Colorectal Cancer Screening in Young Patients With Poor Health and Severe Comorbidity

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Background: Young patients with poor health and a high risk of mortality from comorbid diseases have less chance of deriving a survival benefit from colorectal cancer screening. The aim of this study was to examine the relationship between colorectal cancer screening, self-reported health status, and comorbidity in a cohort of young patients, defined as patients between the ages of 50 and 64 years.

Methods: This was a single-center study conducted at a Veterans Affairs Medical Center from October 1, 1996, to March 30, 2004. Colorectal cancer screening information was obtained from 861 outpatients who completed the 36-Item Short-Form Health Survey (measure of health status) and the Kaplan-Feinstein Index (comorbidity score). Rates of screening were examined by age, physical component summary score, and severity of comorbid illnesses.

Results: Of the veterans, 45.9% had undergone screening within 5 years of their index visit. Screening rates were high among patients with moderate (44.9%) and severe (45.8%) comorbidities. When stratified by age group and physical component summary quartile, there was a trend toward increasing screening rates with better health status in the 50- to 54- and 55- to 59-year age groups. In the 60- to 64-year age group, high screening rates for patients with poorer health were observed: physical component summary quartiles 1 and 2, 55.7% and 54.2%, respectively. Fifty-two patients died during the 5-year follow-up; 37 (71.2%) had undergone screening for colorectal cancer.

Conclusions: Young patients with potentially reduced life expectancy are being screened for colorectal cancer at relatively high rates. Comprehensive assessment of health status and comorbidity should guide cancer screening decisions, especially in individuals with reduced life expectancy who may obtain the least benefit from screening.

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In randomized controlled trials and observational studies, screening for colorectal cancer has been shown to reduce mortality from colorectal cancer. However, the difference in cancerspecific survival is not seen until 5 years after the start of screening.\(^1\)\(^-\)\(^6\) Individuals with a higher risk of mortality from other medical conditions and a life expectancy of fewer than 5 years are less likely to derive survival benefit from screening. In these individuals, the accumulation of multiple life-shortening conditions may counter any potential benefit from mortality reduction that the screening test provides.\(^7\)\(^-\)\(^10\) Furthermore, the potential risks and complications from screening tests may be higher in these individuals.\(^7\)

The importance of incorporating information about comorbidity and functional status has been emphasized in cancer screening decisions in elderly persons.\(^11\) No studies, to our knowledge, have examined the association between health status and, specifically, colorectal cancer screening in young patients, defined as individuals between the ages of 50 and 64 years. Young patients with poor health status and a decreased life expectancy of fewer than 10 years may be less likely to receive benefit from screening; like elderly patients, their life expectancy is potentially decreased because of their comorbidity conditions. In addition, because of their younger age, their chance of having colorectal cancer is also relatively lower.

Screening young patients with poor health and multiple comorbidities may provide little benefit in terms of prolonging life expectancy, yet it may expose these individuals to unnecessary harm.

Despite increasing emphasis on the importance of making cancer screening decisions in the context of overall health and life expectancy, it is unclear how to determine the impact of poor health on the use of screening tests. In this study, we examined the association between colorectal cancer screening and 2 validated self-reported measures of health, a comorbidity index and a quality of life measure, both of which have been independently correlated with life expectancy. Thus, the aim...
of this study was to examine the relationship between colorectal cancer screening, self-reported health status, and comorbidity in a cohort of young patients.

METHODS

DATA COLLECTION

This represents a secondary analysis of a large prospective cohort study conducted at a Veterans Affairs (VA) Medical Center. The details of the study design and methods have been previously reported.2,13 In brief, the aim of the study was to determine the prevalence of unrecognized diabetes mellitus. The study population consisted of veterans aged 45 to 64 years seen in the outpatient clinics between October 1, 1996, and March 30, 1999. Patients with established diabetes mellitus or metastatic cancer were excluded from the study. Eligible patients were asked to complete the Medical Outcomes Study 36-Item Short-Form Health Survey (SF-36) and the Kaplan-Feinstein Index (KFI) modified for use in a patient interview.

In this analysis, we included patients who were 50 years or older, who did not have a history of colorectal cancer and had not been previously screened. Data relating to colorectal cancer screening, specifically information regarding fecal occult blood testing (FOBT), colonoscopy, flexible sigmoidoscopy, and double-contrast barium enema, were obtained from direct medical record review and the hospital’s computerized medical record system. Patient information was compiled from physician notes, endoscopy clinic visits, and radiology and laboratory reports. Detailed medical record abstraction covered a period of 5 years from the time of enrollment into the study. Colorectal cancer screening was defined as undergoing FOBT within 1 year or flexible sigmoidoscopy, double-contrast barium enema, or colonoscopy within the 5-year study period.14 The study was approved by the institutional review board.

