

The Impact of the Patient Centered Medical Home on Colorectal Cancer Screening
in a Navy Primary Care Clinic

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Abstract

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Background: Colorectal cancer (CRC) is the second leading cause of cancer death among men and among women. Even though available screening tests are effective at decreasing incidence of and deaths from CRC, use of CRC screening is still inadequate. Nationally, the CRC screening rate is only 68% among eligible patients for medical facilities in the top 10% for CRC screening. The Patient Centered Medical Home (PCMH) is a team-based model of care that purports to improve access to care, patient satisfaction, and performance of cancer screening and other preventive measures.

Methods: This retrospective cohort study was designed to test the hypothesis that implementation of the PCMH is associated with an increase in CRC screening rates in patients enrolled to PCMH care teams compared to those in non-PCMH care teams. All eligible patients, age 51-75, enrolled to a Navy primary care clinic were included (3,519 patients in 2007, and 4,120 in 2011). Data were analyzed comparing baseline to post-implementation time points for PCMH teams and non-PCMH teams in the clinic.

Results: All teams improved CRC screening completion from baseline, with PCMH teams outperforming non-PCMH teams in rate of completion (adjusted odds ratio (OR) =1.30, $p=0.001$) and rate of patients never screened (adjusted OR = 0.77, $p=0.001$).

Conclusion: The study shows that PCMH implementation was associated with improved CRC screening.

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DEDICATION

To my father

INTRODUCTION

Colorectal cancer (CRC) is the second leading cause of cancer death among men and among women.¹ Colonoscopy, flexible sigmoidoscopy and fecal occult blood cards are effective methods to identify early lesions and decrease the incidence of and deaths from CRC.² Yet, among the top ten percent of medical facilities in the United States, the CRC screening rate was only 68%.³ The Patient Centered Medical Home (PCMH) is a team-based model of care that purports to not only improve access to care and patient and staff satisfaction, but also to raise performance of preventive screening including cancer screening.

The bulk of recent literature on the PCMH describes the experiences of specific practices or groups in their transition from traditional practice to the new model, including barriers, challenges, costs and effectiveness in meeting the defined characteristics of a PCMH.⁴⁻³⁹ The most significant report, a study of 36 practices describing outcomes of the National Demonstration Project, included two composite scores with components of CRC screening.¹⁶ This study compared practices who completed the transition on their own to those who received support from external facilitators. The first composite score of ambulatory quality was developed by the Ambulatory Care Quality Association (ACQA), a collaborative group with representatives from the American Academy of Family Physicians (AAFP), the American College of Physicians (ACP), America's Health Insurance Plans (AHIP), and the Agency for Healthcare Research and Quality (AHRQ).⁴⁰ It included CRC screening and 15 other measures (covering cancer screening, immunization, tobacco interventions, coronary artery disease management, diabetes control and antibiotic use). CRC screening was considered adequate in this measure if a subject had received one or more of: fecal occult blood testing within a year, flexible sigmoidoscopy

within 5 years, double contrast barium enema within 5 years or colonoscopy within 10 years.

The second measure used by this study was a composite score for compliance with all prevention recommendations of the U.S. Preventive Services Task Force (USPSTF), including screening for CRC with fecal occult blood testing within a year, flexible sigmoidoscopy within 5 years, or colonoscopy within 10 years. The study found that after implementing the PCMH, the percent of total compliance with the ACQA set rose by 8.3% (facilitated) and 9.1% (self-directed transitions to the PCMH), while total compliance with the USPSTF recommendations rose by 4.3% after facilitated transitions while falling by 0.7% after self-directed transitions. However, these were composite measures and specific CRC screening rates were not provided. This study employed a quasi-experimental design, therefore the wide spectrum of attributes among examined practices may confound any attempt to quantify performance on subsections of either composite measure, such as including CRC screening within the ACQA set or USPSTF compliance measure.

A review article by Wender and Altshuler in 2009 specifically notes the absence of any published study on the effect of the PCMH on cancer morbidity and mortality, despite the fact that the PCMH model seems poised to improve these outcomes.³⁹

The Naval Hospital Bremerton Family Medicine Clinic began a phased implementation of the PCMH model in July 2010. To implement the model, panel size was decreased from 1400 to 1100 patients per provider full-time equivalent (FTE). Additional focus was placed on preventive health measures, including proactive use of patient lists to contact those “overdue” for colorectal cancer screening. Nursing and support staff numbers were increased and their roles were

redefined to include this outreach effort and a screening-status check during each patient appointment.

This was a retrospective cohort study designed to test the hypothesis that implementation of the PCMH was associated with an increase in CRC screening rates in patients enrolled to PCMH care teams compared to those in non-PCMH care teams. The study employed a valid quasi-experimental study design called the “separate-sample pretest-posttest control group design”.⁴¹ This study was approved by the Institutional Review Boards (IRB’s) of the University of Washington and the Navy Medicine Western Region.

METHODS:*Study Design:*

The use of a retrospective cohort approach was because the phased implementation of the PCMH had already been completed. The Family Medicine Clinic included five patient care teams (PCTs), each including 3-5 full-time equivalent primary care providers and 3300-5500 patients. The PCMH model was implemented in one PCT in July 2010, then implemented in the other four teams in July 2011, providing a one year window with side-by-side operation of PCTs in both PCMH and non-PCMH models.

