

References

1. Department of Health, Education, and Welfare: Healthy people: the Surgeon General's report on health promotion and disease prevention. DHEW Publication No. (PHS) 79-55071, U.S. Government Printing Office, Washington, D.C., 1979.
2. Department of Health and Human Services: Promoting health/preventing disease: objectives for the nation. U.S. Government Printing Office, Washington, D.C., 1980.
3. National Center for Health Statistics: Blood pressure of persons 18-74 years, United States, 1971-72. Vital and Health Statistics, Series 11, No. 150, DHEW Publication No. (HRA) 75-1632, Hyattsville, Md., April 1975.
4. National Center for Health Statistics: Blood pressure levels of persons 6-74 years, United States, 1971-1974. Vital and Health Statistics, Series 11, No. 203, DHEW Publication No. (HRA) 78-1648, Hyattsville, Md., September 1977.
5. National Center for Health Statistics: Hypertension in adults 25-74 years of age, United States, 1971-1975. Vital and Health Statistics, Series 11, No. 221, DHHS Publication No. (PHS) 81-1671, Hyattsville, Md., April 1981.
6. Rowland, M., and Roberts, J.: Blood pressure levels and hypertension in persons ages 6-74 years: United States, 1976-1980. Advance data, Vital and Health Statistics, No. 84, Oct. 8, 1982.
7. Evaluation of the health aspects of sodium chloride and potassium chloride as food ingredients. Report, contract No. FDA 223-75-2004, Bureau of Foods, Food and Drug Administration, Washington, D.C., 1979.
8. The public and high blood pressure: a survey. DHEW Publication No. (NIH) 77-356, Washington, D.C., 1973.
9. The public and high blood pressure: six-year followup survey of public knowledge and reported behavior. DHHS Publication No. (NIH) 81-2118, Washington, D.C., 1981.
10. Directory of community high blood pressure control activities. DHEW Publication No. (NIH) 77-1243, High Blood Pressure Information Center, 120/80 NIH, Bethesda, Md., 1977.
11. Hypertension Detection and Follow-up Program Cooperative Group: Five-year findings of the Hypertension Detection and Follow-up Program, I. Reduction in mortality of persons with high blood pressure, including mild hypertension. JAMA 242: 2562-2571, Dec. 7, 1979.
12. Hypertension Detection and Follow-up Program Cooperative Group: Five-year findings of the Hypertension Detection and Follow-up Program, II. Mortality by race, sex, and age. JAMA 242: 2572-2577, Dec. 7, 1979.
13. Hypertension Detection and Follow-up Program Cooperative Group: Five-year findings of the Hypertension Detection and Follow-up Program, III. Reduction in stroke incidence among persons with high blood pressure. JAMA 247: 633-638, Feb. 5, 1982.
14. Diagnosis and management of hypertension: a national survey of physicians' knowledge, attitudes, and reported behavior (conducted for the Food and Drug Administration and the National High Blood Pressure Education Program, National Heart, Lung, and Blood Institute). DHEW Publication No. (NIH) 79-1056, High Blood Pressure Information Center, 120/80, NIH, Bethesda, Md., 1979.

Family Physicians' Beliefs about Screening for Colorectal Cancer Using the Stool Guaiac Slide Test

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This research was supported in part by a Public Health Service grant (CA-16411) from the National Cancer Institute.

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Synopsis

The stool guaiac slide test (SGST) is a relatively recent innovation in screening for colorectal cancer. The test detects occult blood in the stool that may indicate the presence of cancer.

In recent years, the SGST has been widely promoted as a screening test to aid in the detection of colorectal cancer. However, data from public and mass screening programs indicate that many people are unaware of the test and that few have actually taken it. The findings from these studies suggest that many physicians may not be using the test in their medical practices.

The literature on diffusion theory suggests that acceptance of an innovation is influenced by the potential adopter's perception of the innovation's relative advantages over those of the ideas it supersedes, its perceived complexity, and its compatibility with the existing values and practices of the receiver. This research examined these factors as they relate to use of the SGST among a sample of 131 family physicians in New York State.

