

THE EFFECTIVENESS OF A SECURE EMAIL REMINDER SYSTEM FOR  
COLORECTAL CANCER SCREENING

by

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THE EFFECTIVENESS OF A SECURE EMAIL REMINDER SYSTEM FOR  
COLORECTAL CANCER SCREENING

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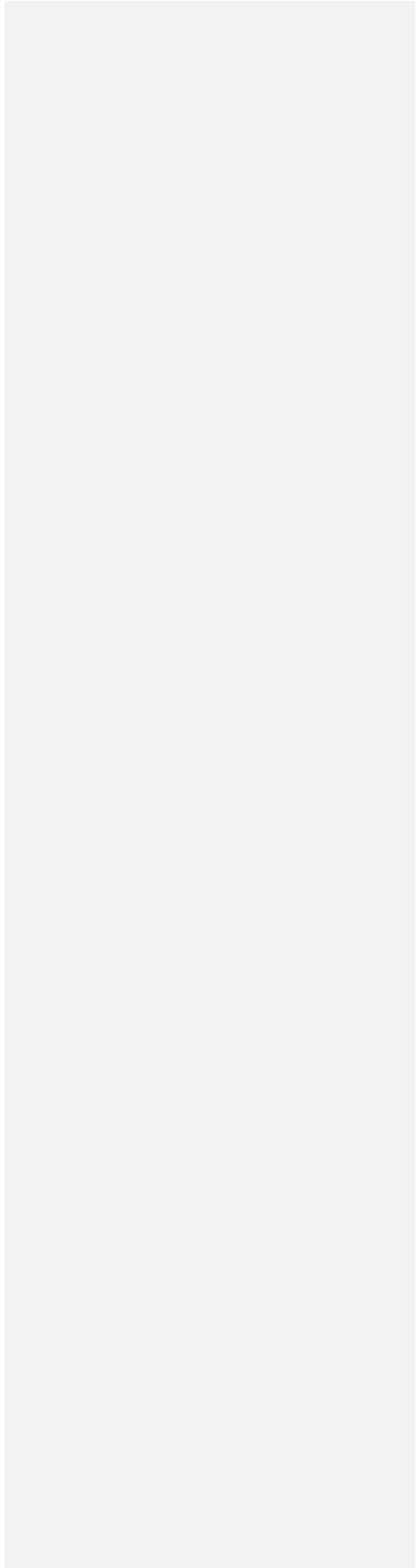
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## **ABSTRACT**

Colorectal cancer is the third most common cancer and the second most common cause of cancer death in the United States. Despite methods to improve early detection only 53% of the eligible population in the United States is current with these guidelines. Letter reminders have been shown effective in improving screening rates. Meanwhile computers and email usage have increased and even penetrated the field of medicine. This study looks at the effectiveness of using a secure email system linked to an electronic health record to send reminders to patients in an effort to increase colorectal cancer screening rates. **METHODS.** In a randomized prospective cohort study, 1409 subjects were randomly placed into one of three arms of the study: 1) usual care, 2) letter reminder or 3) email reminder. In the two intervention arms a letter or an email was sent inviting patients to pick up a fecal occult blood test at the lab for colorectal cancer screening. The number of completed colorectal cancer screenings was tallied after 3 months study period. **RESULTS.** Rates of colorectal cancer screening in the 3 groups were 8.7% in the usual care group, 24.2% in the letter reminder group and 23.2% in the email group. Significant statistical difference was seen between the usual care group and the letter reminders ( $p < 0.0005$ ) and between the usual care and email reminders ( $p < 0.0005$ ) but no statistical difference was seen between the letter reminders and the email reminders ( $p = 7.11$ ). **CONCLUSION.** Email reminders are as effective as letter reminders in increasing screening rates of colorectal cancer.

## **INTRODUCTION**

Colorectal cancer is the third most common cancer and the second most common cause of cancer death in the United States. The earlier it is detected the better the survival rate but often, symptoms do not present until the cancer is in advanced stages. Screening methods have been shown to reduce both the incidence and mortality rate of colorectal cancer. On average, only 53% of the eligible population in the US receives screening at the recommended intervals. Outreach programs using letter reminders have been shown effective in increasing screening rates but can cost up to \$319 per additional patient screened. In the meantime, computer and email use have been increasing among the general population as well as by physicians. The increasing presence of electronic health records have advanced to the point of including email capabilities, although privacy and security are still a main concern for both providers and their patients. This study looks at the effectiveness of using a secure email system linked to an electronic health record to send reminders to patients in an effort to increase colorectal cancer screening rates. It compares the effectiveness of email reminders with letter reminders and usual care.

## **BACKGROUND**

Colorectal cancer (CRC) is the second most common cancer in women and the third most common cancer in men in the Western world (1). In the United States colorectal cancer is the third most common cancer in both men and women with a predicted 148,810 new cases diagnosed in 2008 (American Cancer Society) (2). It is also the second leading

cause of cancer death for both men and women in the United States with a predicted 49,960 deaths for 2008 (2).

