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Effectiveness of Promoting Colorectal Cancer Screening During Annual Workplace Health Monitoring

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Colorectal cancer (CRC) is the fourth most common and leading cause of cancer in the United States with a screening rate of 72%. Purposes of the project were to educate environmental investigator workers about CRC screening tools, encourage testing, and measure behavioral effects one year later. Workplace health monitoring programs present an opportunity to educate and encourage eligible workers to seek testing. During a 2023 annual health monitoring program, 552 environmental health workers were examined. Based on CRC risk factors, 74 were encouraged to discuss screening with a primary care provider (PCP), educated about various screening tools, tests' sensitivity, and costs. 54% received a reminder letter encouraging a conversation with a PCP about screening. In 2024, 62 of the 74 eligible workers returned for exams and were asked if they discussed screening with a PCP, if screening occurred and, if screened, what method was chosen. 39 (63%) had the discussion and 25 (40%) completed screening: 14 via colonoscopy and 11 via Cologuard. Of the 41 workers who received reminder letters 17 (41.5%) completed testing. Encouraging workers to seek CRC screening was moderately effective: 40% (n=25) who received a recommendation from a PCP to obtain screening did so while 41.5% who received a follow up letter completed screening.

Keywords: *colorectal, cancer, screening, workplace, health monitoring*

Introduction

Colorectal cancer (CRC) is the fourth leading cause of cancer and cancer deaths in the United States of America (USA) (Centers for Disease Control and Prevention n.d.a, Centers for Disease Control and Prevention n.d.b, U.S. Cancer Statistics Data Visualizations Tool, based on 2022 submission data (1999-2020): U.S. Department of Health and Human Services, Centers for Disease Control and Prevention and National Cancer Institute, https://www.cdc.gov/cancer/dataviz).

In 2021 the US Preventive Services Task Force (USPSTF) recommended changing the beginning screening age from 50 to 45. The Centers for Disease Control and Prevention (CDC) via Healthy People 2030 project set a screening goal of 74.4% for the USA. Table 1 illustrates 2020 screening rates for males, females, insured and uninsured in the USA and Texas.

Worksite screening and health monitoring programs present a significant opportunity to increase screening rates and promote the health and safety of employees. Designed properly, such programs can influence health behaviors, improve knowledge

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and skills, and facilitate necessary/recommended screenings and immunizations (Centers for Disease Control and Prevention n.d.d).

The Occupational Safety and Health Administration indicates "the fundamental purpose of surveillance (health monitoring) is to detect and eliminate the underlying causes such as hazards or exposures of any discovered trends and thus has a prevention focus" (U.S. Department of Labor Occupational Safety and Health Administration 2025).

The purposes of the current practice improvement project imbedded into a mandatory health monitoring program were:

1. To educate workers about CRC screening tools.
2. Encourage eligible persons to seek screening.
3. Measure the behavioral effect one year later.

Designing a health screening program requires an understanding of the targeted population's risk factors, national recommendations/standards, participant determinants and predictors of utilization.

Literature Review

The USPSTF recommends screening all adults aged 45 to 75 years for CRC. Recommended methodologies for screening vary and should be determined by patient/clinician discussion. Screening option recommendations include:

- High-sensitivity guaiac fecal occult blood test (HSgFOBT) or fecal immunochemical test (FIT) every year.
- Stool DNA-FIT every 1 to 3 years.
- Computed tomography colonography every 5 years.
- Flexible sigmoidoscopy every 5 years.
- Flexible sigmoidoscopy every 10 years + annual FIT.
- Colonoscopy screening every 10 years (U.S. Preventive Services Task Force 2021, American Cancer Society n.d.).

Vallis and Wang (2022) indicate lifestyle choices in addition to personal and familial risk factors as outlined in Figure 1 contribute to CRC and pre-cancerous adenoma incidence. High alcohol intake, excess weight, inactivity, elevated intake of red and/or processed meat, and smoking are the lifestyle choices most responsible for a higher incidence of CRC. On the other hand, healthy lifestyles seem to be inversely proportional to CRC risk. (Combined effect of Healthy Lifestyle Factors and Risks of Colorectal Adenoma, Colorectal Cancer, and Colorectal Cancer Mortality: Systematic Review and Meta-Analysis (Yu et al. 2022).

Figure 1. *Colorectal Cancer Screening Questionnaire*

Have you ever been screened for colorectal cancer (CRC):
Yes___ No___
If so, how many years ago? (Enter # of years)
_____

Changeable risk factors: lifestyle issues

Are you or do you have the following?