Eighty-two percent of these physicians reported that they provide guaiac slides to at least some of their patients to collect stool specimens at home. The test was reportedly more commonly used for older patients than for younger ones. The physicians' beliefs about the relative effectiveness of the test in detecting early-stage colorectal cancer, compared with the effectiveness of alternative screening tests, and their perceptions about

patients' willingness and ability to do the test at home were found to be important factors distinguishing between physicians who said they used the test and physicians who did not. The findings from this study suggest that future efforts aimed at promoting the use of the

SGST among primary care physicians should emphasize the relative merits of the test in comparison with those of alternative screening procedures, especially with regard to its effectiveness in detecting early stage cancers, its simplicity, and its acceptance by patients.

THE STOOL GUAIAIC SLIDE TEST (SGST) is a relatively recent innovation in screening for colorectal cancer. The test detects occult blood in the stool that may indicate the presence of cancer. The idea of testing stool for the presence of occult blood as an indicator of cancer is not new. It has been known for many years that colorectal cancers bleed intermittently (1,2). However, previous fecal occult blood tests were unreliable (3,4). It was not until the introduction of the impregnated guaiac slide in the late 1960s and the demonstration of its effectiveness in detecting early-stage cancers that fecal occult blood testing became applicable as a screening test for colorectal cancer (5-11). As yet, however, there is insufficient evidence to indicate that screening for colorectal cancer by fecal occult blood testing can significantly reduce mortality from the disease.

During the past few years the SGST has been widely promoted as a screening test for colorectal cancer. The American Cancer Society now recommends that all persons more than 50 years of age have an SGST every year (12). However, data from recent population surveys and mass screening programs indicate that many people are unaware of the test and that only a small percentage (3 to 20 percent) have actually taken it (13-15). The findings from these studies suggest that many physicians may not be using the SGST in their medical practice.

There is often a large time lag between the discovery and the application of medical innovations (16,17). Little is known about how to accelerate the diffusion process. Availability of information about the existence, efficacy, and acquisition of medical innovations is clearly not in itself a sufficient condition for adoption by health professionals. What seems to be important is how the potential adopter perceives the innovation in terms of its relative advantage over the idea it supersedes, its compatibility with the existing values and needs of the receiver, and its complexity (18).

This study examines these factors as they relate to the use of the SGST among a sample of family physicians in New York State. Family physicians, by virtue of their frequent contact with a large segment of the adult population, are in an opportune position to provide information and services to promote early cancer detection (19-21). The findings from this study may suggest ways to promote the use of the SGST by primary care physicians.

Methods and Materials

The study population consisted of 254 board-certified family physicians randomly selected from a list of 1,212 physicians in New York State who were included in the 1981 National Directory of Family Physicians. A mailed questionnaire was used to collect information from physicians about their opinions and uses of several cancer screening procedures, including the SGST.

In January 1982, questionnaires were sent to physicians in the sample, along with a cover letter, explaining the aims of the study, and a postage-prepaid return envelope. After 4 weeks, nonrespondents were sent another questionnaire and a second letter urging their participation in the survey. Six weeks following the second mailing, those who still had not responded were again sent a questionnaire and a third letter urging their participation.

Of the 254 physicians in the sample, 31 were dropped because the mailing address used was incorrect or because the questionnaire was returned as undeliverable, with no forwarding address. Of the 223 remaining physicians, 131 returned completed questionnaires, yielding a response rate of 59 percent.

Eighty-seven percent of physicians who responded to the survey were male, and their average age was 49 years (the age range was 28 years to 76 years). Fifty-five percent had a private solo practice, 21 percent were members of a private group practice, 12 percent worked either full- or part-time in a hospital, 9 percent were members of a prepaid group practice, and 3 percent worked in another setting such as a public health clinic or nursing home. The median number of patients seen by each physician in an average week was 100, and about 2 percent of patients were being treated or followed for cancer.

Measures

Use of the SGST. The dependent variable in this study, use of the SGST, was measured by asking physicians if they provide guaiac slides to patients to collect stool specimens at home. Responses were obtained separately for patients in each of three age groups: 20-40 years, 41-50 years, and 51 years or more. Physicians who indicated that they provided stool guaiac slides to patients in any of these age groups were classified as

“users”; those who reported that they did not were classified as “nonusers.”

