Patient and Provider Characteristics Associated with Colorectal, Breast, and Cervical Cancer Screening among Asian Americans

Caroline A. Thompson[1], Scarlett Lin Gomez[2,3], Albert Chan[1,4], John K. Chan[5], Sean R. McClellan[1], Sukyung Chung[1], Cliff Olson[1], Vani Nimbal[1], and Latha P. Palaniappan[1]

Abstract

Background: Routinely recommended screening for breast, cervical, and colorectal cancers can significantly reduce mortality from these types of cancer, yet screening is underutilized among Asians. Surveys rely on self-report and often are underpowered for analysis by Asian ethnicities. Electronic health records (EHR) include validated (as opposed to recall-based) rates of cancer screening. In this article, we seek to better understand cancer screening patterns in a population of insured Asian Americans.

Methods: We calculated rates of compliance with cervical, breast, and colorectal cancer screening among Asians from an EHR population and compared them with non-Hispanic whites. We performed multivariable modeling to evaluate potential predictors (at the provider- and patient-level) of screening completion among Asian patients.

Results: Aggregation of Asian subgroups masked heterogeneity in screening rates. Asian Indians and native Hawaiians and Pacific Islanders had the lowest rates of screening in our sample, well below that of non-Hispanic whites. In multivariable analyses, screening completion was negatively associated with patient–physician language discordance for mammography [OR, 0.81; 95% confidence interval (CI), 0.71–0.92] and colorectal cancer screening (OR, 0.79; CI, 0.72–0.87) and positively associated with patient–provider gender concordance for mammography (OR, 1.16; CI, 1.00–1.34) and cervical cancer screening (OR, 1.66; CI, 1.51–1.82). In addition, patient enrollment in online health services increased mammography (OR, 1.32; CI, 1.20–1.46) and cervical cancer screening (OR, 1.31; CI, 1.24–1.37).

Conclusions: Language- and gender-concordant primary care providers and culturally tailored online health resources may help improve preventive cancer screening in Asian patient populations.

Impact: This study demonstrates how the use of EHR data can inform investigations of primary prevention practices within the healthcare delivery setting.

See all the articles in this *CEBP Focus* section, "Cancer in Asian and Pacific Islander Populations."

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Introduction

According to the 2012 U.S. Census, Asians were the nation's fastest growing race or ethnic group. Their population increased by 2.9% in 2012, and more than 60% of this growth in the Asian population came from international migration (1). Contrary to trends in other groups, breast and colorectal cancer incidence rates have increased in the Asian American population, although trends have varied across Asian ethnicities (2–5). Although rates of cervical cancer have declined over the past 20 years, it remains one of the most common cancers among South and Southeast Asian females (6). Rates of colorectal cancer among Japanese currently exceed those of non-Hispanic whites, whereas Asian Indians are diagnosed at a quarter of the rate of non-Hispanic whites. Breast cancer incidence rates have doubled among Koreans since 1990, and all of the Asian ethnic groups except Japanese show increasing trends, despite documented declines over the past 5 to 10 years among other U.S. racial/ethnic groups (7, 8).

[1]Palo Alto Medical Foundation Research Institute, Palo Alto, California. [2]Cancer Prevention Institute of California, Fremont, California. [3]Department of Epidemiology, Stanford University School of Medicine, Palo Alto, California. [4]Palo Alto Medical Foundation Medical Group, Mountain View, California. [5]Sutter Health, San Francisco, California.

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Corresponding Author: Latha P. Palaniappan, Palo Alto Medical Foundation Research Institute, 795 El Camino Real, Ames Building, Palo Alto, CA 94301. Phone: 650-853-4752; Fax: 650-329-9114; E-mail: lathap@pamfri.org

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Routine screening for breast, colorectal, and cervical cancers can significantly reduce mortality from these types of cancer, yet screening for these cancers is underutilized in many Asian American ethnic groups (9–11).

In addition, cultural (e.g., modesty, stigma, health beliefs) and structural (socioeconomic status, insurance, access to care, language, health literacy, provider communications) factors prevent cancer screening in Asian American immigrant populations (12–18); these barriers have been shown to lessen but not resolve with generations in the United States (19–21). Up-to-date compliance with screening guidelines often requires engagement in routine healthcare practices, which may not be customary in many Asian countries and is challenging for recent immigrants who have to navigate the new and complex U.S. healthcare system on their own (22). System-level barriers to routine screening include scheduling, complex patient instructions (e.g., colonoscopy prep), and communication with healthcare providers, all of which may interfere with timely screening completion in patients and may be particularly challenging for those with limited English proficiency (23–25). As the Affordable Care Act (ACA) is adopted nationwide, many previously medically underserved immigrants and citizens will be receiving primary care in the United States for the first time. The ACA's preventive services policy covers routine screening for breast, colorectal, and cervical cancer without cost to the patient (26). Given the substantial heterogeneity in cancer diagnoses among Asians and the continued significance of cultural and structural barriers to receiving care, there is a need for more research to better understand screening patterns in these populations.