Since the PCMH already had been implemented, we could not conduct a prospective study. Furthermore, if we were to design a prospective study, randomization of patients would have required reassignment to different providers and care teams, which is impractical, hurts continuity of care, and is likely to decrease efficiency and effectiveness of care, especially within a time-frame similar to this study.

Study Sample Selection:

This study examined the enrolled population of the designated Family Medicine Clinic. Records were identified by accessing a database report, which provided a list of people assigned to the Family Medicine Clinic who were eligible for CRC screening.

Inclusion Criteria:

Subjects were eligible for this study if they were aged 51-75 years, and continuously enrolled in the two military health insurance programs, TRICARE Prime or TRICARE Plus, for at least 24 months. This is the basis of inclusion in the Military Health System Population Health Portal (MHSPHP) dataset. The age groups were chosen because the evidence in support of CRC screening is strongest for people ages 50-75. Since evaluation of adequate CRC screening via MHSPHP uses a retrospective approach, subjects were not included until reaching age 51, allowing evaluation of whether screening was done within the first year after reaching the age recommended to start CRC screening. The required enrollment period would decrease the chance of inappropriately assigning credit for CRC screening or blame for lack of screening to the current provider. Active duty members, retirees and family members of all races and ethnic groups were included in the dataset. Inclusion criteria were identical for the PCMH and non-PCMH groups.

Exclusion Criteria:

Subjects were excluded if they had current or prior colorectal cancer or a history of total colectomy, based on diagnosis and procedure codes from the electronic medical record. Detailed codes are listed in the MHSPHP Methodology attached below as Appendix 1.

Sample Size Estimation:

This study included all eligible patients in the population, therefore the study accurately describes actual CRC screening rates vice estimating them via sampling. In December, 2007, 3160 patients met eligibility criteria. In July, 2011, 4120 patients met eligibility criteria. A

power calculation was conducted. Assuming a control group of 2500 patients, intervention group with 1000 patients, $\alpha = 0.05$, screening rate in the 65% range, there was 80% power to detect a change in the screening rate of 5% (65% to 70%).⁴² Therefore, the final sample sizes had sufficient power to detect the differences in the CRC screening rates.

Data Collection:

Two data samples were extracted from a centralized database within the electronic health record. The same data collection procedure was employed for two points in time: December 2007 and July 2011, hereafter referred to as the sampling points. The first sampling point was chosen because it precedes any planning, discussion or pre-implementation training related to the PCMH model. This should represent the true baseline performance of the clinic. The second sampling point represents the end of a one year period including both PCMH and non-PCMH PCTs. After this point, all PCTs operated in the PCMH model.

Data was extracted from the Military Health System Population Health Portal (MHSPHP). This database pulls data from many sources for analysis and use in optimizing patient care. The methodology this system uses for identifying records, defining inclusion and exclusion criteria, and creating “patient action lists” is attached below as Appendix 1. MHSPHP produces patient action list reports periodically from data that is continuously updated. These reports include patient lists for each provider showing enrolled patients that are eligible for CRC screening, their date and type of last CRC screening, and protected health information (PHI) including date of birth (DOB), sponsor’s SSN, address and telephone number. Note that the MHSPHP criteria for adequate screening are a consolidation of standards from major medical societies in the mid-

2000's, including the U.S. Preventive Services Task Force, American Society for Gastroenterology and American Cancer Society. These medical society standards are in flux as newer screening tests, including CT colonoscopy and fecal immunochemical testing (FIT), have come into use, but the MHSPHP standards do not yet include the newer tests.

The Department Head of Population Health at Naval Hospital Bremerton maintains an archive of patient action lists and has developed tools to provide them to Family Medicine Clinic leadership and PCTs in convenient form. He examined the patient action lists for December 2007 and July 2011, converted DOB to age in years, converted provider names to "PCMH" or "nonPCMH" and dropped all PHI from the list, leaving only that data included on the data abstraction form in Appendix 2. This abstracted data was provided to the principal investigator for analysis. No key code was created or retained and no linkages could be made back to individual patients after de-identification of the data.

Outcome Measures:

The primary outcome was the rate of patients appropriately screened for colorectal cancer. Patients were considered adequately screened if they had a fecal occult blood test (FOBT) within 12 months or a flexible sigmoidoscopy within 60 months or a colonoscopy within 120 months.

Secondary outcomes were length of time overdue for CRC screening and proportion of patients never screened for CRC. The length of time overdue for screening was calculated by determining the date screening was due, then calculating the number of days from that date to the sampling point. The CRC screening due date was designated as the latest of two dates: appropriate date

after last CRC screening (using the same time intervals as above) or date subject turned 50 years old (the earliest age at which routine screening is indicated). Subjects with no screening test found were excluded from the time overdue analysis. Since the MHSPHP report only looks back ten years and subjects may or may not have had screening over ten years ago, the CRC screening due date for these subjects, and thus the length of time overdue, cannot be determined. Finally, the proportion of patients never screened for CRC was designated as the proportion with no CRC screening within the previous ten years.

Data Analysis:

Rates of up-to-date CRC screening for the PCMH group and non-PCMH group subjects were calculated as a percentage at each sampling point and the differences between groups at each sampling point were compared for statistical significance using bivariate analysis (chi square test) and multivariate logistic regression to control for effects of age and gender. To test for a differential effect of the PCMH model over time, multiple logistic regression was performed combining data from both sampling points and including an interaction term for enrollment group and sampling point.