Most colorectal cancers develop from polyps arising on the mucosal wall of the colon. As these adenomatous polyps grow in size, they may develop dysplastic cells which eventually invade the bowel wall and then metastasize. Survival depends on when in this natural course the cancer is diagnosed (Table 1), so it is important to diagnose colorectal cancer in the earliest stages of the disease.

Unfortunately, presenting symptoms for colorectal cancer are vague and often occur late in the disease. These include abdominal pain, change in bowel habit and rectal bleeding or anemia. About half the patients presenting with symptoms are already at Dukes stage C or D (1). It is clear that screening methods are needed to detect and diagnose colorectal cancers at an earlier stage to increase the survival rate.

Several groups have produced guidelines for screening people of average risk for colorectal cancer, including the American Cancer Society (4), the American Academy of Family Physicians (5) and the U.S. Preventive Services Task Force (USPSTF) (6).

| Stage of Disease            | Dukes Classification | 5-Year Survival Rate |
|-----------------------------|----------------------|----------------------|
| Tumor limited to bowel wall | A                    | 80-95%               |
| Invading muscularis propria | B                    | 55-80%               |
| Lymph node positive         | C                    | 40%                  |
| Distant metastasis          | D                    | 10%                  |

Table 1. Colorectal cancer survival statistics (3).

Average risk patients are defined as those without inflammatory bowel disease, family history of colorectal cancer or one of several hereditary diseases such as Familial Adenomatous Polyposis, Hereditary Non-Polyposis Colon Cancer and Peutz-Jeghers Syndrome. All of the guidelines agree that screening should begin by age 50 and recommend one of the following methods of screening:

- 1) yearly fecal occult blood testing (FOBT),
- 2) sigmoidoscopy every 5 years,
- 3) annual FOBT plus sigmoidoscopy every 5 years, or
- 4) colonoscopy every 10 years.

#### **A Comparison of Screening Methods**

FOBT is the most widely used of the screening methods. Since blood vessels at the surface of a polyp or cancer in the colon are fragile and bleed easily, the FOBT can be used to screen for them by detecting blood within the feces. There are two types of tests in wide use, guaiac cards and fecal immunochemical test (FIT) cards. The guaiac cards detect blood from any source in the gastrointestinal tract, including blood from ingested red meat or partially digested blood originating in the stomach. Therefore, some dietary and medication restrictions are required in preparation for the test. The FIT cards detect only intact human hemoglobin and not digested blood, therefore this test is more specific for colorectal pathology and requires no dietary restrictions (7).

FOBT is also the most widely studied of the different screening methods. Several prospective randomized controlled trials have shown that periodic screening with FOBT



can reduce colorectal cancer mortality by 15-33% (8-10). Sensitivity of a single sample is an estimated 40% for guaiac cards and improves to > 90% with multiple samples repeated semiannually (6). The specificity is calculated to be 96-98% (6).

Sigmoidoscopy is used to directly visualize the distal colon's mucosa for polyps or colon cancer. With flexible sigmoidoscopy, up to half the colon (70 cm) can be screened. The evidence for the effectiveness of sigmoidoscopies in reducing mortality is indirect. Case-controlled studies using rigid sigmoidoscopy have shown a 60% mortality reduction but only in cases with lesions within reach of the sigmoidoscope (11). It is estimated that the sigmoidoscope will only detect 55% of all polyps and cancers since it is not possible to reach the proximal colon, especially considering that 20-30% of patients with advanced colon cancer in the proximal colon have no distal polyps (12). Since this is an invasive procedure, there are risks associated with sigmoidoscopy, including pain, gas and bleeding.

Colonoscopy directly visualizes the entire colon. Not only can this procedure be used for screening but it is also the follow-up test for those patients with positive FOBT and for patients who have a polyp found on sigmoidoscopy. In conjunction with polypectomy, colonoscopy has been shown to reduce the incidence of colorectal cancer by 76-90% in several cohort studies (13, 14). Like sigmoidoscopy, colonoscopy has the risks of pain, gas and bleeding. In addition, there are the added risks of anesthesia, major bleeding after polypectomy, and perforation of the bowel. Cost effectiveness studies have shown that colonoscopy is the most cost effective of the screening modalities (15, 16).

However, if more inexperienced providers begin to perform colonoscopy in an attempt to meet screening and surveillance recommendations, the complication rates may increase. Even the USPSTF states in its guidelines that “it is unclear whether the increased accuracy of colonoscopy compared with alternative screening methods (for example, the identification of lesions that FOBT and flexible sigmoidoscopy would not detect) offsets the procedure's additional complications, inconvenience, and costs.”(17).