Relative effectiveness. The degree to which an innovation is perceived as better than the ideas preceding it is believed to influence its adoption (18). Respondents were asked to rate separately the effectiveness of the SGST, digital rectal examination, and proctosigmoidoscopy in detecting early-stage colorectal cancer, using a four-point scale ranging from “not very effective” to “very effective.” Perceived relative effectiveness was measured by comparing the physicians’ ratings of the effectiveness of the SGST with their ratings of the two alternative screening procedures and classifying the SGST as “more effective” than the alternative test, “equally effective,” or “less effective.”

Compatibility. The degree to which an innovation is perceived as compatible with an individual’s ideas, beliefs, and current practices is thought to influence its adoption (18). In this study, compatibility was assessed by questioning physicians about their uses of cancer screening tests other than the SGST, on the assumption that those using other cancer screening tests were more likely to believe that there is a benefit from early cancer detection and, as a result of this belief, would be more likely to use the SGST.

Respondents were given a checklist of common cancer screening tests or procedures and asked to check which ones they usually include in a medical examination of an asymptomatic patient. Screening checklists were completed separately for males and females in each of the three age groups (20–40 years, 41–50 years, and 51 years or more). The checklist for females contained nine screening tests or procedures; the checklist for males contained five tests or procedures. Compatibility was measured by counting the total number of cancer screening tests or procedures checked, excluding the SGST, for all subgroups. The possible range of scores on this measure was 0 to 42, a low score indicating poor compatibility and a high score indicating high compatibility.

Complexity. The extent to which an innovation is perceived by an individual as difficult to understand or use is believed to hinder its adoption (18). In this study, physicians’ perceptions of the complexity of the SGST were assessed by three items developed to measure their views of their patients’ willingness and ability to do the test. Respondents were asked to indicate the extent to which they agreed or disagreed with the following statements: (a) Most patients will not comply with the dietary restrictions necessary to make the SGST reliable; (b) If given the SGST to do at home, most patients will not do the test; and (c) The instructions for doing the test are too

‘Nearly all physicians who responded to our survey, regardless of whether or not they used the SGST, agreed with the statement that the test is useful as a first line of screening for colorectal cancer and that it is useful in uncovering other pathologies of the colon and rectum.’

complex for most patients to understand. All items were measured on a four-point scale ranging from “strongly agree” to “strongly disagree.”

Beliefs about the usefulness of the test. The physicians’ beliefs about the usefulness of the SGST were assessed by four single-item measures. Respondents were asked to indicate the degree to which they agreed or disagreed with the following statements: (a) The SGST is useful as a first line of screening for colorectal cancer; (b) The SGST is useful in uncovering pathologies of the colon and rectum other than cancer; (c) The SGST is too unreliable to be useful as a screening test for colorectal cancer; and (d) The SGST should not be promoted until there is evidence that screening will be effective in reducing mortality. All items were measured on a four-point scale ranging from “strongly agree” to “strongly disagree.”

Professional and other characteristics. This study also examined a number of professional and personal characteristics of physicians as they relate to use of the SGST. Among the variables examined were current type of medical practice, average weekly patient load, recency of graduation from medical school, age, and sex.

Data Analysis

The statistical associations between the independent variables and use of the SGST were evaluated, using either a chi-square test or a two-sample *t* test as appropriate. In the tables that accompany this paper, the number of physician respondents is not always the same because of isolated instances of missing data.

Results

Of the 131 physicians responding to our survey, 107 (82 percent) indicated that they provide guaiac slides for patients to collect stool specimens at home. As illustrated by the chart, physicians' use of the SGST increases with the age of patients. Thirty-four percent of physicians indicated that they provide slides for patients 20–40 years of age, an additional 36 percent provide slides only for patients 41–50 years of age, and 12 percent more provide slides only for patients 51 years of age or more.

Of the 107 physicians who indicated that they provided slides for their patients, 76 percent asked patients to complete three slides, 18 percent asked patients to complete two slides, and 6 percent asked patients to complete only one slide. Seventy-five percent of those providing slides asked their patients to follow a restricted diet in connection with the test.