INSTRUMENTS

The SF-36 is a generic multidimensional self-report health questionnaire that measures health-related quality of life attributable to mental and physical health.13 The SF-36 has been extensively validated and has been shown to be associated with several outcomes, including mortality, across a broad range of patient populations.16-20 The SF-36 measures 8 health domains: physical functioning, role limitation due to physical problems, bodily pain, general perception of health, vitality, social functioning, role limitation due to emotional problems, and mental health. Two summary scales, physical and mental component summaries (PCS and MCS, respectively), can be derived from the domain scales that are standardized to a mean score of 50 and an SD of 10 (range, 0-100).

Comorbidity was assessed using the KFI, which is a validated instrument that has been used in various patient populations to study the impact of comorbidity according to severity of organ decompensation and prognostic impact.21 Individual comorbid conditions are classified according to their severity of organ decompensation. The overall comorbidity score is obtained based on the highest severity of a single condition within one organ system or the cumulative contribution of conditions from several organ systems. Individual diseases and overall comorbidity are classified into 4 categories: none, mild, moderate, or severe (0-3, respectively).21 Previous studies12,22 have reported a stepwise increase in cumulative mortality attributable to comorbid disease with each increased level of the comorbidity index.

STATISTICAL ANALYSIS

Statistical analyses were performed using SAS statistical software, version 8.2 (SAS Institute Inc, Cary, NC). Two-sided testing was performed and statistical significance was set at P<.05. Patients were grouped into age ranges and quartiles based on SF-36 score (quartile 1 indicates patients with the worst health status; and quartile 4, patients with the best health status) to reflect their varying life expectancies.6,20 Colorectal cancer screening rates between groups were compared using the Cochran-Armitage χ² test for trend, which evaluates trends in binomial proportions across levels of a single factor or covariate.27

RESULTS

PATIENT CHARACTERISTICS

From the original cohort of 1253 patients, 987 who were 50 years and older were eligible for colorectal cancer screening. Seventy-four patients were excluded because of missing data or because they had already undergone screening. Fifty-two patients died during the 5-year follow-up and were excluded from the study (Figure 1). The baseline characteristics of the remaining 861 patients are presented in Table 1. Most of the patients were men, and 71.9% described their race as white. Of the patients, 41.7% were between the ages of 50 and 54 years, with less than a third of the population in the 60- to 64-year age range. Of the patients, 64.3% had no or mild disease, based on their KFI, while 21.7% and 13.9% had moderate or severe comorbidities, respectively (percentages do not total 100 because of rounding). The median SF-36 PCS score was 36.3 (range, 0-100).

COLORECTAL CANCER SCREENING ACCORDING TO AGE ONLY

Overall, 45.9% of the veterans in our sample population underwent screening for colorectal cancer within 5 years of their index visit (Table 2). Of the 395 screened pa-
patients, 258 underwent FOBT and approximately a third underwent a screening colonoscopy, primarily for a positive family history of colon cancer. Screening rates for colorectal cancer were higher in the older age group: 51.1% of patients had been screened in the 60- to 64-year age group, compared with 42.3% and 43.3% of patients in the 50- to 54- and 55- to 59-year age groups, respectively. However, these differences were not statistically significant ($P=.51$).

**COLORECTAL CANCER SCREENING ACCORDING TO AGE, PCS QUARTILE, AND KFI**

We first analyzed colorectal cancer screening rates by KFI within each age group. In the 50- to 54-year age group, screening rates were highest for patients with severe comorbid disease. In the 55- to 59- and 60- to 64-year age groups, screening rates were slightly lower for patients with severe comorbid disease compared with individuals with no or mild or moderate comorbidity (Figure 2). These observed differences within age groups were not statistically significant (50- to 54-year age group, $P=.83$; 55- to 59-year age group, $P=.48$; and 60- to 64-year age group, $P=.78$).

We then examined the association between colorectal cancer screening and SF-36 PCS quartiles. Among the 50- to 54-year age group, screening rates were lower for patients with poorer health status, with only 34.1% of the patients with the worst health status (PCS quartile 1) being screened compared with 55.1% of patients with the best health status (PCS quartile 4); this observed trend of increased screening as health status improved was statistically significant ($P=.005$). In contrast, in the 60- to 64-year age group, screening rates for individuals within the worst health status quartiles (PCS quartiles 1 and 2) were 55.7% and 54.2%, respectively, while a slightly smaller percentage of individuals with the best health status (45.8%) had been screened. These differences were not statistically significant ($P=.07$) (Figure 3).

**MORTALITY, HEALTH STATUS, AND COMORBIDITY SCORE**

There were 52 deaths from our original cohort of 861 patients during the 5-year follow-up period (Table 3). Most of these individuals were in PCS quartile 1 and had moderate comorbidity. Of the 52 patients, 37 (71.2%) had undergone screening for colorectal cancer.

