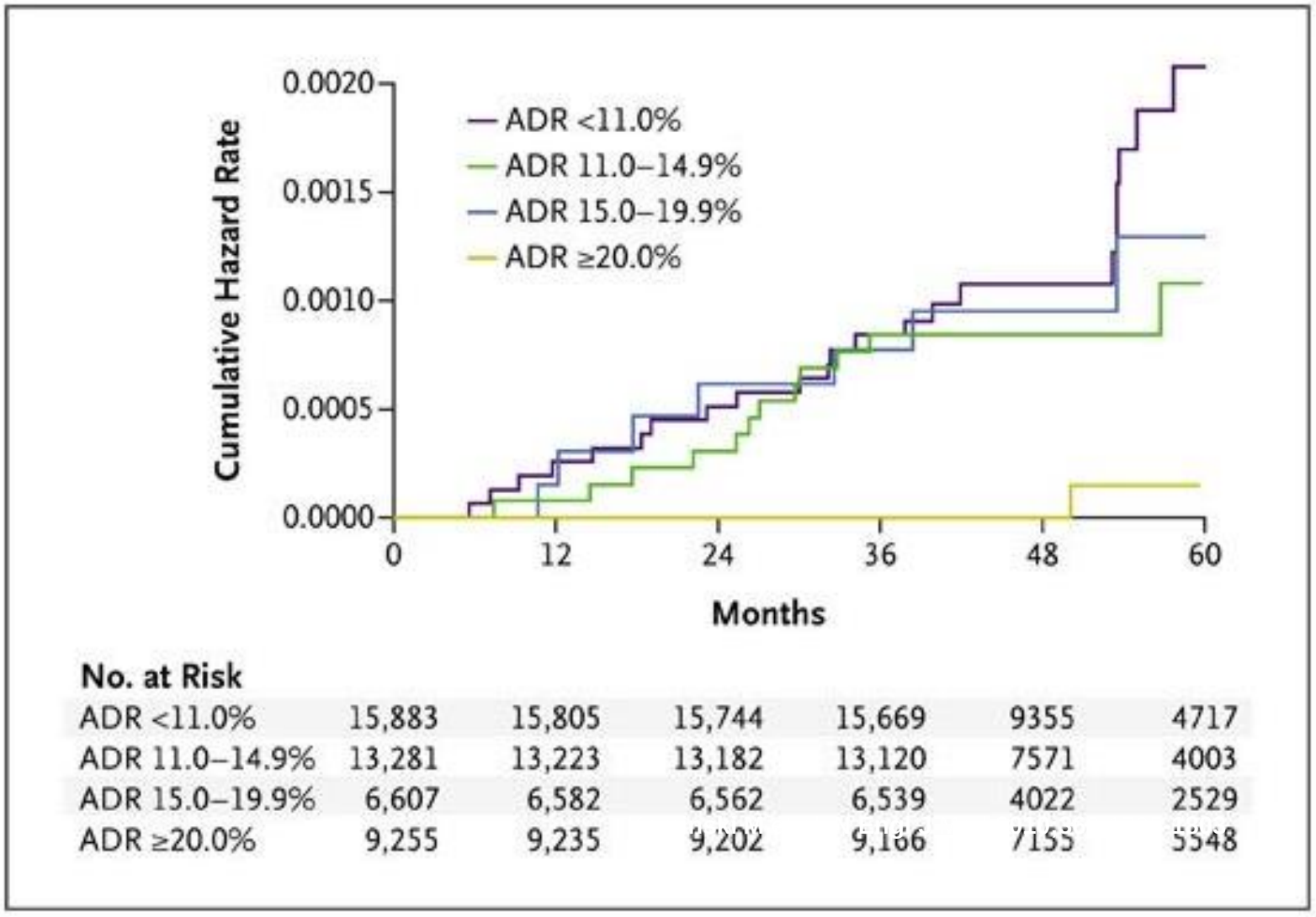
- A total of 42 interval colorectal cancers were identified
- In only one subject (2.4%) could the interval cancer be attributed to an ineffective polypectomy
- The number of cases that were linked to individual endoscopists was 0 for 154 endoscopists, 1 for 25 endoscopists, 2 for 4 endoscopists, and 3 for 3 endoscopists
- Altogether, 186 endoscopists contributed cases to the program database.
- The median adenoma detection rate was 12.2%, and the median cecal intubation rate was 93.8%