1. Overweight (BMI>25) or obese (BMI>30):
   Yes___ No___
2. Sedentary lifestyle (<150 minutes of exercise weekly)
   Yes___ No___
3. Diet consisting of heavy red meat and/or processed meats
   Yes___ No___
4. Current or former smoker
   Yes___ No___
5. Alcohol use (men >2 drinks/day & women >1 drink/day)
   Yes___ No___

Unchangeable risk factors: personal/family history or other

Are you or do you have the following?

1. Age between 50 & 75
   Yes___ No___
2. Family history of CRC Yes___
   No___
3. Personal history of CRC
   Yes___ No___
4. History of intestinal polyps
   Yes___ No___
5. History of irritable bowel disease
   Yes___ No___
6. Ethnicity: African American or Jewish Yes___
   No___
7. Diabetes mellitus
   Yes___ No___

Based on the above responses the nurse practitioner recommends you Yes___
No___
seek CRC screening.

Do you intend to seek CRC screening with your PCP/gastroenterologist?
Yes___ No___

Ouakrim et al. (2013) conducted a literature review of 4,986 journal articles related to factors associated with CRC screening participation for people at increased

risk due to family history of the disease. Findings indicated "receiving recommendations from clinicians was the most consistent predictor identified across studies. The review also revealed a consistent pattern of association with predictors related to familial aspects of CRC, such as strength of family history, and relationship to the affected relative. Among the psychological constructs, social influence emerged as the most consistent predictor of screening participation".

Beydoun and Beydoun (2008) reviewed the literature for predictors of CRC screening behaviors among average-risk older adults in the USA. Findings showed "frequently reported predictors of CRC screening behaviors include older age, male gender, marriage, higher education, higher income, White race, non-Hispanic ethnicity, smoking history, presence of chronic diseases, family history of CRC, usual source of care, physician recommendation, utilization of other preventive health services, and health insurance coverage." Perceived barriers, a key construct in the Health Belief Model, was the greatest predictor of CRC screening. The Health Belief Model suggests health behavior can be predicted based on the constructs of perceived barriers, benefits, self-efficacy and threats (Jones et al. 2015).

Lau et al. (2020) reviewed 30 studies in a meta-analysis of the Health Belief Model and the relationship to CRC screening. Findings indicated "perceived susceptibility, benefits and cues to action were directly associated with screening history or intention. Perceived barriers inversely associated with screening history or intention. The studies included also found other modifying factors including sociodemographic and cultural norms."

The American Cancer Society (2016) indicates there are five top reasons why people do not get screened for CRC: fear of undergoing a painful procedure, belief that since there is no family history of CRC there is no personal risk, symptom free means no personal risk, expense is too great, and inconvenience and other associated costs are too high.

Age, gender and insurance coverage are frequently cited as predictors for health behavior in general and CRC screening in particular (Centers for Disease Control and Prevention n.d.c).

The Centers for Disease Control (CDC) statistics reveal significant discrepancies in those with (75%) and without (39%) health insurance regarding CRC screening (see Table 1).

Table 1. *Colorectal Screening Rates in the USA and Texas 2020*

	USA	Texas
Up to date	72%	67%
Males	71%	64%
Females	74%	69%
Insured	75%	73%
Uninsured	39%	32%

Source: https://www.cdc.gov/cancer/colorectal/statistics/use-screening-tests-BRFSS.htm.

Atlas et al. (2023) tested interventions to improve timely follow up on patients with abnormal breast, cervical, colorectal and lung cancer results. Interventions among 11,980 patients included electronic health record (EHR) reminders and other

outreach efforts such as reminder letters. 31.4% of individuals in the EHR reminder group and 22.9% in the usual care group completed screening within 120 days.

Studies have shown varied improvements in CRC screening uptake when reminder letters are mailed to patients. Coronado et al. (2018) reviewed the literature and found a wide variation in the effectiveness of reminder letters on CRC screening from 22% to 45% depending on a wide variety of patient population variables (gender, race, socioeconomic status, etc.), Coronado's study increased CRC uptake by 13.9%. Baker et al. (2014) showed a 44.9% increase in CRC screening when multiple phone calls and reminder letters were used as interventions.