The average length of time overdue for screening (excepting those with no screening test found) was then analyzed. The data was not normally distributed, so the differences between PCMH and non-PCMH groups at each sampling point was compared for statistical significance using bivariate analysis (Mann-Whitney test) and multiple linear regression to adjust for age and gender. To test for a differential effect of the PCMH model over time, multiple linear regression was performed combining data from both sampling points and including an interaction term for

enrollment group and sampling point. Multiple linear regression analyses were run with both original data and a log transformation of days overdue.

The proportions of patients in the PCMH group and non-PCMH group who were never screened were calculated and the differences between these proportions were compared for statistical significance using both bivariate analysis (chi square test) and multivariate logistic regression (to control for effects of age and gender). To test for a differential effect of the PCMH model over time, multiple logistic regression was performed combining data from both sampling points and including an interaction term for enrollment group (PCMH vs non-PCMH) and sampling point (2007 vs 2011).

RESULTS:**Study Population**

The study included 3,519 subjects in the 2007 sampling point, with 1,174 in the PCMH group and 2,345 in the non-PCMH group. The 2011 sampling point included 4,120 subjects, with 1,039 in the PCMH group and 3,081 in the non-PCMH group. Demographic characteristics of the study population and CRC screening outcomes are shown in Table 1.

Table 1. Patient Demographics and CRC Screening Outcomes

	2007			2011		
	PCMH N=1,174	Non-PCMH N=2,345	p-value	PCMH N=1,039	Non-PCMH N=3,081	p-value
Demographics						
Age* Mean (\pm SD)	59.0 (\pm 6.4)	58.5 (\pm 6.2)	0.054	59.0 (\pm 6.4)	58.4 (\pm 6.1)	0.011
% Male [†]	52.6%	47.4%	0.001	51.0%	50.0%	0.555
CRC Screening						
% Up to date [†]	57.1%	57.4%	0.834	74.6%	68.9%	<0.001
Time (days) overdue ^{††}	356 (161-659)	356 (172-659)	0.880	337 (109-652)	365 (148-764)	0.054
% Never screened [†]	27.4%	27.5%	0.940	13.4%	18.6%	<0.001

* p-value from t-test

† p-value from chi square test

†† Time overdue reported as median (interquartile range), p-value from Mann-Whitney test

There was no significant difference in age between the PCMH and non-PCMH groups in 2007 (59.0 versus 58.5 years, $p=0.054$), but the difference was statistically significant in 2011 (59.0 versus 58.4 years, $p=0.011$). Similar results were found when using methods of non-normal distribution of ages, including analysis of medians, interquartile ranges and Mann-Whitney tests (data not shown).

Gender distributions were significantly different in 2007, but similar in 2011. In 2007, PCMH group enrollees were 52.6% men while non-PCMH group enrollees were 47.4% men ($p=0.001$). In 2011, the two groups were nearly identical (51% vs. 50% male, $p=0.555$).

Bivariate Analyses

Primary Outcome Measure: Adequate CRC Screening Rate

In 2007, the percentage of enrolled patients adequately screened for CRC was similar in the PCMH group and the non-PCMH group (57.1% vs. 57.4%, $p=0.834$). In 2011, the rate of adequate screening for CRC was higher than in 2007 for both groups. Nevertheless, the PCMH group adequately screened a higher percentage of enrollees than the non-PCMH group (74.6% vs. 68.9%, $p<0.001$). Results are shown in Table 1 and Figure 1.