Despite the availability of these guidelines and the compelling evidence of their effectiveness, only 60.8% of the 195,318 participants of the 2006 Behavioral Risk Factor Surveillance System survey reported having had an FOBT within 1 year preceding the survey or a lower endoscopy within 10 years preceding the survey (18) and 29.5% reported never having been screened. In addition, of those medical groups reporting to the National Committee on Quality Assurance, the average colorectal screening rate is only 53.3% for Medicare patients and 54.5% for commercial patients. (19)

### **Methods to Improve Health Screening**

Several methods have been used by healthcare providers and organizations to try to increase participation in preventive medicine efforts. These programs have included letters, telephone calls, mass media campaigns and even door to door solicitation. Efforts can be categorized into seven intervention components as described by Stone, et al (20): 1) reminders to patients or clinicians, 2) feedback to clinicians or to health plans, 3) education of the patient or the clinician on the health prevention guidelines, 4) incentives in the form of bonuses for the clinicians (i.e. pay for performance) or discounts for the

patients, 5) regulatory and legislative actions, 6) mass media campaigns, and 7) organizational change. A meta-analysis to show the relative effectiveness of these different interventions reviewed some 81 studies and, using both quantitative meta-regression analysis and qualitative analysis, concluded that reorganizing the delivery of preventive services with such things as planned preventive services and designated non-physician staff was the most effective strategy (20). Reminders were the next most effective.

Reminders can take the form of either inreach or outreach services. Inreach involves addressing the need for a colorectal cancer screening at every visit, even when the patient is there for another problem, and can be performed in either the outpatient or inpatient setting. Alerts and reminders, as prompts for inreach, have been shown to be effective in improving vaccination rates, breast cancer screening, cardiovascular risk reduction and colorectal cancer screening in the outpatient setting (21). In addition, indirect evidence that inreach is effective is the knowledge that frequency of office visits is one of the main factors correlating with whether or not a patient has had a colorectal cancer screening.(22). Finally, 74-94% of patients in one study who had not received colorectal cancer screening stated that a doctor's recommendation would have motivated them to undergo screening (23). The reasons for physicians to not recommend colorectal cancer screening to their patients are several and include the lack of a reminder system to identify those patients in need of colorectal cancer screening as a major factor (24). Other barriers include lack of time, too many other issues to address at the visit, and patient distrust (25). In addition, this effective method must rely on the patient to get an

appointment before the subject of screening can be discussed, which suggests that this reminder method alone would be inadequate to cover all patients needing screening.

A more proactive approach is by outreach. Outreach involves reminding patients of their personal screening recommendations independent of office visit utilization. Usually reminders are in the form of a letter or a phone call, but some studies have included videos and even sent the FOBT cards with the reminders. Lewis, et al looked at the difference in response rate between usual care and a letter reminder accompanied by a colon cancer decision aid video and instructions on how to obtain a test. He found a 15% rate of colorectal cancer screening in the intervention group as compared to a 4% rate in the usual care group (26). Other studies have looked at the rate of screening in groups who were mailed the FOBT cards with the reminder and found screening rates of 15% and 23.2% depending on whether or not a follow up reminder was sent (27, 28).

There are some significant barriers to screening even with these outreach methods including difficulty in arranging an appointment, cost of the test, patients feeling healthy and the discomfort of the test itself. One study designed specifically to look at the characteristics of members who responded to reminders found lower response rates in two groups: younger, healthier patients and those with the highest number of chronic diseases (29). In other words, those who, presumably, feel healthy and therefore don't think they need screening and those who have too many health concerns to worry about one more are less likely to respond to outreach methods.

The cost effectiveness of these outreach programs has also been examined. One study compared the costs of several types of interventions including usual care, letter reminder with follow up letter reminder, letter reminder with informational booklet, and a letter reminder, informational booklet and a follow-up phone call, and found that the letter reminder alone was the most cost-effective approach . The actual costs of a letter reminder/informational booklet followed by a phone call, including both fixed and variable costs (i.e. staff time to produce the letters, processing responses, costs of envelopes, paper and postage) was estimated to be about \$319 dollars per additional member screened (30). Other studies have calculated a more cost-effective \$94 per additional patient screened (26).

Given evidence of the effectiveness of reminder systems, several surveys have attempted to determine how widespread their use is in medical groups. Schmittiel, et al used data from the National Study of Physician Organizations and the Management of Chronic Illnesses (NSPO) and found that 51% of physician organizations with 20 or more clinicians in them used reminders for mammograms, 41% for influenza vaccinations and 26% for diabetic retinopathy screening. Factors that were associated with the use of reminders included whether or not the group was required to report quality results, the group's public recognition of quality and its information technology capabilities (31).