**COMMENT**

Ultimately, for a screening test to provide benefit, it must lead to a reduction in disease-specific mortality and prolong life expectancy for that individual. While the impact of screening on prolonging life expectancy is demonstrable in healthy patients, in individuals with significant comorbid disease and poor health status, the benefits of screening are not clear.

To our knowledge, this is the first study to examine the association between health status, comorbidity, and colorectal cancer screening in a cohort of patients aged 50 to 64 years. Prior studies examining the association between health status and screening in elderly patients have found mixed results, with overuse and underuse of colorectal cancer screening.

Our study demonstrates that colorectal screening rates did not vary by severity of comorbid illness, as determined by the KFI. We found that a relatively large number of patients with moderate and severe comorbid conditions had been screened for colorectal cancer: 44.9% and 45.8%, respectively. The estimated 10-year mortal-

### Table 1. Baseline Characteristics of the 861 Veterans

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>No. (%) of Veterans*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, y</td>
<td></td>
</tr>
<tr>
<td>50-54</td>
<td>359 (41.7)</td>
</tr>
<tr>
<td>55-59</td>
<td>252 (29.6)</td>
</tr>
<tr>
<td>60-64</td>
<td>270 (31.4)</td>
</tr>
<tr>
<td>Male sex</td>
<td>825 (95.8)</td>
</tr>
<tr>
<td>Race</td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>619 (71.9)</td>
</tr>
<tr>
<td>Black</td>
<td>225 (26.1)</td>
</tr>
<tr>
<td>Other</td>
<td>17 (2.0)</td>
</tr>
<tr>
<td>Service connected</td>
<td>596 (69.2)</td>
</tr>
<tr>
<td>KFI (comorbidity score)</td>
<td></td>
</tr>
<tr>
<td>No or mild</td>
<td>554 (64.3)</td>
</tr>
<tr>
<td>Moderate</td>
<td>167 (21.7)</td>
</tr>
<tr>
<td>Severe</td>
<td>120 (13.9)</td>
</tr>
<tr>
<td>SF-36 PCS quartile</td>
<td></td>
</tr>
<tr>
<td>1 (Worst)</td>
<td>216 (25.1)</td>
</tr>
<tr>
<td>2</td>
<td>209 (24.3)</td>
</tr>
<tr>
<td>3</td>
<td>217 (25.2)</td>
</tr>
<tr>
<td>4 (Best)</td>
<td>219 (25.4)</td>
</tr>
</tbody>
</table>

Abbreviations: KFI, Kaplan-Feinstein Index; PCS, physical component summary; SF-36, 36-item Short-Form Health Survey.

### Table 2. Individuals Who Underwent Colorectal Cancer Screening*

<table>
<thead>
<tr>
<th>Variable</th>
<th>No. (%) of Individuals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of screening test</td>
<td></td>
</tr>
<tr>
<td>Fecal occult blood test</td>
<td>258 (65.3)</td>
</tr>
<tr>
<td>Flexible sigmoidoscopy</td>
<td>43 (10.9)</td>
</tr>
<tr>
<td>Barium enema</td>
<td>51 (12.9)</td>
</tr>
<tr>
<td>Colonoscopy</td>
<td>138 (34.9)</td>
</tr>
<tr>
<td>Screening by age, y</td>
<td></td>
</tr>
<tr>
<td>50-54</td>
<td>152/359 (42.3)</td>
</tr>
<tr>
<td>55-59</td>
<td>105/232 (45.3)</td>
</tr>
<tr>
<td>60-64</td>
<td>138/270 (51.1)</td>
</tr>
<tr>
<td>Screening by KFI (comorbidity score)</td>
<td></td>
</tr>
<tr>
<td>No or mild</td>
<td>258/554 (46.2)</td>
</tr>
<tr>
<td>Moderate</td>
<td>84/187 (44.9)</td>
</tr>
<tr>
<td>Severe</td>
<td>55/120 (45.8)</td>
</tr>
<tr>
<td>Screening by SF-36 PCS quartile</td>
<td></td>
</tr>
<tr>
<td>1 (Worst)</td>
<td>88 (40.7)</td>
</tr>
<tr>
<td>2</td>
<td>100 (47.9)</td>
</tr>
<tr>
<td>3</td>
<td>99 (45.6)</td>
</tr>
<tr>
<td>4 (Best)</td>
<td>108 (49.3)</td>
</tr>
</tbody>
</table>

Abbreviations: See Table 1.

*Percentages may not total 100 because of rounding.

*A total of 395 (45.9%) of the 861 subjects underwent colorectal cancer screening.
...with mortality. In our cohort, 25.1% of the patients had a PCS score of 26 or less, indicating poor health status, and 40.7% of these patients had been screened for colorectal cancer. Compared with individuals within the best health status quartile, individuals with a PCS score of less than 25 have a 12-fold increase in 5-year mortality.