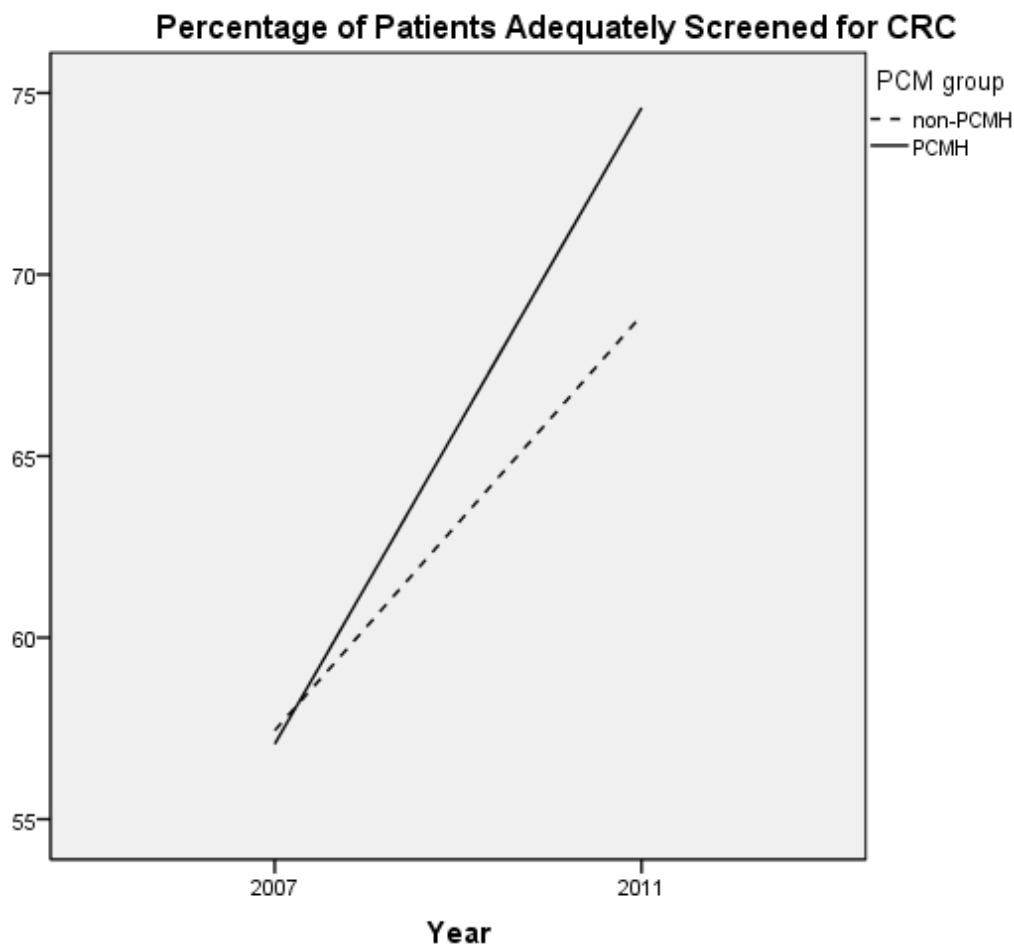


Figure 1. Percentage of Patients Adequately Screened for CRC Over Time, by Enrollment Group

Secondary Outcome Measures:

Average length of time overdue

In both 2007 and 2011, the average length of time overdue had a non-normal distribution. Using the Mann-Whitney test, there was no significant difference in the distribution of length of time overdue between the PCMH and non-PCMH groups in 2007 (median 356 days for each group, $p=0.88$), while the difference was marginally statistically significant in 2011 (median 337 days vs. 365 days, $p=0.054$), as shown in Table 1.

Proportion of patients never screened for CRC

In 2007, the proportion of enrolled patients without a CRC screening test recorded within ten years was similar in the PCMH group and the non-PCMH group (27.4% vs. 27.5%, $p=0.94$). In 2011, the proportion of enrolled patients without recorded CRC screening was lower than in 2007 for both groups. However, the PCMH group had a significantly lower unscreened rate than the non-PCMH group (13.4% vs. 18.6%, $p<0.001$). These bivariate results are shown in Table 1 and Figure 2.

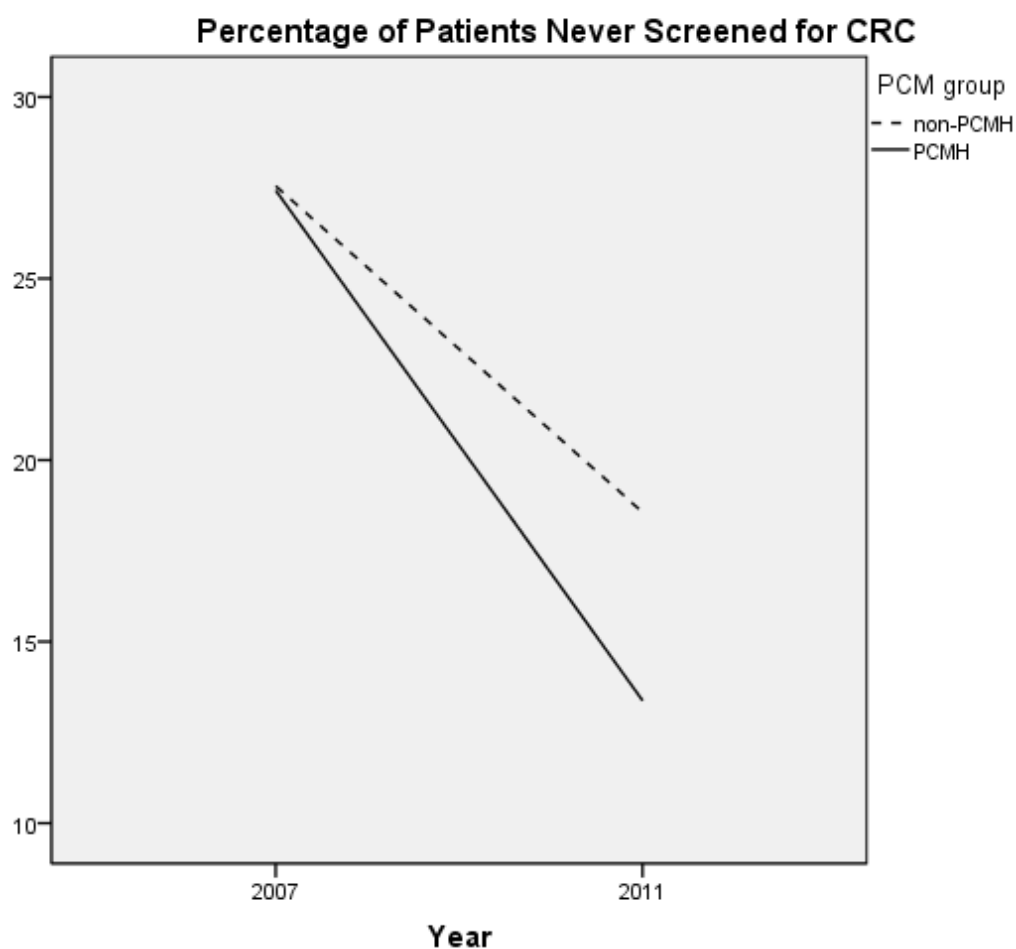


Figure 2. Percentage of Patients Never Screened for CRC Over Time, by Enrollment Group