Existing literature on routine cancer screening practices draws largely from national surveys that (with few exceptions) group Asians together as one race because detailed ethnicities are not identified in the surveys or there are not enough respondents in each ethnic group to make valid inferences. Furthermore, these surveys are largely based on self-report for screening completion. The widespread adoption of electronic health record (EHR) technology by many healthcare systems provides a new opportunity to investigate cancer screening rates in routine care settings. EHR data include validated (as opposed to recall-based) rates of screening and allow for investigation of potentially modifiable factors that influence screening at the patient-, provider-, and system-level. In this article, we seek to better understand cancer screening patterns using EHR data in a large population of insured Asian Americans in the Greater San Francisco Bay Area, where the population is 23.3% Asian according to the 2010 U.S. Census. Examining health behaviors in an equal-access healthcare setting allows us to identify remaining disparities and mediating factors after controlling for healthcare access.

Materials and Methods

Study setting

This study was conducted in a mixed-payer, outpatient healthcare organization serving approximately 800,000 active patients in northern California, which has been using an EHR system since 2000. Approximately 30% of the overall patient population self-identifies as Asian American, and the patient age and race distributions are generally similar to those of the catchment area residential population. The patient population has high rates of insurance [58% preferred provider organization (PPO), 23% health maintenance organization (HMO), 16% Medicare, 2% self-pay, and 1% Medicaid]. The organization maintains a provider-driven health maintenance program embedded in the EHR, which is activated for all patients with an assigned primary care provider. EHR-based health maintenance activities include automated screening reminders to primary care physicians via the EHR and secure messages to patients who are enrolled in an online patient portal.

Identification of screen-eligible population

For this study, we identified all "active," screening eligible patients in our population over a 2-year period of January 1, 2012 and December 31, 2013, who self-identified as Asian. To avoid inclusion of patients who may receive preventive services elsewhere, a patient was considered "active" if they had an assigned primary care provider in internal medicine or family medicine and had at least one primary care–related visit during the 2 years. Screening eligibility was determined according to the U.S. Preventative Task Force recommendations (27–29). For cervical cancer, we included women ages 21 to 65 years, for breast cancer, we included women ages 50 to 75 years, and for colorectal cancer screening, we included men and women ages 50 to 75 years. Patients were excluded if their primary care provider deemed screening to be "not medically indicated" in the EHR.

Identification of screening completion

From the pool of screening-eligible patients, screening completion was determined via billing records, a completed procedure, and/or external completion of the screening as recorded in the health maintenance module of the EHR by the primary care provider. Classification of completion was based on the U.S. Preventive Task Force guidelines: for cervical cancer, completion was satisfied by a pap smear in the past 3 years for women ages 21 to 30 years or in the past 5 years for women older than 30 years (29). For breast cancer, screening was completed if they had a mammogram in the past 2 years (27). For colorectal cancer, 1 of 3 modalities satisfied screening: (i) a colonoscopy in the past 10 years; (ii) flexible sigmoidoscopy, double-contrast barium enema, or computed tomographic (CT)

colonography in the past 5 years; or (iii) fecal occult blood test (FOBT) in the past 12 months (28).

Explanatory variables

Patient age, primary care provider, number of primary care visits during the 2-year period (excluding those used for cancer screenings performed in a primary care setting such as pap smears), and enrollment in online healthcare services ("My Health Online") were extracted from healthcare records in the EHR. Patient race and ethnicity, primary language, and need for interpreter were identified by self-report. Asian race categories include Asian Indian, Chinese, Filipino, Japanese, Korean, Vietnamese, and native Hawaiian and Pacific Islander (including Samoans and Guamanians). Anyone who self-identified as "other Asian" or as more than one Asian race was excluded.

