Predicting Advanced Proximal Colonic Neoplasia With Screening Sigmoidoscopy

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**Context**  Indications are not well defined for follow-up colonoscopy for all patients with distal colonic tubular adenomas (TAs) found at screening sigmoidoscopy.

**Objective**  To determine whether distal adenoma size, number, and villous histology, along with family history and age, are predictors of advanced proximal colonic neoplasia.

**Design**  Cross-sectional analysis conducted between January 1, 1994, and December 31, 1995.

**Setting**  Large group-model health maintenance organization in northern California.

**Patients**  A total of 2972 asymptomatic subjects aged 50 years or older undergoing colonoscopy as follow-up to a screening sigmoidoscopy.

**Main Outcome Measure**  Based on sigmoidoscopy, colonoscopy, and pathology reports, occurrence of advanced proximal neoplasia, defined as adenocarcinoma or TAs 1 cm or larger or with villous features or severe dysplasia located beyond sigmoidoscopic view.

**Results**  The prevalence of advanced proximal neoplasia was similar among patients with no TAs at sigmoidoscopy, those with TAs less than 1 cm in diameter, and those with TAs 1 cm in diameter or larger (prevalence, 5.3%, 5.5%, and 5.6%, respectively). Of patients with a distal tubulovillous or villous adenoma, 12.1% had advanced proximal neoplasia. In multivariate analyses, having a distal tubulovillous adenoma or villous adenoma was the strongest predictor of advanced proximal neoplasia (odds ratio, 2.30; 95% confidence interval, 1.69-3.14). Age of 65 years or older, having more than 1 adenoma, and a positive family history of colorectal cancer were also significant predictors. Distal adenoma size was not a significant predictor in any multivariate analyses.

**Conclusions**  Advanced proximal neoplasia is uncommon in subjects with or without distal TAs, but subjects with advanced distal histology and those older than 65 years are at increased risk. Age-specific screening using sigmoidoscopy starting at ages 50 to 55 years and colonoscopy after age 65 years may be justified.

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Figure 1. Colorectal Cancer Prevention Program Protocol for Average-Risk Subjects

- 60-cm Screening Flexible Sigmoidoscopy for Average-Risk Persons Beginning at Age 50 Years
- At Least 1 Polyp Identified
- Single Tiny Polyp (≤5 mm)
- Single Small Polyp (6-9 mm)
- Single Large Polyp (≥1 cm or ≥1 Polyp)
- Hyperplastic Polypectomy at Sigmoidoscopy
- TA and First-Degree Relative With CRC
- TA, VA, or SD
- Polypectomy at Colonoscopy
- Single Tiny Polyp
- Single Small Polyp
- Single Large Polyp
- Sigmoidoscopy in 5 Years
- Sigmoidoscopy in 10 Years
- No Polyps Identified

TA indicates tubular adenoma; VA, villous adenoma; SD, adenoma with severe dysplasia; and CRC, colorectal cancer. A hyperplastic polyp was considered a negative finding. Reprinted from HMO Practice, volume 11, number 1, by special permission 14. Copyright 1997 by The HMO Group.

**METHODS**

**Setting**

The features of the CoCaP protocol have been described elsewhere and are shown in Figure 1. Screening sigmoidoscopies are available to all Kaiser Foundation Health Plan members in northern California as part of routine medical care. Primary care physicians usually refer patients for sigmoidoscopy, but gastroenterologists or nurses practicing under their supervision perform most of the examinations. The guideline recommends screening sigmoidoscopy for all average-risk Kaiser Foundation Health Plan members aged 50 years or older at least once every 10 years. Patients with inflammatory bowel disease, a history of colorectal adenomas or cancer, a family history of a polyposis syndrome or nonpolyposis colorectal cancer, a single first-degree relative with colorectal cancer diagnosed at age 55 years or younger, or more than 1 first-degree relative with colorectal cancer were classified as high risk. High-risk patients are usually referred for colonoscopy and, therefore, were not included in the present analyses.