Table 2. Characteristics of 186 Endoscopists, According to the Adenoma Detection Rate.*

Characteristic	Adenoma Detection Rate				
	<11.0%	11.0 to 14.9%	15.0 to 19.9%	≥20.0%	Total
Colonoscopists — no. (%)	80 (43.0)	46 (24.7)	34 (18.3)	26 (14.0)	186 (100.0)
No. of colonoscopies included in study					
Median (interquartile range)	130 (54–230)	161 (98–304)	125 (98–194)	178 (112–654)	145 (80–262)
Range	30–1824	34–1848	35–1589	32–1737	30–1848
Person-years of follow-up — no.	65,528	54,339	27,490	41,431	188,788
Mean age in 2000 (±SD) — yr	43.8±7.6	41.0±6.0	40.8±5.9	40.3±5.0	42.1±6.7
Male sex — no. (%)	65 (81.2)	38 (82.6)	27 (79.4)	19 (73.1)	149 (80.1)
Screening centers — no.†	35	28	18	12	45
Rate of cecal intubation — %					
Median (interquartile range)	91 (84–95)	94 (88–96)	94 (91–96)	95 (92–98)	94 (88–96)
Range	55–100	52–100	60–98	85–100	52–100
Complete colonoscopies — no./total no. (%)	14,273/15,883 (89.9)	12,129/13,281 (91.3)	6,249/6,607 (94.6)	8,901/9,255 (96.2)	41,552/45,026 (92.3)
Colonoscopic experience — no. (%)‡					
<5 yr	18 (22.5)	13 (28.3)	16 (47.1)	12 (46.2)	59 (31.7)
5–10 yr	20 (25.0)	17 (37.0)	7 (20.6)	6 (23.1)	50 (26.9)
>10 yr	30 (37.5)	14 (30.4)	8 (23.5)	5 (19.2)	57 (30.6)
Unknown	12 (15.0)	2 (4.3)	3 (8.8)	3 (11.5)	20 (10.8)
Specialty — no. (%)					
Gastroenterology	22 (27.5)	17 (37.0)	14 (41.2)	14 (53.8)	67 (36.0)
Internal medicine or no specialty	24 (30.0)	14 (30.4)	8 (23.5)	6 (23.1)	52 (28.0)
Surgery	34 (42.5)	15 (32.6)	12 (35.3)	6 (23.1)	67 (36.0)
No. of interval cancers/100,000 person-yr of follow-up	33.6	22.1	25.5	2.4	22.3

* Plus–minus values are means ±SD. Because of rounding, percentages may not total 100.
† The numbers of centers do not total 45 because endoscopists at each center had multiple rates of adenoma detection.
‡ The years of colonoscopic experience for endoscopists were not included in the multivariate analysis because of the lack of prospectively collected complete data.

Cumulative Hazard Rates for Interval CRC, According to the Endoscopist's Adenoma Detection Rate (ADR)



No. at Risk						
ADR <11.0%	15,883	15,805	15,744	15,669	9355	4717
ADR 11.0–14.9%	13,281	13,223	13,182	13,120	7571	4003
ADR 15.0–19.9%	6,607	6,582	6,562	6,539	4022	2529
ADR ≥20.0%	9,255	9,235	9,202	9,166	7155	5548

Results

Two independent risk factors for interval CRC were identified:

- The endoscopist's rate of adenoma detection (P=0.008)
- The subject's age (P=0.005)

- The rate of cecal intubation ***was not*** significantly associated with the risk of interval colorectal cancer (P=0.50).