Multivariate Analyses

Primary Outcome Measure: Adequate CRC Screening Rate

As shown in Table 2, multivariate logistic regression adjusting for gender and age found that the difference in the rate of patients adequately screened for CRC remained statistically non-significant between the PCMH and non-PCMH group in 2007 ($p=0.608$), but was statistically significant in 2011, with the PCMH group adequately screening a higher proportion than the non-PCMH group (Odds Ratio (OR) =1.30, $p=0.001$). The differential effect of the PCMH over time was tested by combining the two sampling point data sets and introducing an interaction term for enrollment group and sampling point. This interaction term was statistically significant (multivariate logistic regression OR=1.36, $p=0.006$), confirming that the rate of adequate CRC screening increased over time by more in the PCMH group than in the non-PCMH group (Table 3).

Table 2. Rates of Adequate CRC Screening, Multivariate Logistic Regression

	2007			2011		
	Odds ratio	95% CI	p-value	Odds ratio	95% CI	p-value
PCMH*	0.96	0.84 – 1.11	0.608	1.30	1.11 – 1.53	0.001
Male*	1.06	0.93 – 1.22	0.366	1.22	1.06 – 1.39	0.005
Age†	1.04	1.03 – 1.06	<0.001	1.04	1.03 – 1.06	<0.001

* Odds ratios compare to reference categories of non-PCMH and female gender, respectively

†Odds ratio for age reflects the increase in adequate CRC screening associated with a one-year increase in age

Table 3. Rates of Adequate CRC Screening, Multivariate Logistic Regression

Combining All Data

	Odds ratio	95% CI	p-value
PCMH*	0.96	0.83 – 1.11	0.573
Male*	1.14	1.03 – 1.25	0.008
Age [†]	1.04	1.035 – 1.052	<0.001
Year 2011*	1.65	1.48 – 1.85	<0.001
PCMH*Yr [‡]	1.36	1.09 – 1.68	0.006

* Odds ratios compare to reference categories of non-PCMH, female gender, and 2007, respectively

† Odds ratio for age reflects the increase in adequate CRC screening associated with a one-year increase in age

‡ Interaction term testing whether rate of adequate CRC screening changes over time differently when comparing PCMH to non-PCMH enrollees. Typically examined only for significance vs. non-significance.

In 2011 and in the combined analysis, gender was associated with a significant difference in rate of adequate CRC screening. Results of bivariate analyses for 2007 and 2011 are presented in Table 4, showing the only significant difference to be among women in 2011, where PCMH enrollees had a higher rate of adequate screening than non-PCMH enrollees (76.2% vs. 65.5%, $p < 0.001$). There were no significant differences between PCMH and non-PCMH groups in rate of adequate screening for men in 2011 ($p = 0.694$) or either gender in 2007 (men $p = 0.555$, women $p = 0.817$). Stratifying the combined multivariate logistic regression by gender (Table 5) confirms that the differential effect of the PCMH model was significant in women (interaction term OR 1.65, $p = 0.001$) but not in men (interaction term $p = 0.551$).

Table 4. Rates of Adequate CRC Screening by Gender, Bivariate Analysis

	2007			2011		
	PCMH	Non-PCMH	p-value*	PCMH	Non-PCMH	p-value*
Male	57.1%	58.6%	0.555	73.0%	72.0%	0.694
Female	57.0%	57.0%	0.817	76.2%	65.6%	<0.001

* p-value from chi square test

Table 5. Rates of Adequate CRC Screening, Multivariate Logistic Regression
Stratified by Gender

	Male			Female		
	Odds ratio	95% CI	p-value	Odds ratio	95% CI	p-value
PCMH*	0.93	0.76 – 1.14	0.476	1.00	0.82 – 1.23	0.994
Age [†]	1.04	1.03 – 1.05	<0.001	1.045	1.03 – 1.05	<0.001
Year 2011*	1.85	1.57 – 2.18	<0.001	1.49	1.28 – 1.74	<0.001
PCMH*Yr [‡]	1.11	0.82 – 1.49	0.511	1.65	1.21 – 2.24	0.001

* Odds ratios compare to reference categories of non-PCMH, female gender, and 2007, respectively

† Odds ratio for age reflects the increase in adequate CRC screening associated with a one-year increase in age

‡ Interaction term testing whether rate of subjects never screened for CRC changes over time differently when comparing PCMH to non-PCMH enrollees. Typically examined only for significance vs. non-significance.

Secondary Outcome Measures:

Length of time overdue

Multiple linear regression adjusting for gender and age, and with inclusion of an interaction term for enrollment group and sampling point (PCMH*Yr), was performed to test whether length of time overdue changed over time differentially for PCMH and non-PCMH enrollees (Table 6).

This analysis confirms that the difference between enrollment groups did not change differentially over time, as the interaction term was not statistically significant ($p=0.257$). In multiple linear regression analysis of each sampling point separately (data not shown), the difference between the PCMH and non-PCMH group in time overdue for CRC screening was likewise statistically non-significant (2007 $p=0.672$, and 2011 $p=0.086$). Regression analyses generated nearly identical p-values with original data and log transformation of days overdue.