**Data Sources**

Standardized sigmoidoscopy and colonoscopy reports from each Northern California Kaiser Permanente facility are routinely entered into a computer database. Pathology reports are collected for all lesions suspected to be polyps or cancer, and histological diagnoses are coded, entered into the database, and linked to specific polyps when multiple lesions are found. An experienced pathologist serves as pathology coordinator for the program and resolves any problems with histological classification of polyps. Formal presentation was made to the chiefs of pathology from each Kaiser Permanente medical center prior to the commencement of the program, reviewing the World Health Organization criteria for the classification of tumors of the large intestine. Copies of the criteria were also distributed to each pathology department.

**Definition of Screening Examinations and Categorization of Sigmoidoscopy Findings**

A screening examination was defined according to the endoscopist’s assessment of the reason for the sigmoidoscopy (recorded as either “screening” or “consult/diagnostic”). When no endoscopist assignment was available (4.2% of all cases classified as “screening”), patient self-report of symptoms was used to identify screening examinations. Only patients aged 50 years or older, at average risk for colorectal cancer, and who received a screening sigmoidoscopy were included in this study. Distal neoplasms were defined as all neoplasms found on sigmoidoscopy (74.9%) and lesions found on colonoscopy within the reach of the index sigmoidoscopy (6.2%). For patients in whom the depth of insertion on the index sigmoidoscopy was not noted or was less than 40 cm, lesions at a depth of insertion of 60 cm or less at colonoscopy (1.9%) and lesions reported as being in the rectum or sigmoid colon when only the colon segment was noted (17.1%) were also classified as distal. All other lesions found at colonoscopy were classified as proximal. Advanced neoplasms were defined as adenocarcinoma, adenomas larger than 1 cm, adenomas with villous features, or severe dysplasia. The endoscopist recorded polyp size at the time of the procedure, using the open biopsy forceps method. For this study, a positive family history was defined as a single first-degree relative with colorectal cancer who was older than 55 years (or of unknown age) at the time of diagnosis. Patients with higher-risk family histories were excluded from this analysis.

Between January 1, 1994, and December 31, 1995, a total of 118,567 sigmoidoscopies were performed in the Northern California Kaiser Permanente Medical Care Program; 72,366 (61%) of these were performed in patients aged 50 years or older and were classified as screening examinations. Excluded from our analysis were 1,195 screening examinations (1.7%) performed in patients reporting a high-risk family history and 6,251 screening examinations (8.6%) performed in patients with a history of polyps or cancer. Of the remaining 64,920 patients having sigmoidoscopy, the size of the distal TA could not be evaluated in 15 because of incom-
plete data, and complete pathology results were unavailable in 409. An additional 292 patients with distal adenocarcinoma, adenoma with severe dysplasia, or distal nonadenocarcinoma malignancy were excluded from all analyses because there is little doubt that such patients require complete colonic evaluation to exclude synchronous proximal malignancy. The total number of included subjects was 64,204.

Several patients were identified who received a colonoscopy within 6 months following a sigmoidoscopy despite lack of a CoCap protocol indication. These included 767 patients with no distal adenomas and 178 with only a single TA less than 6 mm in diameter and no family history of colorectal cancer. Records were reviewed for each of these patients to determine whether symptoms developing after the sigmoidoscopy led to the colonoscopy. In 76 patients, the indication for the colonoscopy was unclear following record review, and 207 patients had developed new symptoms. These 283 patients were excluded from all analyses. In the remaining 544 subjects without a distal adenoma and 118 subjects with only a 5-mm or smaller adenoma and a negative family history, no colonoscopy indication other than the sigmoidoscopy findings could be found. For subjects without adenomas, colonoscopy was frequently ordered to complete removal of lesions left in place at sigmoidoscopy. These lesions proved not to be adenomas on histological examination, and 280 (51.5%) were hyperplastic.