Methods

Environmental investigators for the State of Texas were required to undergo annual health-monitoring exams to detect undiagnosed work-related illnesses and fitness for duty. The full-time employees ranged in age from early 20's to mid-70's, were provided full health insurance with Blue Cross Blue Shield of Texas through the employer and had incomes in the $40,000 to $75,000 range. Exams included: complete work and personal health histories, vital signs, chest X ray, spirometry, electrocardiography, audiometry, laboratory work (complete blood count, 24 chemistries, lipids, hemoglobin A1c and lead levels), workplace appropriate immunizations (tetanus, hepatitis A&B), and a physical examination. Additionally, employees completed a brief CRC screening questionnaire (Figure 1) in 2023. The nurse practitioner (NP) provided brief counseling during the examinations directed at moving employees 45 years and older and/or with CRC risk factors to seek follow up with a primary care provider (PCP). The NP shared information with employees meeting the inclusion criteria and placed emphasis on types of screening and sensitivity of the tools available. Individuals with modifiable risk factors were encouraged to lose weight, exercise, follow a healthy diet, stop smoking and/or reduce alcohol consumption. Data were gathered over a two-year period (2023 & 2024) during the months of January through April.

Inclusion criteria for the intervention were participants at least 45 years of age, had never been screened or not screened in the past 10 years, had a family history of a first degree relative or multiple family members with a history of CRC, and individuals with a personal history of polyps.

In 2023, 552 health monitoring evaluations were conducted (52% male and 48% female). In 2024 562 evaluations were performed (53% male and 47% female). 128 investigators had CRC screening within the past 10 years while 74 met the inclusion criteria for screening. The 128 already screened for CRC represent a screening percentage of 63% which is below the national (75%) and state (73%) screening rates for eligible persons with insurance (see Table 1).

In 2023 a reminder follow-up letter (Figure 2) was sent to 41 of the 74 (55%) eligible participants two months following the initial screening. The letter reminded individuals about CRC risk factors and screening recommendations made during the screening.

Figure 2. *Follow-up Letter*

Dear May 4, 2023

You may remember during Health Monitoring this year I mentioned the need for you to discuss getting screened for colorectal cancer with your primary care provider. I recommended screening either because of your age or other risk factors related to colorectal cancer. I am writing to give you a follow-up reminder. Please go get screened! Below are a few important risk factors related to colorectal cancer.

Changeable risk factors: lifestyle issues

1. Overweight (BMI>25) or obese (BMI>30):
2. Sedentary lifestyle (<150 minutes of exercise weekly)
3. Diet consisting of heavy red meat and/or processed meats
4. Current or former smoker
5. Alcohol use (men >2 drinks/day & women >1 drink/day)

Unchangeable risk factors: personal/family history or other

6. Age between 45 & 75
7. Family history of colorectal cancer
8. Personal history of colorectal cancer
9. History of intestinal polyps
10. History of irritable bowel disease
11. Ethnicity: African American or Jewish
12. Diagnosis of diabetes mellitus

At next year's Health Monitoring exam, I will ask you about your screening experience. Please let me know if you have any questions.

In 2024, 62 of the eligible 74 workers needing screening returned for health monitoring. Twelve employees from 2023 no longer worked at the agency, had an internal job change, were sick or did not participate in the health monitoring and subsequently lost to follow up.

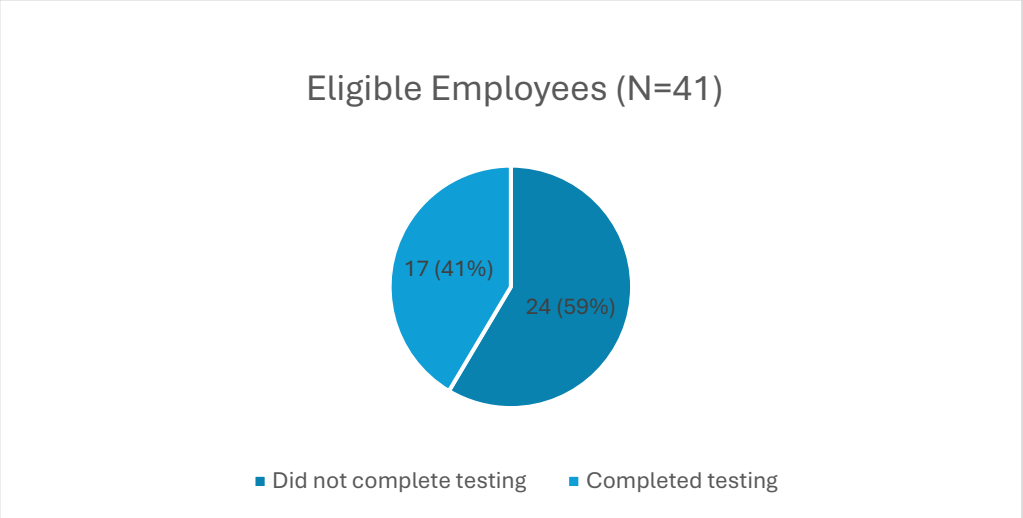
Returning workers (62) who received a CRC screening recommendation in 2023 were again questioned in 2024 to determine if they discussed screening with a PCP, if testing were recommended, and, if screened, what type of screening was performed (colonoscopy or stool-based test).