Table 6. Time Overdue for Screening, Multivariate Linear Regression Combining All Data

	Coefficient*	Std. Error	T	p-value
PCMH	-.018	.046	-.388	.698
Male	.023	.031	.717	.473
Age	.005	.003	1.761	.079
Year	.024	.037	.653	.514
PCMH*Yr [†]	-.079	.070	-1.134	.257

* Coefficients for multivariate linear regression of log (days overdue)

† Interaction term testing whether time overdue for CRC screening changes over time differently when comparing PCMH to non-PCMH enrollees. Typically examined only for significance vs. non-significance.

Proportion of patients never screened for CRC

As shown in Table 7, multivariate logistic regression, adjusting for gender and age, found that the difference between the PCMH and non-PCMH group in the proportion of patients never screened for CRC remained statistically non-significant in 2007 ($p=0.723$), but was statistically significant in 2011, with lower odds of being unscreened in the PCMH group than the non-PCMH group ($OR=0.77$, $p=0.001$). The differential effect of the PCMH over time was tested by combining the two sampling point data sets and introducing an interaction term for PCMH and sampling point, as shown in Table 8. This interaction term was statistically significant (multivariate logistic regression $OR=0.67$, $p=0.003$), confirming that the proportion of patients never screened for CRC decreased over time by more in the PCMH group than in the non-PCMH group.

Table 7. Proportion Never Screened for CRC, Multivariate Logistic Regression

	2007			2011		
	Odds ratio	95% CI	p-value	Odds ratio	95% CI	p-value
PCMH*	0.97	0.83 – 1.14	0.723	0.77	0.65 – 0.90	0.001
Male*	1.15	0.99 – 1.33	0.076	0.82	0.72 – 0.94	0.005
Age [†]	1.07	1.06 – 1.09	<0.001	0.96	0.95 – 0.97	<0.001

* Reference categories are non-PCMH and female gender, respectively

[†] Odds ratio for age reflects the increase in adequate CRC screening associated with a one-year increase in age

Table 8. Proportion Never Screened for CRC, Multivariate Logistic Regression

Combining All Data

	Odds ratio	95% CI	p-value
PCMH [*]	1.04	0.88 – 1.21	0.665
Male [*]	0.83	0.74 – 0.92	0.001
Age [†]	0.92	0.915 – 0.934	<0.001
Year [*]	0.59	0.52 – 0.67	<0.001
PCMH*Yr [‡]	0.67	0.52 – 0.87	0.003

* Odds ratios compare to reference categories of non-PCMH, female gender, and 2007, respectively

† Odds ratio for age reflects the increase in adequate CRC screening associated with a one-year increase in age

‡ Interaction term testing whether rate of subjects never screened for CRC changes over time differently when comparing PCMH to non-PCMH enrollees. Typically examined only for significance vs. non-significance.

In both 2007 and 2011, age was associated with significantly different proportions of subjects without CRC screening within ten years (Table 7). The direction of that difference changed over time: in 2007, a one-year increase in age was associated with an increase in never having been screened for CRC (OR = 1.07, 95% CI 1.06 – 1.09), while in 2011, a one-year increase in age was associated with a decrease in never having been screened (OR = 0.96, 0.95 – 0.97).

In 2011 and in the combined analysis, gender was associated with significantly different proportions of subjects without CRC screening within ten years. Results of bivariate analyses for 2007 and 2011 are presented in Table 9, showing the only significant difference to be among women in 2011, for whom a lower proportion of PCMH enrollees than non-PCMH enrollees had no prior screening (13.8% vs. 20.8%, $p < 0.001$). There were no significant differences between

PCMH and non-PCMH groups in the proportion of enrollees never screened among men in 2011 ($p=0.066$) or either gender in 2007 ($p=0.629$ among men, $p=0.652$ among women). Stratifying the combined multivariate logistic regression by gender (Table 10) confirms that the differential effect of the PCMH on the proportion of patients without prior CRC screening was significant for women (OR = 0.63, $p=0.013$) but not for men ($p=0.094$).

Table 9. Proportion Never Screened for CRC, by Gender

	2007			2011		
	PCMH	Non-PCMH	p-value*	PCMH	Non-PCMH	p-value*
Male	26.9%	25.8%	0.629	13.0%	16.4%	0.066
Female	28.1%	29.1%	0.652	13.8%	20.8%	<0.001

* p-value from chi square test

Table 10. Subjects Never Screened for CRC, Multivariate Logistic Regression
Stratified by Gender

	Male			Female		
	Odds ratio	95% CI	p-value	Odds ratio	95% CI	p-value
PCMH*	1.08	0.86 – 1.36	0.504	0.99	0.79 – 1.24	0.912
Age [†]	0.92	0.91 – 0.94	<0.001	0.93	0.92 – 0.94	<0.001
Year 2011*	0.55	0.45 – 0.66	<0.001	0.63	0.53 – 0.75	<0.001
PCMH*Yr [‡]	0.73	0.50 – 1.05	0.094	0.63	0.44 – 0.91	0.013

* Odds ratios compare to reference categories of non-PCMH, female gender, and 2007, respectively

† Odds ratio for age reflects the increase in adequate CRC screening associated with a one-year increase in age

‡ Interaction term testing whether rate of subjects never screened for CRC changes over time differently when comparing PCMH to non-PCMH enrollees. Typically examined only for significance vs. non-significance.