**Statistical Analysis**

The prevalence of advanced proximal neoplasia is described as a proportion, with 95% confidence interval, for each category of distal adenoma. The following set of predictors was used for both the univariate and multivariate analyses: number of adenomas found (0, 1, or >1), size of adenomas found (no adenomas, <1 cm, or ≥1 cm), histology of adenomas (no adenomas, TA, or adenoma with villous features), age in years, sex, and family history of colorectal cancer (yes or no). Univariate logistic regression models were fit to evaluate each variable individually. A multivariate logistic regression model was built, excluding subjects without distal adenomas, with the same variables as the univariate analysis. The results of the logistic regression are reported as odds ratios (ORs), which provide good approximations of relative risk, since the proportion with advanced proximal neoplasia is low. We also performed a recursive-partitioning analysis of predictor variables using Classification and Regression Tree (CART) software. This method creates a classification tree for the outcome of advanced proximal neoplasia using the predictor variables described herein. Beginning with the entire sample, the CART program identifies the predictor variable and, for continuous variables, the cut point that best separates the sample into 2 subgroups. The decision is made using the Gini criterion, a measure of variability within the new subgroups. Each resulting subgroup is evaluated to determine if splitting it into 2 or more subgroups based on another variable (or a different level of a continuous variable) would produce more homogeneous subgroups. This procedure may result in an overfitted model. The trees are pruned back, using standard methods. The proportion of subjects having an advanced proximal neoplasm is reported in each node of the tree.

**RESULTS**

**Study Population**

Nearly half of the study subjects were women and nearly half were between ages 50 and 60 years (Table 1). Approximately 8% had a positive family history of colorectal cancer and 83 with 1 first-degree relative diagnosed as having colorectal cancer at age 55 years or older. According to the Colorectal Cancer Prevention Program protocol, follow-up colonoscopy is indicated for patients with adenomas of any size who have a positive family history.

<table>
<thead>
<tr>
<th>Follow-up Colonoscopy Within 6 Months, No. (%)</th>
<th>Distal Findings at Screening Sigmoidoscopy</th>
</tr>
</thead>
<tbody>
<tr>
<td>No adenoma</td>
<td>58,724 (81.5)</td>
</tr>
<tr>
<td>Single tubular adenoma ≤5 mm in diameter</td>
<td>2,414 (3.8)</td>
</tr>
<tr>
<td>Positive family history†</td>
<td>193 (0.3)</td>
</tr>
<tr>
<td>Negative family history</td>
<td>2,221 (3.5)</td>
</tr>
<tr>
<td>Single tubular adenoma 6-9 mm in diameter‡</td>
<td>687 (1.1)</td>
</tr>
<tr>
<td>Positive family history†</td>
<td>58 (0.1)</td>
</tr>
<tr>
<td>Negative family history</td>
<td>629 (1.0)</td>
</tr>
<tr>
<td>Multiple adenomas or advanced adenoma§</td>
<td>2,379 (3.7)</td>
</tr>
<tr>
<td>Total</td>
<td>64,204</td>
</tr>
</tbody>
</table>

*The 544 subjects receiving colonoscopy in the “no adenoma” comparison group included 481 without a family history of colorectal cancer and 63 with 1 first-degree relative diagnosed as having colorectal cancer at age 55 years or older.
†Positive family history is limited to subjects with 1 affected first-degree relative with colorectal cancer who was older than 55 years at the time of diagnosis.
‡The Colorectal Cancer Prevention Program protocol allows for physician discretion in the decision to perform a follow-up colonoscopy in patients with a 6- to 9-mm tubular adenoma found at sigmoidoscopy.
§The multiple adenomas or advanced adenoma group included 315 patients with 2 or more adenomas, the largest being 5 mm; 227 with 2 or more tubular adenomas, the largest being 6 to 9 mm; 917 with 1 or more tubular adenoma 1 cm or larger in size; 847 with at least 1 tubulovillous adenoma of any size; and 73 with at least 1 villous adenoma of any size.
history of colorectal cancer and 23% reported a prior negative sigmoidoscopy or colonoscopy finding. Almost half of the 687 subjects with a distal TA between 6 and 9 cm in diameter had a colorectal adenoma. Of patients with other guideline indications for colonoscopy, 83.5% received a colonoscopy within 6 months (Table 2).

Using multivariate logistic regression, age, sex, and family history were evaluated as predictors of receiving follow-up colonoscopy. After adjustment for distal findings, women were somewhat less likely than men to receive a follow-up colonoscopy (OR, 0.69), and subjects older than 80 years were slightly more likely to receive a follow-up colonoscopy (OR, 1.2). Subjects with a family history of colorectal cancer were approximately twice as likely to receive a follow-up colonoscopy (OR, 2.2), consistent with our protocol.