Information technology continues to improve the ways that we can communicate with one another. One of the more recent communication tools that has gained wide usage is email. A recent population survey showed that 79% of Americans have gone online in

2008 (32). Of these, 60% use email on a daily basis (33), and 65% of Americans go online to search for medical information (34). Although relatively few US adults report their doctor using new technologies (only 8% report their doctor using email to communicate directly with them), they are strongly in favor and value new medical technology (81% positively responded for email, specifically) (35). However, concerns about privacy are still evident, with 4% of American adults reporting that they (or their family members) had ever had their health information lost or stolen (36).

Computer and e-mail use has penetrated the medical field, too. Even as early as 1998 a survey showed that 82% of internists used computers for personal or professional reasons (37). Of these, 81% had technology to connect to the internet at home and 65% from the office. More than half reported using email daily in the office but only about 7% reported using it with patients. With the predicted increase in the use of electronic health records (EHRs) these numbers are likely to grow in the next decade (38). There are even discussions to secure reimbursement for time spent on email consultations (39).

Some potential advantages of email in healthcare have been enumerated by Car and Sheikh (40). Taking advantage of the asynchronous nature of email, patients can conveniently ask a question or request an appointment -- rather than playing "phone tag" to reach the doctor or waiting for office hours. The ease in which patients can be directed to additional health information on the web from an email is another advantage. Access to healthcare can potentially be improved as many phone calls and office visits might be replaced with emails (although no studies to this point have demonstrated this

advantage). However, some potential pitfalls to email use in healthcare are recognized. Use may widen the social disparities in healthcare access by disadvantaging those who cannot afford internet access. In addition, the style of email communication -- with its lack of vocal intonation, visual cues and other non-verbal communications -- may increase diagnostic and communication errors. The problems of patient privacy and violation of provisions of the Health Insurance Portability and Accountability Act (HIPAA) are also an ongoing concern.

Patient opinion regarding the use of email in patient-physician communication has been recorded in two studies (41, 42). In patients who have not yet used email to communicate with their provider, the concerns are mostly of a logistic nature. Some patients express concern about trying a new form of communication and prefer to continue with more "comfortable" forms of communication, such as face-to-face communication, telephone or letters. Whether or not the messages will be successfully delivered concerns many patients. Security and privacy are also concerns among patients. In those patients participating in an email pilot study the group using email were increasingly satisfied with the convenience of communicating with their provider as compared to the control group (42).

For physicians, guidelines have been developed for the use of email in communicating with patients (43). These include establishing rules and expectations with the patient with regards to appropriate email use, acknowledgment of the receipt of messages, the physician responding to email in a timely fashion, obtaining informed consent from the

patient, maintaining privacy, and documentation of the communication in the patient's chart. One study looked at whether physicians using email were following these guidelines and found 58-75% were not following one or more of the recommendations (44). In general, however, studies of physicians who use email to communicate with their patients show their high satisfaction with this mode of communication (41, 42, 44).

Further research is still needed to better define the role for email communication including its use in delivering preventive care reminders. The only study available found no difference in email and letter reminders in promoting screening mammograms (45). As part of a larger study aimed at promoting screening mammograms, a subgroup of subjects was selected to receive email reminders. This subgroup consisted of employees of a large healthcare facility whose email address was available. Letter reminders were sent to 488 of them while 399 of them received email reminders. The percentage of patients current in their mammogram screenings were 68.1% for those receiving letter reminders and 72.2% for those receiving email reminders. There was no statistical difference between the 2 groups.

The purpose of this work was to explore email use in delivering another type of preventive health reminder, CRC screening reminders. This study compared email reminders to both usual care and to letter reminders in their effectiveness to increase screening rates using FOBT in patients past due for CRC screening.



IRB approval was sought and granted for this study. The requirement of informed consent was waived because of the low risk and in order not to influence the behavior of the subjects. No one but the primary investigator had access to the subjects' personal health information or medical records listed in the protected database during the study. Population statistics were performed during the analysis part of the study but no personal identifiable information was revealed as a result for the analysis.

## **METHODS**

### **Setting**

This study was conducted in a nonprofit Health Maintenance Organization (HMO) in the Northwest USA with approximately 479,000 members. The HMO has an electronic health record (EHR) which contains patient demographics, medical histories, outpatient encounter diagnoses, procedures and progress notes. It also contains information about future appointments that are scheduled with both primary care clinicians and specialists. Another information system contains information about hospitalizations, including diagnoses and surgical procedures performed during those hospitalizations. Outside records from previous health care providers are also scanned into the EHR when they become available.

The HMO is actively developing programs to encourage patients to participate in colorectal cancer screening. An automated telephone reminder system is currently being tested, as is a program which promotes colorectal cancer screening to patients during

influenza vaccination campaigns. Primary care providers are also encouraged to send a health maintenance reminder to their patients during their birthday month. This practice, even if followed, would still miss patients who have not yet signed up with a primary care provider.