There are important reasons why health status and comorbidity should be included in decisions regarding colorectal cancer screening. The number and severity of comorbid conditions and functional impairments are strong predictors of life expectancy, and reduced life expectancy will significantly reduce the benefit of screening. In the context of colorectal cancer screening, if an individual’s life expectancy is anticipated to be fewer than 5 years, then screening may be of little benefit. In our study, 52 patients died during the 5-year follow-up period from non–colorectal cancer deaths, and of these patients, 71.2% had undergone colorectal cancer screening but had not derived any survival benefit. Most of these individuals had limited life expectancy based on their health status and comorbidity score and may, therefore, have been inappropriately screened.

In addition to the possibility that individuals with poor health status may not live long enough to benefit from a screening test, an added consideration in determining candidacy for screening is the risk-benefit ratio. Any overall potential benefit must be weighed against harm that can come from the screening test. While FOBT itself is associated with minimal harm, individuals who have a positive FOBT result may require further testing with colonoscopy. Complications of colonoscopy include perforation (1/1000), serious bleeding (3/1000), and cardiopulmonary events from intravenous sedation (5/1000). In addition, a colonoscopy may carry more potential harm, especially in patients with poor health status. In an effort to quantify benefits and risks of colorectal cancer screening in elderly patients with varying life expectancies, Ko and Sonnenberg43 demonstrated that across different age groups, individuals with poor health status were the least likely to benefit from screening and that more screening tests would be needed to demonstrate a reduc-
tion in cancer-related mortality. For example, in men aged 70 to 74 years with poor health status, 1877 FOBTs would need to be performed to show benefit compared with 177 FOBTs in individuals with good health status.

While there is consensus that screening decisions, particularly in elderly persons, should be made in the context of overall health status and life expectancy, there are no specific recommendations as to how to evaluate and assess health status. Studies have shown that physicians are poor at predicting survival and have limited ability to translate factors, such as family history, age, and comorbidity, into an estimate of life expectancy. In light of this, validated instruments measuring health status and comorbidity that are associated with life expectancy and that can be applicable to the individual patient may be useful tools for clinicians.

Several limitations in our study deserve mention. First, we did not contact patients or physicians to determine if any veterans may have undergone colorectal cancer testing outside the VA health care system. In addition, we only observed patients for 5 years from the index visit, and the standard for colorectal cancer screening with colonoscopy is every 10 years. These limitations may have potentially biased our results by giving us underestimates of the actual screening rates. However, in our study, 43.9% of veterans had undergone screening and this is just slightly higher than the screening rate of 32% found by Ferreira et al in a study examining the impact of an intervention to improve colorectal cancer screening in a VA setting. Jha et al have demonstrated higher colorectal cancer screening rates (68% in 2000), but this was based on VA performance measures that may not accurately reflect screening procedures.

Second, we used self-report measures of health status and comorbidity and, therefore, we may have had some underreporting or overreporting of health status by patients. However, previous studies have shown that self-report instruments seem to provide a reasonable estimate of comorbidity and health.

Third, the mean SF-36 score of our sample population was 36, which is much lower than the general population mean of 50, suggesting a potential selection bias of sicker patients. However, the low SF-36 score among veterans has been previously demonstrated. Other researchers have shown that VA outpatients have substantially worse health status than non-VA populations; in one study, the overall PCS score was 36.9 (95% confidence interval, 36.3-37.5), which was more than 50% of 1 SD (10 points) worse than that of a sample of ambulatory patients seen in non-VA ambulatory settings.

Last, because this study was performed at a VA Medical Center and the study population consisted of mostly male veterans, the generalizability of the study may be questioned. However, the VA system is the largest integrated health care system in the United States, providing care to approximately 5.3 million veterans, and is, therefore, an important setting to study.

In summary, this study underscores the importance of incorporating health status in screening decisions for young patients. Individuals with poor health status and diminished life expectancies should potentially not be referred for screening. In elderly patients, the importance of incorporating factors, such as comorbid illnesses and overall health status, is acknowledged; however, to our knowledge, there are no guidelines for how to incorporate information regarding health status in younger patients.

Furthermore, there needs to be a means for clinicians to “opt out” of offering colorectal cancer screening. If an individual is deemed a poor candidate for screening, based on health status, then there must be a mechanism that allows clinicians to not offer screening to that patient without being penalized. This is especially important in a managed care setting, in which clinical behavior is monitored through the use of performance measures and clinical reminders, such as in the VA health care system. It is increasingly clear that proper evaluation of, and incorporation of, life expectancy, physical function, and comorbidity conditions must be a fundamental part of cancer screening decisions. Future research should focus on the development of appropriate decision tools to reduce potentially inappropriate colorectal cancer screening in severely chronically ill patients.

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REFERENCES