Results

A total of 552 workers completed the questionnaire (see Figure 1) in 2023. Two-hundred and two (202) met the inclusion criteria described above, 128 had already been screened within the past 10 years and 74 needed screening.

Of the 74 workers needing screening, 41 (55%) received letters encouraging further action related to getting CRC screening. Twelve workers (16%) were lost to follow up during the 2024 exams due to no longer being employed, sick, or had an internal job change not requiring health monitoring. Seven of the 12 lost to follow up had received reminder letters. Consequently, 62 workers were asked follow-up questions (see Table 2) and were included in the data analysis. 39 (63%) spoke with a PCP about getting screened for CRC, 37 (60%) received a recommendation to get tested, and 25 (40%) completed screening: 11 (44%) via stool testing and 14 (56%) via colonoscopy (see Table 2). 17 (41.5%) who received the reminder letter successfully completed screening. Figure 3 shows the impact of a reminder letter on CRC screening.

Figure 3. *Impact of Reminder Letters*



Reasons for not getting screened included scheduling issues, insurance denial, personal health problems, procrastination, and family turmoil. All stool-based testing was performed using Cologuard.

Table 2. *CRC Screening Questionnaire Follow-Up Results (N=62)*

Did you discuss CRC screening with your PCP?	39 (63)%
Did your PCP recommend CRC screening?	37 (60%)
Did you get CRC screening?	25 (40%)
Stool based screening	14 (56%)
Colonoscopy screening	11 (44%)

Discussion

Health monitoring exams provide an additional opportunity to remind employees to seek other health maintenance services such as CRC screening, mammograms, pap smear, adult immunizations (shingles, pneumonia, influenza, COVID, tetanus) and other CDC recommended screenings. Compared to other health monitoring programs the current program actualized CDC's idea of improving health behavior, reducing risks and enhancing overall health related to CRC[1] via a worksite screening.

Many eligible workers were unaware of the CRC recommended screening age of 45. Once educated about the recommendation for screening, workers were very receptive and expressed interest in pursuing follow up with a PCP. Future research and practice improvement projects might focus on ideas presented below which incorporate suggestions from other researchers cited above.

Workers who did not get screened provided excuses such as: "I forgot", "my insurance denied the request", or "my other medical issues prevented me from getting screened". Regardless of the excuse, some individuals have health beliefs that negate seeking and using preventive health services. Future projects/research would benefit by including both locus of control and health belief models incorporated into the screening/assessment tools.

While results on the study population are reported above there is only anecdotal information related to impact on family members of workers tested. The NP requested each eligible CRC screening candidate to inform family members about recommended screening guidelines. Three workers indicated relatives decided to seek testing once informed of the national CRC screening recommendations. The total trickle-down impact of the recommendation is unknown. Again, future research might focus on how family members influence CRC screening habits and behavior. Additionally, future research might center on the influence workplace CRC screening effects family members habits and beliefs.

Prompting workers participating in annual health monitoring examinations to seek CRC screening was moderately effective: 68% (n=25) who received a recommendation from a PCP to obtain screening did so. Future programs might include providing take-away health education information (written or electronic) as a reminder to pursue screening.

Only 17 (41.5%) of eligible workers who received a follow up letter completed CRC screening. The data does not provide evidence the letters were instrumental in individuals completing the screening. Would any of the 17 (41.5%) have been screened if not prompted by a letter? Did the follow up letter make any difference? Future programs might include a second or third follow up letter or phone call to boost compliance.

41.5% of participants who received the reminder letter successfully completed screening. Other researchers (Coronado et al. 2018, Baker et al. 2014) have shown results as low as 13.9% and as high as 44.9% when multiple interventions were performed. The current project was successful by sending only one follow up letter as a reminder.

[1]https://www.cdc.gov/workplace-health-promotion/php/model/index.html.

The current practice improvement project did not control for outside variables such as encouragement by other health care providers, family/significant others, or health department campaigns to obtain CRC screening. Locus of control and health beliefs drive preventive health behaviors, and the current project did not consider either. Finally, results of the current program may or may not be applicable to other population. To improve screening rates, future programs might include distributing education information (written or electronic) as a reminder to pursue screening.

Conclusions

Encouraging workers to seek CRC screening was moderately effective: 40% (n=25) who received a recommendation from a PCP to obtain screening did so while 41.5% who received a follow up letter completed screening. Associated screening costs are negligible and easily incorporated into any employee health care encounter.