Another information system is available at the HMO to aid clinicians and their staff to identify patients for both inreach and outreach efforts. Known as the “panel support tool” it is used to track preventive medicine needs and quality measures. Various queries can be performed to identify patients who are in need of labs, screening tests, or adjustment in their medications based on recommended guidelines. In addition to individual patient’s preventive health needs, a clinician can view his patient panel’s overall statistics for several measures (including colorectal cancer screening) and can retrieve lists of patients who are not in compliance with recommended measures.

The HMO also provides an online software application which allows patients to access portions of their medical record and to send secure electronic messages to their physician. Patients can view most of their laboratory test results, past and future appointment times, request appointments or referrals and renew medications, among other features. The application is web-based and password-protected with 128-bit encryption. Patients are required to actively request enrollment in this service using a simple online application, at which time they provide a home email address. When a clinician sends an email to a patient, a generic message is sent to their home email alerting the patient to login to the

secure email system to retrieve their message. The emails both sent and received become part of the patient's medical record.

### **Selection of Subjects**

In November, 2007, the HMOs research center was preparing for a large scale outreach for CRC screening. A total of 18,847 patients had been identified who were both enrolled in the secure email service and were due for CRC screening. Of these, a random sample of 2100 patients were selected as subjects in this study, based on power calculations. Included were men and women between the ages of 50 and 80 who had accounts on the secure email system and who had 12 or more months of insurance coverage with no more than one 45 day break prior to November 1, 2007. From this group were excluded those patients who had either a FOBT in the previous 12 months, a sigmoidoscopy in the previous 5 years, or a colonoscopy in the previous 10 years as recorded in their medical record. Also excluded were those patients with a total colectomy, a history of colon cancer or inflammatory bowel disease, use of anticoagulants like Coumadin or Plavix, or an oncology visit in the previous 12 months. If a patient had a sigmoidoscopy or colonoscopy ordered in the previous six months, but had not yet had the procedure, they were also excluded on the assumption they had chosen one of these tests instead of FOBT. We did not wish to imply that patients should change that choice, since we were recommending FOBT in the reminders. We also wanted to allow enough time for patients to arrange their appointment and complete the procedure. Also excluded were patients for whom a FOBT had been ordered in the

previous 3 months. Finally, patients who were on hospice or in a nursing home facility as well as those patients with the diagnosis of dementia were also excluded from the test.

### **Study Design**

This randomized prospective cohort study had three arms. Of the 18,847 patients between the ages of 50-80 with secure email accounts due for colorectal cancer screening, 2100 were randomized into one of three study arms: the first cohort were to receive usual care, the second cohort were to receive a single letter reminder, and the third cohort were to receive a single email reminder delivered through the secure email system. The three cohorts were matched for age and sex.

Two months following identification of the cohorts, the primary investigator generated the letter or email reminders for patients in the intervention arms of the study. The delay between cohort identification and initiation of the study was due to a desire to avoid a holiday season and the known poor response rate during this time of year. In addition, January 1st is a date when many employees can change their healthcare benefits, so subjects enrolled prior to that date might leave the study due to a change in benefit plans. Because of this delay, the primary investigator reviewed the health records of all subjects to be certain that the initial cohort screened for the study was still eligible for enrollment. The initial chart review was done using the panel support tool and any new discrepancies were verified in the EHR. A total of 691 patients were found to be ineligible during this second screening because they had received their screening test in the interim, had unenrolled in the secure email system, or were no longer members of the HMO. Those

that were still eligible were enrolled in the study and, if in one of the intervention arms, had the letter or email reminder generated within their electronic medical chart and sent during the first two weeks of January, 2008. A FOBT was ordered for subjects of the intervention arms at this time. The content of the email and letter reminders was identical (see appendix A). In order for a subject to respond to this reminder, they had to travel to an HMO laboratory to pick up screening cards, complete the test at home, and return the cards by mail to the laboratory.

Ninety days after sending the letter and email reminders, the subjects' charts were again reviewed to determine which subjects had completed either a FOBT, a sigmoidoscopy or a colonoscopy within those 90 days. Also tracked during this time were any returned reminder letters or unread email reminders. Additionally, for those who completed some form of colon cancer screening the number of days to completion of the screening was noted. SPSS version 12 was used for the statistical analysis of the results.

## **RESULTS**

There were approximately 479,000 members in the general population of the HMO. Of these 38.08% were enrolled in the secure email service at the time of the study. One might assume that a large proportion of those enrolled would be young. In fact, patients 50-80 years of age account for 53% of those patients who are enrolled in the email program (Table 2).

| Age Group | Signed up for Secure Email (percentage) |
|-----------|---|
| 18-24     | 17.36                                   |
| 25-34     | 36.77                                   |
| 35-49     | 37.99                                   |
| 50-59     | 44.07                                   |
| 60-69     | 46.05                                   |
| 70-80     | 33.85                                   |

Table 2. Percent of HMO patients enrolled in secure email by age group

Of the 126,097 patients between 50-80 years old in the HMOs population at the beginning of the study the proportion of those that were already compliant with the CRC screening guidelines was 59.2%. This includes a commercial rate of 55.2% and a Medicare rate of 67.6%. Within the population of patients enrolled in secure email the compliance rate was 69.15%. This supports a supposition that the patients who enroll in the secure email system are more likely to be proactive in their health care.