Correlates of physicians' use of the SGST. Table 1 shows the association between physicians' use of the SGST and their perceptions of selected attributes of the test. Physicians who provided stool testing slides for their patients were significantly more likely than physicians who did not to rate the SGST as more effective in

detecting early-stage colorectal cancer than either the digital rectal examination or proctosigmoidoscopy.

In terms of compatibility with current screening practices, physicians who indicated that they used the SGST were more likely than nonusers to report including other

Physicians' use of the stool guaiac slide test (SGST) by age of patients

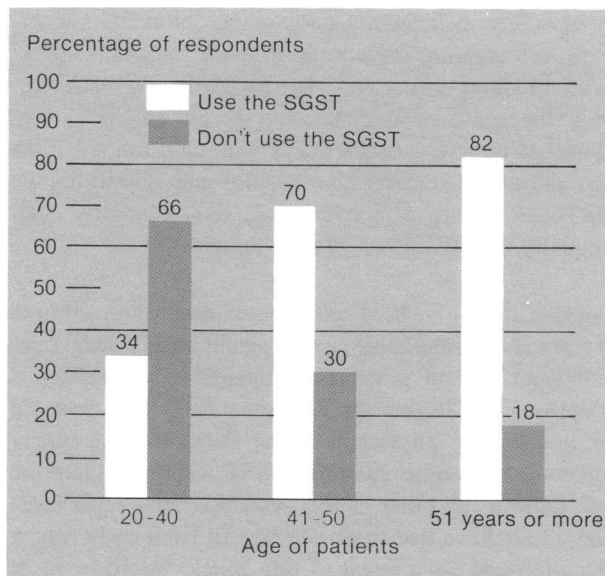


Table 1. Physicians' perceptions about selected attributes of the SGST according to their reported use of the test

Attributes	Use SGST	Do not use SGST	Significance (P value)
<i>Relative effectiveness</i>			
Percentage of physicians rating SGST more effective than digital rectal exam	39.6 (N = 106)	25.0 (N = 24)	0.02
Percentage of physicians rating SGST more effective than proctosigmoidoscopy	18.8 (N = 106)	4.1 (N = 24)	0.01
<i>Compatibility</i>			
Mean number of cancer screening tests in medical examinations of asymptomatic patients of different ages ¹	31.1 (N = 107)	28.3 (N = 24)	0.04
<i>Complexity</i>			
Percentage of physicians agreeing that most patients will not do SGST at home	11.2 (N = 107)	50.0 (N = 22)	0.01
Percentage of physicians agreeing that most patients will not comply with dietary instructions for SGST	44.2 (N = 104)	65.2 (N = 23)	0.06
Percentage of physicians agreeing that test instructions are too complex for most patients to understand	10.3 (N = 107)	30.4 (N = 23)	0.01
<i>Usefulness of the test</i>			
Percentage of physicians agreeing that SGST is useful as a first line of screening for colorectal cancer	95.3 (N = 107)	91.3 (N = 23)	0.44
Percentage of physicians agreeing that SGST is useful in uncovering pathologies of the colon and rectum other than cancer	92.5 (N = 106)	95.7 (N = 23)	0.58
Percentage of physicians agreeing that SGST is too unreliable to be useful as screening test for colorectal cancer	6.5 (N = 107)	18.2 (N = 22)	0.07
Percentage of physicians agreeing that SGST should not be promoted until evidence of effectiveness in reducing mortality is available	15.9 (N = 107)	31.8 (N = 22)	0.08

¹For explanation, see text, page 309.

NOTE: N = number of physicians responding to each question. SGST = stool guaiac slide test.

cancer screening tests in medical examinations of asymptomatic patients.

The physicians' perceptions of the complexity of the SGST, in terms of their patients' willingness and ability to do the test, varied widely between users and nonusers. Fifty percent of physicians who indicated that they did not use the SGST agreed with the statement that most patients would not do the test at home, compared with 11 percent of those physicians who were SGST users. Nearly half (48 percent) of physicians responding to the survey agreed with the statement that most patients would not comply with the dietary restrictions required for the SGST. However, 65 percent of those who did not use the SGST felt that most patients would not comply with the dietary restrictions, compared with 44 percent of physicians who did use the test. A greater percentage of physicians who did not use the SGST than of those who did agreed with the statement that the instructions for doing the test are too complex for most patients to understand (30 percent compared with 10 percent).