### Prevalence of Advanced Proximal Neoplasia

In patients who went on to have a colonoscopy, proximal advanced adenomas and adenocarcinoma were found at similar rates in patients without a distal adenoma and those with adenomas smaller than 1 cm and 1 cm or larger (5.3%, 5.5%, and 5.6%, respectively) (Table 3). Among patients with a tubulovillous or villous adenoma, however, the advanced proximal neoplasia prevalence was 11.7%. There was no association of proximal adenocarcinoma prevalence with distal findings, but the number of cases was small.

### Predictors of Advanced Proximal Neoplasia

In univariate comparisons, distal adenoma size and histology, as well as age of 65 years or older, were statistically significant predictors of advanced proximal neoplasia (Table 4). In the multivariate model, the presence of villous features in the distal adenoma was associated with a doubling of risk of advanced proximal neoplasia, after adjusting for the other variables in the model. Age of 65 years or older, the presence of more than 1 distal adenoma, and a positive family history were also independent predictors of increased risk of advanced proximal neoplasia. Size of the distal TA was not related to risk of advanced proximal neoplasia in this model.

In the CART model, those with a tubulovillous or villous adenoma of any size had an advanced proximal neoplasia prevalence of 12.1% (Figure 2, level A). The remaining patients were split based on age. Those aged 67 years or older had an advanced proximal neoplasia rate of 9.1% (Figure 2, level B). Those younger than 67 years were further divided based on distal adenoma number. Those with 0 or 1 TA had an advanced proximal neoplasia rate of

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**Table 3. Prevalence of Advanced Proximal Neoplasia According to Distal Findings**

<table>
<thead>
<tr>
<th>Distal Findings</th>
<th>No.</th>
<th>1 or More TAs &lt;1 cm</th>
<th>Advanced Adenoma†</th>
<th>Cancer</th>
</tr>
</thead>
<tbody>
<tr>
<td>No adenoma</td>
<td>544</td>
<td>43 (7.9) [5.6-10.2]</td>
<td>26 (4.8) [3.0-6.6]</td>
<td>3 (0.6) [0-1.2]</td>
</tr>
<tr>
<td>1 or more TAs &lt;1 cm</td>
<td>763</td>
<td>140 (18.3) [15.6-21.1]</td>
<td>36 (4.7) [3.2-6.2]</td>
<td>6 (0.8) [0.2-1.4]</td>
</tr>
<tr>
<td>1 TA &lt;1 cm</td>
<td>444</td>
<td>63 (14.2) [10.9-17.4]</td>
<td>18 (4.1) [2.2-5.9]</td>
<td>4 (0.9) [0.2-1.8]</td>
</tr>
<tr>
<td>2 or more TAs &lt;1 cm</td>
<td>319</td>
<td>77 (24.1) [19.4-28.8]</td>
<td>18 (5.7) [3.1-8.2]</td>
<td>2 (0.6) [0.1-1.5]</td>
</tr>
<tr>
<td>1 or more TAs ≥1 cm</td>
<td>850</td>
<td>150 (17.7) [15.1-20.2]</td>
<td>44 (5.2) [3.7-6.7]</td>
<td>4 (0.5) [0.01-0.9]</td>
</tr>
<tr>
<td>1 TA ≥1 cm</td>
<td>539</td>
<td>79 (14.7) [11.7-17.6]</td>
<td>21 (3.9) [2.3-5.5]</td>
<td>3 (0.6) [0.1-1.2]</td>
</tr>
<tr>
<td>2 or more TAs ≥1 cm</td>
<td>311</td>
<td>71 (22.9) [18.2-27.5]</td>
<td>23 (7.4) [4.5-10.3]</td>
<td>1 (0.3) [0.04-1.0]</td>
</tr>
</tbody>
</table>

†TA indicates tubular adenoma; CI, confidence interval.
‡Advanced adenoma is defined as a TA 1 cm or larger in diameter, a tubulovillous or villous adenoma, or an adenoma with severe dysplasia.