Of the original 2100 patients slated for enrollment, 691 were found ineligible by delayed chart review. Table 3 shows the reasons for their ineligibility. As can be seen, 60% of them had either completed a CRC screening test or had one ordered but not yet completed. Another 26% had unenrolled in the secure email system, and only 5% had left the HMO's healthcare plan.

| Reason Ineligible                              | Percent |
|--|---------|
| Screening test already completed               | 33%     |
| Screening test ordered but not completed yet   | 27%     |
| No longer enrolled on secure email system      | 26%     |
| No longer member of HMO                        | 5%      |
| Age (turned 81 during delay)                   | 0.2%    |
| Other (new anticoagulation start, cancer, etc) | 8%      |

Table 3. Reasons for ineligibility after chart review

| Demographic | Usual Care  | Letter      | Email       | p value |
|-------------|-------------|-------------|-------------|---------|
| Age (years) |             |             |             |         |
| 50-59       | 259 (34.4%) | 249 (33.1%) | 245 (32.5%) | 0.950   |
| 60-69       | 174 (35.7%) | 158 (32.4%) | 155 (31.8%) |         |
| 70-80       | 61 (36.1%)  | 51 (30.2%)  | 57 (33.7%)  |         |
| Gender      |             |             |             |         |
| Male        | 215 (35.0%) | 202 (32.9%) | 197 (32.1%) | 0.954   |
| Female      | 279 (35.1%) | 256 (32.2%) | 260 (32.7%) |         |
| Totals      | 494 (35.1%) | 458 (32.5%) | 457 (32.4%) |         |

Table 4. Distribution of subjects within each cohort

The 1409 remaining subjects had been randomized into the three arms of the study before the chart review. The number of subjects remaining in each arm of the study (and therefore enrolled in the study) was 494 receiving usual care, 458 receiving the letter reminder and 457 for email reminders. Subjects were originally randomized based on gender and age and no difference in either in the three cohorts was detected in the enrolled group. (Table 4)

Response to the intervention is shown in Table 5. Positive response is defined as completion of either a FOBT, sigmoidoscopy or colonoscopy within the 3 months of the study. In addition, those subjects whose history was updated during the study period to document a prior sigmoidoscopy (within the past 5 years) or colonoscopy (within the past 10 years) not previously recorded in their record were counted as responding positively to screening in the initial analysis. These subjects would have been excluded from the study if documentation had been complete at beginning of the study period. The positive response rate in the study group overall was 18.5%. The positive response rate within each arm were 8.7% for patients receiving usual care, 24.2% for subjects receiving the letter reminder and 23.2% for subjects receiving the email reminder.

|                 | Subjects receiving screening (% of cohort)* | Subjects not receiving screening (% of cohort) |
|-----------------|---|--|
| Usual Care      | 43 (8.7%)                                   | 451 (91.3%)                                    |
| Letter Reminder | 111 (24.2%)                                 | 347 (75.8%)                                    |
| Email Reminder  | 106 (23.2%)                                 | 351 (76.8%)                                    |
| Totals          | 260 (18.5%)                                 | 1149 (81.5%)                                   |

Table 5. Positive response rates (Screening rates during the study period) in each cohort  
\*Includes subjects whose records were updated during the study period to indicate prior compliance with screening recommendations

A significant difference among at least 2 of the groups was demonstrated using Pearson chi-square test ( $p < 0.0005$ ). Chi square analysis was then performed on separate pairings of the 3 groups and there was a statistically significant difference between usual care and letter reminders ( $p < 0.0005$ ) and between usual care and email reminders ( $p < 0.0005$ ) but not between letter reminders and email reminders ( $p = 0.711$ ).

Analysis was performed again excluding as positive responses subjects who had updated their screening history during the study period. These results are shown in Table 6. The statistically significant difference in the groups remains the same.