Physicians who indicated that they used the SGST did not differ greatly from nonusers in their beliefs about its usefulness and reliability. Nearly all physicians who responded to our survey, regardless of whether or not they used the SGST, agreed with the statement that the test is useful as a first line of screening for colorectal cancer and that it is useful in uncovering other pathologies of the colon and rectum. Only 9 percent of the physicians responding to our survey agreed with the statement that the SGST is too unreliable to be useful as a screening test for colorectal cancer. A greater proportion of physicians who did not use the SGST than of users felt that the test is too unreliable to be useful in screening for cancer. Physicians who did not use the SGST were also somewhat more likely than those who did to agree with the statement that the test should not be promoted until evidence of its effectiveness in reducing mortality is available.

Table 2 shows the relationship between selected professional and personal characteristics of physicians and use of the SGST. Physicians who indicated that they used the SGST did not differ significantly from nonusers with respect to the percentage in private solo practice,

average weekly patient load, number of years since graduation from medical school, age, and sex.

Discussion

Eighty-two percent of physicians responding to our survey reported that they provide guaiac slides for at least some of their patients to collect stool specimens at home. However, because 40 percent of physicians in our sample failed to respond to the survey, our estimate of the actual proportion of family physicians who use the SGST may not be accurate. It is possible that those who did respond to the survey hold more favorable attitudes about cancer screening and are more likely to use the SGST. However, even if we assume that all nonrespondents do not use the SGST, our estimate of the proportion of physicians using the test would drop only to 48 percent. This percentage is still much higher than the 3 to 20 percent figure reported in the literature, based on findings from population surveys and public screening programs (13-15). It is also possible that some physicians responded to the question on use of the SGST in terms of what they believe to be appropriate practice rather than in terms of their actual behavior. However, even if this was the case, our results show that the majority of family physicians in our survey are at least aware of the SGST and its application as a screening test for colorectal cancer.

The attitudes of physicians responding to our survey toward the SGST were favorable. Nearly all respondents believed that the SGST is useful as a first line of screening for colorectal cancer as well as for uncovering non-cancerous pathologies of the colon and rectum. Most physicians also believed that the SGST is fairly reliable in detecting colorectal cancer.

Our findings regarding correlates of physicians' use of the SGST are consistent with other studies of diffusion of medical innovations. These studies have found that the rate of adoption of innovations is influenced by the potential adopters' perceptions of the innovation's relative advantages over ideas it supersedes, its complexity, and its compatibility with the existing values and practices of the receiver (18,22). In our study, physicians who indicated

Table 2. Professional and personal characteristics of physicians according to their reported use of the SGST

Characteristics	Use SGST	Do not use SGST	Significance (P value)
Percentage of physicians in private solo practice	53.2 (N = 107)	70.8 (N = 24)	0.18
Mean number of patients seen by physicians per week	108.9 (N = 103)	92.0 (N = 24)	0.17
Mean number of years since graduation from medical school	22.7 (N = 104)	26.3 (N = 23)	0.24
Mean age of physicians (years)	48.5 (N = 105)	51.1 (N = 24)	0.38
Percentage of physicians who are males	88.8 (N = 107)	79.2 (N = 24)	0.21

NOTE: N = number of physicians responding to each question. SGST = stool guaiac slide test.

that they used the SGST were more likely than nonusers to rate it as more effective in detecting early-stage colorectal cancer than either the digital rectal examination or proctosigmoidoscopy. Physicians using the SGST were also more likely than nonusers to consider the test simple enough for their patients to understand and do on their own. Finally, users of the SGST were more likely than nonusers to report that they included other cancer screening tests in medical examinations of asymptomatic patients. This last finding may reflect differences in physicians' opinions about the benefits of early cancer detection and the value of cancer screening.