DISCUSSION

This study found significant improvements in CRC screening after implementation of the PCMH, as measured by increased rates of adequately screened patients and a decreased proportion of patients never screened for CRC. Both PCMH and non-PCMH groups saw improvements in these measures over time, but unexpectedly, the difference between groups was largely accounted for by less improvement among women in the non-PCMH group. Given that adequate screening increased, proportion of no prior screening decreased, and length of time overdue for those screened at least once did not change significantly, it appears that all teams preferentially targeted patients who had never been screened.

The finding that this specific preventive health measure was better implemented in the PCMH model fits with the established literature. Composite measures of preventive health among PCMH practices have been equal to or better than those in non-PCMH practices. Indeed, NCQA certification as a PCMH requires practices to track and remind patients when they are due for at least three different preventive care services.⁴² This study extends the findings to the military setting.

It is unclear why a gender-related difference occurred. Since the study examined all eligible patients, there is no sampling bias. Historically, there may be precedent in early research of the Screen For Life campaign, which identified a common misperception that CRC is more prevalent among men than women.^{43,44} Women, who perceive they are at lower risk of cancer than men, may believe the benefit of screening is outweighed by its cost (in discomfort, pain, inconvenience, etc.). Alternatively, women are generally higher utilizers of health care⁴⁵ and may

not attend as closely to a new recommendation for preventive screening because the volume of recommendations they receive essentially drowns it out. This latter explanation is weakened by some degree of internal inconsistency (if women are higher utilizers, they might be expected to utilize all services somewhat more than men) and by contradictory findings in Screen for Life campaign research⁴³ (once aware, women were more likely to pursue screening for themselves and their partners). Further research is required to explore the differences in CRC screening between men and women and assess whether similar patterns present in other primary care practices.

This study demonstrates the efficacy of the PCMH model in improving preventive care in a Navy primary care clinic in two ways. First, a specific measure, CRC screening, showed improvements after implementation of the PCMH model. Second, systemic improvements in data collection, analysis and use led to improved CRC screening in every clinic team, regardless of whether the full model, including staffing levels and redesignation of roles, was implemented. It appears reasonable to expect that other preventive measures, such as breast cancer and cervical cancer screening, would similarly improve under the PCMH model.

Systemic improvements noted above were largely the result of a multipronged effort by the Population Health Department. Personnel in this department verified and updated patient data on enrollment and screening tests, used innovative applications of existing software tools to develop user-friendly reports for the Family Medicine Clinic via a collaborative process, and reported frequently to command leadership on status and successes, all of which helped raise awareness and attention to cancer screening at the hospital. The reports provided to Family Medicine

evolved from manually generated lists of enrollees overdue for individual screening tests to automatically generated “Preventive Health Review” forms for each patient appointment, showing status on cancer screening, and target metrics for numerous conditions including hyperlipidemia, hypertension, diabetes, depression and influenza immunization. Such collaboration between Population Health staff and primary care clinical staff offers a model for best practice in applying the best of evidence-based medicine, preventive care and use of clinical data at the point of care.

This study had several limitations that must be acknowledged. First, this study analyzes two groups from an open cohort, in that the population is mobile and patients both enter and leave the group over time. Thus, the group of patients enrolled in 2007 was not identical to those enrolled in 2011, though there was overlap. The study compared only two characteristics of the clinic team enrollment groups to demonstrate their similarity. Given that our patients all gain coverage through the same health plan and most are randomly assigned to primary care teams (a small minority request specific providers) after enrollment in the larger clinic, it was assumed the groups were similar with respect to marital status, income, education and ethnic background, but this was not confirmed. Since this data is not contained within our electronic records, collection of this data would require significant resources and informed consent of each patient, which could prove to be prohibitive obstacles. This study did not randomize patients into the PCMH and non-PCMH teams, therefore there may have been unobserved variables that affected CRC screening rates in the intervention and control groups, such as beliefs surrounding CRC and CRC screening. Lastly, this was a single site study. The results may not be generalizable to other clinics.

In the spectrum of clinical care, cancer screening may be considered low-hanging fruit for improvement. Guidelines and metrics for adequate screening are relatively clear and screening tests require episodic vice ongoing effort. In contrast, efforts to reduce overall morbidity and mortality involve both primary and secondary prevention, which tend to be harder to quantify, more complex to implement or both. For example, primary prevention of cardiovascular morbidity and mortality by increasing rates of exercise and healthy diet may offer a dramatic benefit, but no single prevention method has emerged as clearly effective and able to be implemented on a large scale. Of course, such preventive efforts would also require years or decades of observation to allow quantification of their effect. Secondary prevention measures appear ripe for further study, such as control of hypertension, hyperlipidemia, diabetes and asthma. The PCMH model aims to incorporate management of such conditions into its array of population-based, patient-centered care. Implementation of systems and protocols to monitor and proactively manage all the above health targets should continue to be studied to further the evidence-based implementation of effective and cost-efficient health care.

CONCLUSIONS:

This study confirms the hypothesis that implementation of the PCMH model of care was associated with an increased the rate of CRC screening compared to the non-PCMH, or traditional, model of primary care. Improvements in screening were seen over time in both study groups, with the PCMH group improving their rate of adequate screening and proportion of patients never screened significantly more than the non-PCMH group.

Unexpectedly, women appeared to be disproportionately represented in the difference between the two models of care. The 2011 women in the non-PCMH group lagged behind men in either group and women in the PCMH group regarding improvements in adequate screening and the proportion never screened for CRC. Further research needs to explore the gender differences in CRC screening.