Success of an outreach program depends on the ability to successfully reach patients. In

|                  | Subjects receiving screening (% of cohort)* | Subjects not receiving screening (% of cohort) |
|------------------|---|--|
| Usual Care       | 38 (7.8%)                                   | 451 (92.2%)                                    |
| Letter Reminders | 107 (23.6%)                                 | 347 (76.4%)                                    |
| Email Reminders  | 103 (22.7%)                                 | 351 (77.3%)                                    |
| Total            | 248 (17.8%)                                 | 1149 (82.2%)                                   |

Table 6. Positive response rates (Screening rates during the study period) in each cohort.  
\*Excludes from analysis those subjects whose medical records were updated during the study period to indicate prior screening



this study, only two of 458 letter reminders (0.4%) were returned for incorrect addresses. Of the emails sent out, 159 (35%) had not been opened by the subjects during the three month study period. Because of this high rate of unopened email, further exploration was performed. IRB approval was requested and granted for this additional exploration. One month after the initial study completion, the charts of those subjects who had received but not opened their emails were reviewed again. If a reason was not evident, a second email was sent and responses were monitored carefully. Of the 159 subjects with unopened email, 10 (2%) had unenrolled from the secure email system, 9 (2%) subjects had opened other emails during the study period but not the reminder email, 8 (1.75%) subjects had read the reminder email in the period between the end of study and the subsequent chart review. The remaining subjects had the follow-up email sent and 19 (4%) were returned undeliverable.

Thirty-two (7%) of the subjects who received the initial email reminders replied to those emails. We had anticipated these responses, expecting and receiving several types including questions about the email, correction of the medical history or questions about other health issues.

Three subjects notified us that they were declining to follow through with the colorectal cancer screen due to more pressing health concerns or other reasons. An example is:

“Health problems I expect to die from include at the top of my list stroke or heart problems. I am overweight. This contributes to those. But I don’t expect to die of cancer. Nobody of my blood relatives back as far as we can go has ever died

of cancer. I view the attention spent on testing and retesting for cancer, especially X-rays which I think are as likely to cause cancer with repeated exposures year after year, not a thing that will benefit me. I would much rather spend my time getting a thorough work up of my heart and blood vessels than contribute to the far end of some medical bell curve on a set of diseases I never expect to get. But thank you for your concern.”

Most responses expressed gratitude for the program. An example is:

“Thank you very much – I am very impressed that we are doing outreach to patients on the disease prevention/health maintenance needs. As the former Manager of Clinical Preventive Services, I was able to get this type of assistance, so I am so pleased that [the HMO] is finally taking the prevention seriously. And thanks for your prompt response! ....Thank you!”

Only 3 responses expressed anger, such as in the following example (phone number replaced with # by author):

“IF YOU WANT TO GET A HOLD OF ME FOR SOMETHING IMPORTANT – CALL ###-###-#### AFTER 2PM PACIFIC. OTHERWISE, LEAVE ME ALONE. WHEN I WANT OR NEED SOMETHING, I’LL CALL YOU.”

## **DISCUSSION**

This study shows that reminders are an effective tool in promoting colon cancer screening in the population studied. More important, email reminders were as effective as letter reminders and both were significantly more effective than usual care (which may include both inreach and outreach by the clinicians) in increasing the rate of screening for CRC in delinquent patients. The response rates to both the email and letter reminders were almost 25%. This is much higher than the expected response rate, based on current literature, of 14%. One reason may be that the population of the study had all enrolled in the secure email program, which suggests that this was a population of early information technology (IT) adopters. This population already had a higher colorectal cancer screening rate than the general HMO population and thus are likely to be a self-selected population of more health-conscious patients.

One potential advantage that email reminders have over letter reminders, although not explored in this work, is a potential cost savings. Outreach takes time and effort and in most cases needs to be performed manually. The estimated cost of letter reminder campaigns with follow-up is \$94-\$319 per additional member screened (26, 30). Email reminders, on the other hand, can be automated. The timing, verification of need, and generation of a reminder email can all be automated, and once implemented should be maintainable with considerably less personnel costs as compared to letter reminders. One could imagine a web-based system with a page devoted to recommended preventive health care needs and when they were next due. An annual email could be sent if there were preventive services due. Links could be available for more detailed explanations of the recommendations, to request tests and appointments, or to ask the clinician any

questions the patient may still have, thus giving patients more control over their health and health care needs.

One drawback to using any outreach method is access to accurate contact information. Contact rate in this study was not directly studied. While only two of 458 letters were returned for incorrect address, there was not a process in place to assure that all returned letters were delivered to the investigators. In addition, a correct mail address does not correspond to read mail. For the email reminders, 4% of emails were undeliverable and 27% were never opened. The rate of incorrect email addresses is likely to be higher in this HMO than street addresses since street addresses are verified on a regular basis. An effective email reminder program may, therefore, require effort to keep email addresses up to date.

This study has several limitations. As previously mentioned, the population for this study was a group of early IT adopters. Whether or not email reminders would be as effective as letter reminders as more patients (with presumably less motivation) enroll in online services is unknown. Email reminders may not be as effective in a more general population. In addition, patient preference was not considered in this study. Based on return email responses alone, the reception was overall positive although variability was wide.