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**Table 4. Predictors of Advanced Proximal Neoplasia**

<table>
<thead>
<tr>
<th>Variables</th>
<th>Univariate Comparisons, OR (95% CI) [n = 2972]</th>
<th>Multivariate Model, OR (95% CI) [n = 2428]†</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>1.00 (Referent)</td>
<td>1.00 (Referent)</td>
</tr>
<tr>
<td>Male</td>
<td>1.23 (0.91-1.66)</td>
<td>1.18 (0.85-1.65)</td>
</tr>
<tr>
<td>Age of screening subject, y</td>
<td></td>
<td></td>
</tr>
<tr>
<td>50-59</td>
<td>1.00 (Referent)</td>
<td>1.00 (Referent)</td>
</tr>
<tr>
<td>60-64</td>
<td>1.37 (1.03-2.02)</td>
<td>1.31 (1.06-1.99)</td>
</tr>
<tr>
<td>65-69</td>
<td>1.71 (1.16-2.52)</td>
<td>1.59 (1.04-2.42)</td>
</tr>
<tr>
<td>≥70</td>
<td>1.88 (1.29-2.74)</td>
<td>1.60 (1.07-2.42)</td>
</tr>
<tr>
<td>Average-risk family history‡</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>1.00 (Referent)</td>
<td>1.00 (Referent)</td>
</tr>
<tr>
<td>Yes</td>
<td>1.36 (0.94-1.98)</td>
<td>1.52 (1.01-2.28)</td>
</tr>
<tr>
<td>Distal adenoma size</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No adenoma</td>
<td>1.00 (Referent)</td>
<td>. . .</td>
</tr>
<tr>
<td>Adenoma &lt;1 cm</td>
<td>1.26 (0.81-1.96)</td>
<td>1.00 (Referent)</td>
</tr>
<tr>
<td>Adenoma ≥1 cm</td>
<td>1.66 (1.10-2.52)</td>
<td>1.08 (0.78-1.50)</td>
</tr>
<tr>
<td>Distal adenoma histology</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No adenoma</td>
<td>1.00 (Referent)</td>
<td>. . .</td>
</tr>
<tr>
<td>Tubular adenoma</td>
<td>1.05 (0.68-1.61)</td>
<td>1.00 (Referent)</td>
</tr>
<tr>
<td>Tubulovillous or villous adenoma</td>
<td>2.46 (1.60-3.77)</td>
<td>2.30 (1.69-3.14)</td>
</tr>
<tr>
<td>No. of distal adenomas</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No adenoma</td>
<td>1.00 (Referent)</td>
<td>. . .</td>
</tr>
<tr>
<td>1 Adenoma</td>
<td>1.22 (0.80-1.88)</td>
<td>1.00 (Referent)</td>
</tr>
<tr>
<td>Multiple adenomas</td>
<td>1.97 (1.27-2.95)</td>
<td>1.57 (1.16-2.13)</td>
</tr>
</tbody>
</table>

†OR indicates odds ratio; CI, confidence interval; and ellipses, data not applicable.
‡Average-risk family history is limited to subjects with 1 affected first-degree relative with colorectal cancer who was older than 85 years at the time of diagnosis.
3.6%. Those with more than 1 TA had an advanced proximal neoplasia prevalence of 5.9% (Figure 2, level C). Size of the distal adenoma did not enter this CART model or any of the other models that were its closest competitors.

**COMMENT**

The principal finding of this study is that the prevalence of advanced proximal colonic neoplasia is not related to the presence of a distal TA, regardless of size. However, advanced proximal colonic neoplasia is not uncommon, even among patients without a distal adenoma. The prevalence of advanced proximal neoplasia is increased in patients with a villous or tubulovillous adenoma distally and also is increased in those aged 65 years or older, with a positive family history of colorectal cancer, and with multiple distal adenomas. Our finding that the prevalence of advanced proximal neoplasia is associated with increasing age is supported by the work of other epidemiological studies.10,11 We have also found, as in other studies,20-24 that persons with a distal TA had a greater prevalence of proximal adenomas. However, these patients were not at increased risk for advanced proximal neoplasms.

Size of the distal adenoma may be a predictor of proximal neoplasia if histology is not known. Other investigators have reported that distal adenoma size is a predictor of advanced proximal neoplasia.10,11,13 However, these studies were smaller and could not accurately separate histology and size. In this study, as in others,22,23 larger adenomas were more likely to have villous features. Our findings are similar to those of longitudinal follow-up of patients with rectosigmoid adenomas12; when both size and histology are examined using multivariate analyses, only villous histology remains an independent predictor of advanced proximal neoplasia. In our population, even villous or tubulovillous adenomas of less than 1 cm are associated with a higher risk of advanced proximal neoplasia than TAs 1 cm or larger. Size does not enter into any version of the CART model and is not a significant predictor in multivariate logistic regression, even if histology is omitted. Removing size from the logistic regression has no effect on the significance of the other variables and does not reduce the explanatory power of the model. In other analyses, a size-histology interaction was not a significant predictor of advanced proximal neoplasia.