Applications to Professional Practice

The current practice improvement project encouraged workers to seek colorectal cancer (CRC) screening and measured the behavioral effect one year later. Follow up reminder letters proved to be helpful in facilitating screening efforts. Workplace health monitoring and screening programs present an opportunistic moment for occupational health and environmental nurses to educate and encourage eligible workers to seek testing from a primary care provider (PCP). Incorporating USPSTF recommended screenings into mandated health monitoring programs requires minimal expense, effort, and time. Primary care and occupational health nurses have the knowledge, expertise, and access to workers to recommend and follow up on suggestions.

References

American Cancer Society (2016, June 30) *Top 5 reasons people don't get screened for colorectal cancer*. Available at: https://pressroom.cancer.org/Top5reasonscolorectalcancer.

American Cancer Society (n.d.). *American Cancer Society Guideline for Colorectal Cancer Screening.* Available at: https://www.cancer.org/cancer/colon-rectal-cancer/detection-diagnosis-staging/acs-recommendations.html.

Atlas SJ, Tosteson ANA, Wright A, Orav EJ, Burdick TE, Zhao W, et al. (2023) A Multilevel Primary Care Intervention to Improve Follow-Up of Overdue Abnormal Cancer Screening Test Results: A Cluster Randomized Clinical Trial. *JAMA* 330(14): 1348–1358.

Baker DW, Brown T, Buchanan DR, Weil J, Balsley K, Ranalli L, et al. (2014) Comparative effectiveness of a multifaceted intervention to improve adherence to annual colorectal cancer screening in community health centers: a randomized clinical trial. *JAMA Internal Medicine* 174(8): 1235–1241.

Beydoun HA, Beydoun MA (2008) Predictors of colorectal cancer screening behaviors among average-risk older adults in the United States. *Cancer Causes Control* 19(Dec): 339–359.

Centers for Disease Control and Prevention (n.d.a). *Cancer Statistics at a Glance*. Available at: https://gis.cdc.gov/Cancer/USCS#/AtAGlance/.

Centers for Disease Control and Prevention (n.d.b). *Cancer Statistics at a Glance: Leading Cancer Cases and Deaths All Races and Ethnicities, Male and Female, 2020*. Available at: https://www.cdc.gov/cancer/dataviz.

Centers for Disease Control and Prevention (n.d.c). *Colorectal (Colon) Cancer: Use of Colorectal Cancer Screening*. Available at: https://www.cdc.gov/cancer/colorectal/statistics/use-screening-tests-BRFSS.htm.

Centers for Disease Control and Prevention (n.d.d). *Workplace Health Promotion: Workplace Health Strategies*. Available at: https://www.cdc.gov/workplacehealthpromotion/health-strategies/index.html.

Coronado GD, Petrik AF, Vollmer WM, Taplin SH, Keast EM, Fields S, et al. (2018) Effectiveness of a Mailed Colorectal Cancer Screening Outreach Program in Community Health Clinics The STOP CRC Cluster Randomized Clinical Trial. *JAMA Internal Medicine* 78(9): 1174–1181.

Jones CL, Jensen JD, Scherr CL, Brown NR, Christy K, Weaver J (2015) The Health Belief Model as an Explanatory Framework in Communication Research: Exploring Parallel, Serial, and Moderated Mediation. *Health Communication* 30(6): 566–576.

Lau J, Lim TZ, Wong GJ, Tan KK (2020) The health belief model and colorectal cancer screening in the general population: A systematic review. *Preventive Medicine Reports* 20(Oct): 101223.

Ouakrim DA, Lockett T, Boussioutas A, Keogh L, Flander LB, Hopper JL, et al. (2013) Screening participation for people at increased risk of colorectal cancer due to family history: A systematic review and meta-analysis. *Familiar Cancer* 12(3): 459–472.

U.S. Department of Labor Occupational Safety and Health Administration (2025) *Medical Screening and Surveillance.* Available at: https://www.osha.gov/medical-surveillance.

U.S. Preventive Services Task Force (2021) *Final Recommendation: Colorectal Cancer: Screening.* Available at: https://www.uspreventiveservicestaskforce.org/uspstf/recommendation/colorectal-cancer-screening.

Vallis J, Wang PP (2022) The Role of Diet and Lifestyle in Colorectal Cancer Incidence and Survival. In JA Morgado-Diaz (ed.), *Gastrointestinal Cancers*. Brisbane (AU): Exon Publications.

Yu J, Qi F, Kim JH, Zhu Y (2022) Combined effect of healthy lifestyle factors and risks of colorectal adenoma, colorectal cancer, and colorectal cancer mortality: Systematic review and meta-analysis. *Frontiers in Oncology* 12(Jul): 827019.