The study period was 90 days. The question arises as to whether or not this is long enough for patients to complete their colorectal cancer screening. Figure 1 shows a graph of the number

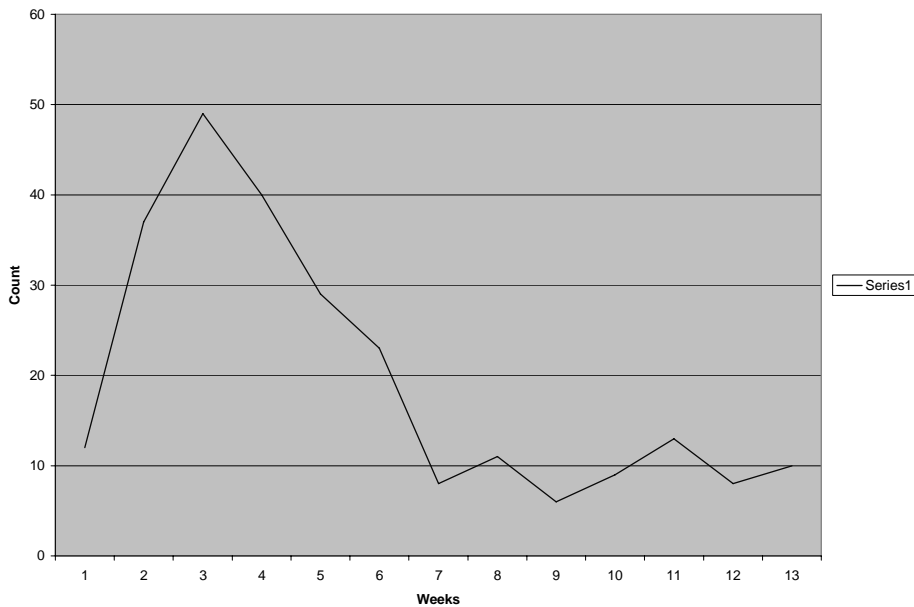


Figure 1. Weeks to completion of screening

of screenings completed per week during the study. As can be seen the majority were completed within the first 6 weeks of the study. It is unknown how many patients completed the screening test after the 90 day study period. However, the response rate from this intervention was higher than previously reported in the literature, even within the 90 days.

Letter reminders have been proven effective in promoting other preventive health programs but further study would be needed to see if email reminders would also be effective. In addition, this study only addressed one health screen for colorectal cancer. It is unclear whether a reminder containing several preventive health recommendations

would have a similar response rate. One study suggests that the compliance rate is lower when several different health screens are included in the reminder (27), but further study of this issue is suggested.

Several other interesting findings resulted from this work that deserve further study.

First, a significant number of subjects did not open their email during the 90 days of the study and it is unclear how to decrease this rate. Some patients read other emails but not the reminder email. This may be because they did not recognize the sender (i.e. the sender was not their primary care provider) or because they ignored it due to the subject line (in this study it was “CRC reminder” for easier indexing in the EHR). Further studies may want to explore whether better responses will occur if the reminder comes from the patient's own primary care provider.

The replies that patients sent in response to the email reminder also shed light on the different attitudes people have toward reminders. Nearly 8% of the email patients sent some form of reply so it does not represent an accurate picture of how many feel positively or negatively toward reminders. Certainly no data is available from the letter recipients to see if they had similar reactions to their reminders. Also, no survey was done with the usual care group to see if they would have preferred a reminder or not. However, the types of responses were illustrative. Some patients were thankful and appreciated the effort to remind them of their health needs while others preferred to concentrate on more urgent health issues and did not want to be bothered. Still others were very opposed to the idea of a health care reminder. This raises the questions as to

whether there should be an opt-out choice in an email reminder program and if a patient does opt out for how long it should be valid. These questions remain for another study.

## CONCLUSION

In this and other studies, letter reminders have been shown effective in increasing preventive services screening rates among patients. But the computer is playing an ever-increasing role in medicine. This study showed that email reminders were as effective as letter reminders in increasing colorectal cancer screening rates. Although more study is needed before it can be widely implemented the possibility of automating the process and subsequent cost savings make email a promising new tool in preventive medicine.

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## APPENDIX A

Sample Letter/mail

Dear @MM@ @NAME@ ,

Colon cancer is the third most common cancer in men and women in the United States and the risk increases with age. With regular routine screening it can be prevented. Colon cancer often starts without any symptoms making regular screening even more important. [REDACTED] recommends that all adults aged 50 and older have regular screening to look for colon cancer or growths that can turn into cancer. This can be accomplished with a simple yearly stool test to look for hidden blood in the stool.

Our records indicate that you are due for colon cancer screening. If you feel this is in error, please contact us so that we may update your records. Otherwise, we highly recommend that you have this simple screening test done. Just come into any [REDACTED] lab and pick up the stool guaiac cards which have been ordered for you.

If you have any questions or would like to learn more please contact us or go to [REDACTED] to find out more about colon cancer and the screening test.

Sincerely,  
D Muller, MD