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APPENDIX 1. METHODOLOGY FOR DETERMINING RATE OF ADEQUATE COLORECTAL CANCER SCREENING

Background: The Military Health System Population Health Portal (MHSPHP) methodology is based on the 2010 Healthcare Effectiveness Data and Information Set (HEDIS®) criteria. These are a set of criteria used to benchmark treatment facilities using a common methodology and should not be confused with clinical practice guidelines. Adults, age 51-75, were selected for benchmarking measurement, because evidence supporting screening is strongest among this age group. The “action report” provided to medical treatment facilities (MTF) and Managed Care Support Contractors (MCSC) on the MHSPHP includes all TRICARE Prime/Plus adults age 50-75, regardless of continuous enrollment, accounting for at least a one year look back.

Measure Definition: Percentage of adults enrolled in TRICARE Prime/Plus, age 51-75, who had appropriate colorectal cancer screening. Screening intervals vary according to the method of screening.

Numerator: Number of adults continuously enrolled in TRICARE Prime/Plus, age 51-75, who had appropriate colorectal cancer screening in direct care or purchased care. Screening intervals vary according to the method of screening.

One or more screenings for Colorectal Cancer. Appropriate screening must meet one of three criteria:

- Fecal Occult Blood Test (FOBT) within the last 12 months
- Flexible Sigmoidoscopy within the last 60 months
- Colonoscopy within the last 120 months

Denominator: Number of adult enrollees as of the last day of the measurement month, age 51-75, who were continuously enrolled during the preceding 24-month period. An adult whose coverage lapses for more than two months (60 days) during each previous 12-month period of enrollment is not considered continuously enrolled.

Patients with a diagnosis of colorectal cancer or with a previous total colectomy are excluded. Performance measures require a retrospective approach; adults are not included in the denominator for this measure until age 51 (1-year look back).

Data Sources:

- Defense Eligibility Enrollment Registration System (DEERS)
- Composite Health Care System (CHCS) Managed Care Platform National Enrollment Database (NED) module
- Purchased Care Claims Data (NETWORK) (M2)
- Standard Ambulatory Data System (SADR) (M2)
- Standard Inpatient Data System (SIDR) (M2)
- M2_RAD
- CHCS Lab
- AHLTA Clinical Data Mart (CDM) Historical Procedures

Methodology:

1. Use DEERS to identify adults continuously enrolled in TRICARE Prime/Plus, age 51-75
2. Use SADR/SIDR/NETWORK (M2) data to identify adults, age 51-75, with at least one code to identify colorectal cancer screening
3. Use SADR/SIDR/NETWORK (M2) data to exclude adults with a history of colorectal cancer or total colectomy
4. Use CHCS Lab ad hoc to identify additional Fecal Occult Blood Tests in direct care
5. Use CHCS Managed Care Platform NED module ad hoc report to identify Primary Care Manager (PCM) in direct care
6. Use CDM Historical procedures to identify adults who have a documented history of colon cancer screening (FOBT, DCBE, sigmoidoscopy, colonoscopy) or total colectomy in Historical procedures

Data Sources & Codes:**Codes to Identify Colorectal Cancer Screening**

Description	CPT Codes	HCPCS	ICD-9-CM Diagnosis	ICD-9-CM Procedure
Fecal Occult Blood Test (FOBT)	82270, 82274	G0328, G0394	V76.51	
Flexible Sigmoidoscopy	45330-45335, 45337-45342, 45345	G0104		45.24
Colonoscopy	44388-44394, 44397, 45355, 45378-45387, 45391, 45392	G0105, G0121		45.22, 45.23, 45.25, 45.42, 45.43

Codes to Exclude Members for History of Colorectal Cancer or Colectomy

Description	CPT Codes	HCPCS	ICD-9-CM Diagnosis	ICD-9-CM Procedure
Colorectal Cancer		G0213-G0215, G0231	153, 154.0, 154.1, 197.5, V10.05	
Colectomy	44150-44153, 44155-44158, 44210-44212			45.8

Action Report: List of all adults enrolled in TRICARE Prime/Plus age 50 and older, by Primary Care Manager (PCM) or TRICARE Region. Identifies adults with the date of their most recently documented colorectal cancer screening and those who could not be identified as having a colorectal cancer screening. The action list is based on current DEERS enrollment, in contrast to the HEDIS® aggregate report which specifies continuous enrollment. Adults with a documented history of total colectomy will not be included in the Action Report.

APPENDIX 2. DATA ABSTRACTION FORM

Data Abstraction Form: Impact of PCMH on CRC screening in a Navy Primary Care Clinic

Patient Unique Study Identifier	Gender	Team	Age PRE	Date Last PRE	Date Due PRE	Age POST	Date Last POST	Date Due POST
1.								
2.								
3.								
N.								

FIELD NAME	DESCRIPTION
Gender	Male or Female gender
Team	Clinic team of enrollment, either control or intervention
Age PRE	Age in years at December 2007
Age POST	Age in years at July 2011
Date Last PRE	Date of last colorectal cancer (CRC) screen before December 2007
Date Last POST	Date of last colorectal cancer (CRC) screen before July 2011
Date Due PRE	Date next CRC screen after December 2007 is due
Date Due POST	Date next CRC screen after July 2011 is due