Discussion

- A widely recommended quality indicator for screening colonoscopy (the endoscopist's rate of adenoma detection) was significantly associated with the risk of interval cancer
- A second widely recommended quality indicator, the cecal intubation rate, was not associated with the risk of interval cancer
- Risk factor for interval cancer in the entire colon vs. the right colon only.
- Only one interval cancer (2.4%) was attributed to an ineffective polypectomy, whereas two previous studies have suggested that ineffective polypectomy may account for 25% of interval cancers

Discussion

- On the basis of the prevalence of adenomas and cecal intubation rates in studies of screening colonoscopy in the United States, threshold values for rates of adenoma detection (15% among women and 25% among men 50 years old) and cecal intubation (95% for both sexes) have been proposed.

- Although the presented study was not designed to determine the threshold for the adenoma detection rate, the 20% value that emerged from the analysis (for both sexes combined) is close to these recommendations.

Accuracy of CT Colonography for Detection of Large Adenomas and Cancers

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Background

Computed tomographic (CT) colonography: a minimally invasive, structural evaluation of the entire colorectum

Advantages of CT colonography over other screening tests for colorectal cancer:

- rapid imaging of the entire colorectum
- a relatively noninvasive technique, with no need for sedation
- a low risk of procedure-related complications

Aims

- The degree to which CT colonography is effective in detecting asymptomatic colorectal lesions remains a controversial topic

- The National CT Colonography Trial of the American College of Radiology Imaging Network was designed **to assess the accuracy of CT colonography in detecting histologically confirmed, large colorectal adenomas and cancers** (10 mm in diameter)

Methods

Radiologist Training

- Of 20 radiologists who met the initial entry criteria, the 15 with the highest scores on the qualifying examination were subsequently invited to participate in the study

CT Colonography

- For each abnormality, the location and size were noted, as well as the radiologist's degree of confidence that the lesion was a polyp. They were instructed to record only lesions measuring 5 mm or more in diameter (the prevalence of advanced histologic features is below 2% in smaller lesions)

Methods

Colonoscopy

- Same-day CT colonographic and colonoscopic examinations were performed for 2512 of 2531 (99%) participants.
- For cases in which lesions that were 10 mm or more in diameter were detected on CT colonography but not on colonoscopy, patients were advised to undergo an additional colonoscopic examination within 90 days.

Histologic Review and Lesion Matching

- Tissue samples from all lesions measuring 5 mm or more were centrally reviewed an experienced gastrointestinal pathologist

Methods

- Total number of participants enrolled – 2600
- The majority of the participants (89%) had no known risk factors for colorectal cancer other than age
- 235 participants (9%) had a first-degree relative with a history of colorectal polyps or cancer
- 34 participants (1%) had a personal history of polyps or cancer

Results

For 10% of patients with one or more large lesions detected by colonoscopy, CT colonography did not detect a large lesion

Results

- The mean (±SD) sensitivity, specificity, positive predictive value, negative predictive value **for lesions measuring 10 mm or more** were 0.90±0.031, 0.86±0.022, 0.23±0.020, 0.99±0.002, respectively

- The sensitivity for the detection of adenomas or cancers greater than or equal to 5 mm, 6 mm, 7 mm, 8 mm, and 9 mm was 0.65, 0.78, 0.84, 0.87, and 0.90, respectively, with specificity ranging from 0.86 to 0.89.

Results

Imaging

- The pooled sensitivities for detecting large lesions with the use of primary two-dimensional conventional software and primary three-dimensional endoluminal fly-through software were similar

Extracolonic Findings

- Extracolonic findings were observed in 66% of the participants; however, only 16% were deemed to require either additional evaluation or urgent care.

Discussion

- According to the reference standard, the overall prevalence of large adenomas and cancers in this population was 4%.
- If all patients with a lesion measuring 5 mm or more on CT colonography were to be referred for colonoscopy, the colonoscopy-referral rate, based on our results, would be 17%.
- If a 6-mm threshold were used instead, the referral rate would drop to 12%.

Discussion

- Despite the consensus opinion that colorectal cancer screening is effective, adherence to current guidelines remains low among adults eligible for screening.

- The less invasive nature of CT colonography and the low risk of procedure-related complications, as compared with colonoscopy, may be attractive to patients and may improve screening-adherence rates

Thank you!

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