Subjects were not randomly assigned to colonoscopy, so selection bias may explain the higher-than-expected observed prevalence of advanced proximal lesions. This is primarily a concern for patients without distal TAs or with single TAs of no more than 5 mm, for whom colonoscopy was not recommended by our guideline. However, patients from these groups who may have been at increased risk for proximal neoplasia because of a strong family history or symptoms developing after the sigmoidoscopy were carefully eliminated. Nevertheless, our finding that size of the TA is not related to risk is found when comparing persons with 6- to 9-mm adenomas with those with larger lesions or when restricting the analysis to distal TAs of at least 1 cm.

Hyperplastic polyps are not generally thought to be associated with an increased prevalence of proximal adenomas.22-24 but this opinion is not universally held.25,26 In addition, other factors may have contributed to our observed prevalence. For example, information about diet and nonsteroidal anti-inflammatory drug use was not collected as part of this program and these factors were not included in any analyses.

Polyp size was measured using the open biopsy forceps technique, a potentially inaccurate measurement.27,28 However, distal adenoma size was unrelated to the prevalence of advanced proximal adenomas in multiple analyses (treating size as a continuous variable, excluding lesions smaller than 6 mm, or comparing lesions larger than 2 cm with those smaller than 1 cm). Size misclassification should not obscure associations in all of these analyses. It is also possible that the lack of centralized pathology review led to nonuniform histological diagnoses. Histological misclassification, however, would have only decreased the likelihood of finding an association between distal histology and advanced proximal neoplasia.

Finally, we chose to define a distal colonic neoplasm based on location of the polyp at colonoscopy rather than using sigmoidoscopy findings, particularly for sigmoidoscopies with a depth of insertion less than 40 cm. However, we believe that a sigmoidoscopy shorter than 40 cm is incomplete and should be followed up with further screening tests, such as barium enema or colonoscopy. Many of these short examinations were stopped because of a lesion that may have been partially seen on the sigmoidoscopy and not recorded or because of pain or colonic
spasm. In many cases, an anatomically distant cancer was found at colonoscopy, just beyond the depth of the sigmoidoscopy. When analyzed according to a sigmoidoscopy-based definition of a distal lesion, the prevalence of advanced proximal neoplasia among subjects without a distal adenoma increases, but our main finding that the size of distal TAs does not predict advanced proximal neoplasia is unchanged.

The purpose of this study was to evaluate the utility of easily measured clinical variables to predict an advanced proximal neoplasia at follow-up colonoscopy. A formal policy evaluation is beyond the scope of this article, but certain implications seem clear based on our results. Our findings may be interpreted to support colonoscopy for persons with any lesion found at sigmoidoscopy for only those with distal villous lesions. They do not support follow-up colonoscopy for all persons found to have a distal TA at sigmoidoscopy.

Two approaches to colorectal cancer screening are supported by our data. The first would be to continue to screen with sigmoidoscopy (a feasible and effective strategy), starting at ages 50 to 55 years for average-risk patients, followed by a single screening colonoscopy at approximately age 50-55 years (Figure 3). Using sigmoidoscopy, a lower-risk group of patients may be identified who are younger than 55 years, have no family history of colorectal cancer, and do not have a distal adenoma larger than 1 cm (59% of our population), and follow-up colonoscopy may be deferred in these patients. Only a small proportion of the proximal lesions left in place in younger screening subjects will progress to symptomatic invasive cancer, and those that do may take many years. Thus, if screening colonoscopy were delayed until age 65 years, the majority of these lesions would likely be detected before invasion. If, however, any chance of finding an advanced proximal neoplasia is thought to be unacceptably high, a second approach would be to offer primary screening colonoscopy every 10 years for all patients older than 50 years. However, significant feasibility issues still prevent this approach from being recommended for population screening.

Until better tests are available, we have several effective but imperfect choices for colorectal cancer screening. The choice of approach should also adequately consider patient preferences, which vary depending on individual circumstances. The results of this study will be useful in informing that shared decision.

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