Practically speaking, our findings suggest that future efforts to promote use of the SGST among primary care physicians should emphasize its relative merits, compared with those of alternative screening procedures—especially its effectiveness in detecting early-stage cancer, its simplicity, and its acceptance by patients. For example, one might emphasize the fact that the SGST can detect cancers in parts of the colon not reached by other screening procedures (digital rectal examination and proctosigmoidoscopy) or highlight the fact that the SGST is inexpensive and noninvasive and is therefore more likely to be accepted by patients than alternative screening tests for colorectal cancer. We are not recommending, however, that physicians use the SGST in lieu of other methods for detecting colorectal cancer. As yet, there is insufficient evidence that screening for colorectal cancer by fecal occult blood testing can significantly reduce mortality from the disease. However, results from several large screening programs suggest that the SGST can help the physician detect colorectal cancer in an early stage of the disease, often before symptoms appear (5–11). The SGST may be useful to the physician for first-line screening of asymptomatic patients for colorectal cancer.

References

1. Izak, G., Stein, Y., and Karshai, A.: Quantitative determination of gastrointestinal bleeding using CR-51 labeled red blood cells. *Am J Dig Dis* 5: 24–31 (1960).
2. Gregor, D. H.: Occult blood testing for detection of asymptomatic colon cancer. *Cancer* 28: 131–134 (1971).
3. Ostrow, J. D., Mulvaney, C. A., Hansell, J. R., and Rhodes, R. S.: Sensitivity and reproducibility of chemical tests for fecal occult blood with an emphasis on false-positive reactions. *Am J Dig Dis* 18: 930–940 (1973).
4. Winawer, S. J., Sherlock, P., Schottenfeld, D., and Miller, D. G.: Screening for colon cancer. *Gastroenterology* 70: 783–789 (1976).
5. Gregor, D. H.: Diagnosis of large bowel cancer in the asymptomatic patient. *JAMA* 201: 943–945 (1967).
6. Gregor, D. H.: A progress report: detection of colorectal cancer using guaiac slides. *CA* 22: 360–363 (1972).
7. Globor, G. A., and Peskoe, S. M.: Outpatient screening for gastrointestinal lesions using guaiac-impregnated slides. *Am J Dig Dis* 19: 399–403 (1974).

8. Hastings, J. B.: Mass screening for colorectal cancer. *Am J Surg* 127: 228–233 (1974).
9. Winchester, D. P., et al.: A mass screening program for colorectal cancer using chemical testing for occult blood in the stool. *Cancer* 45: 2955–2958 (1980).
10. Gilbertson, V. A., McHugh, R. E., Schuman, L., and Williams, S. E.: The earlier detection of colorectal cancers: a preliminary report of the results of the occult blood study. *Cancer* 45: 2899–2901 (1980).
11. Winawer, S. J., et al.: Progress report on controlled trial of fecal occult blood testing for the detection of colorectal neoplasia. *Cancer* 45: 2959–2964 (1980).
12. American Cancer Society. Guidelines for the cancer-related check-up: recommendations and rationale. *CA* 30: 194–240 (1980).
13. James, W. G., and Lieberman, S.: What the American public knows and does about cancer and cancer tests. *Public Health Education About Cancer—UICC Tech Rep Series* 45: 66–79 (1979).
14. Morrow, G. R., Way, J., Hoagland, A. C., and Cooper, R.: Patient compliance with self-directed Hemoccult testing. *Prev Med* 11: 512–520 (1982).
15. Cummings, K. M., Michalek, A., Mettlin, C., and Mittelman, A.: Screening for colorectal cancer using the stool guaiac slide test. *Cancer*. In press.
16. Coleman, J. S., Katz, E., and Manzel, H.: *Medical innovation*. Bobbs-Merrill, New York, 1966.
17. Graham, S.: Studies of behavior change to enhance public health. *Am J Public Health* 63: 327–334 (1973).
18. Rogers, E. M., and Shoemaker, E. F.: *Communications of innovations: a cross-cultural approach*. Free Press, New York, 1971.
19. Rosser, W. W.: Screening in family medicine: the current situation. *J Fam Pract* 6: 503–509 (1978).
20. Schuman, S. H.: Prevention: the vital and unique role of the family physician. *J Fam Pract* 9: 97–102 (1979).
21. Williams, P.: How primary care physicians can improve cancer survival: early diagnosis, prevention. *The Clinical Cancer Letter* 5: 2 (1982).
22. Howe, H. L.: Enhancing the effectiveness of media messages promoting regular breast self-examination. *Public Health Rep* 96: 134–142 (1981).