The following current primary care provider characteristics were extracted from the EHR: gender (male or female), specialty (internal or family medicine), provider degree (DO, MD, or NP/PA), and languages or dialects spoken at a "Very Good," "Excellent," or "Fluent" level. For descriptive purposes, Asian languages spoken by providers were categorized by country (e.g., Hindi and Urdu are both Indian languages). Patient–provider language concordance was also classified in 3 categories: English (if patient's primary language is English), non-English concordant (if patient language is not English but their provider speaks the primary language of the patient), and non-English discordant (if patient language is not English and their provider does not speak the same non-English language). Concordance was based on exact language (e.g., Hindi matches only with Hindi, and not with Urdu) except if the language was specified as Chinese in which case it also matched with Mandarin.

Statistical methods

After describing the provider and patient populations by cancer screening type, we calculated screening completion rates by cancer type and detailed race categories, additionally including rates for non-Hispanic whites as comparison. We used multivariable mixed logistic regression models with random intercept by provider to account for clustered variance within primary care providers. One model per cancer type was used to investigate patient- and provider-level predictors of screening completion in Asian patients only. For Asian ethnicity, the largest subpopulation, Chinese, was chosen as the reference category. We present ORs and 95% confidence intervals (CI) based on robust estimation of standard errors as calculated using PROC GLIMMIX in SAS. We also calculated intraclass correlation coefficients (ICC) to determine the extent of correlation in observations of patients belonging to the same physician. ICC is the ratio of between-group variance to the total variance. All analyses were performed using SAS version 9.3 (SAS Institute Inc., Cary, NC, USA).

Results

Patient characteristics

Patient characteristics are provided by cancer screening type in Table 1 and by detailed Asian ethnicity in Supplementary Table S1. For cervical cancer screening, we identified 49,522 "active" Asian, screening-eligible patients. Of these, we excluded 4,644 (9%) who identified as "other Asian" and 2,819 (6%) as "mixed Asian"; 1,112 (2%) were excluded for having a primary care provider outside of family or internal medicine, 654 (1.3%) for pap smear designation of "not medically indicated," 1,128 (2%) for unknown primary language, and 59 (0.04%) for unknown provider characteristics of clinical degree and sex, leaving 39,845 in the cervical cancer analytical sample. The median age was 40 years and less than 5% of the sample was older than 60 years. Asian Indians made up 42% of the population, followed by Chinese (34%), and Filipinas (11.9%), all other races comprised less than 5% of the population. A total of 86% of the women spoke English as their primary language and 37% were enrolled in online health services.

For mammography, we identified 13,870 "active" Asian, screening-eligible patients. Of these, 2,602 (19%) were excluded on the basis of the criteria provided above, leaving 11,268 in the breast cancer screening analytical sample. The percentages of exclusions were similar to the cervical cancer screening sample. The median age was 58 years. Chinese women made up 46% of the population, Asian Indians and Filipinas, 18%, Japanese, 10% and all others comprised less than 5% of the total. A total of 81% of the women spoke English as their primary language and 33% were enrolled in online health services.

For colorectal cancer screening, we identified 25,274 "active" Asian, screening-eligible patients. Of these, we excluded 4,481 (18%) on the basis of the criteria provided above, leaving 20,793 in the colorectal cancer screening analytical sample. Exclusion percentages were similar to the cervical cancer screening sample. The median age was 58 years, and the population was 55% female. Chinese made up 45% of the population, Asian Indians, 23%, Filipinos, 16%, Japanese, 9% and all others comprised less than 5% of the total. A total of 83% spoke English as their primary language and 34% were enrolled in online health services.

Provider characteristics

Provider characteristics are presented in Table 2. About 67% of providers were female, 93% held an MD degree, and 53% specialized in family medicine versus internal medicine. About 8% of all physicians were proficient (at a level of "Very Good," "Excellent," or "Fluent") in any Asian

Table 1. Asian patient characteristics according to cancer screening type

	Cervical cancer screening	Mammography screening	Colorectal cancer screening
Patient characteristics			
All patients	39,845 (100.0%)	11,268 (100.0%)	20,793 (100.0%)
Sex			
Male	— (—)	— (—)	9,363 (45.0%)
Female	39,845 (100.0%)	11,268 (100.0%)	11,430 (54.9%)
Age, y			
Median (interquartile range)	40 (13)	58 (11)	58 (11)
21—29	3,477 (8.7%)	— (—)	— (—)
30—39	14,794 (37.1%)	— (—)	— (—)
40—49	13,080 (32.8%)	— (—)	— (—)
50—59	6,516 (16.3%)	6,588 (58.4%)	12,077 (58.0%)
60—69	1,978 (4.9%)	3,514 (31.1%)	6,360 (30.5%)
70+	— (—)	1,166 (10.3%)	2,356 (11.3%)
Race/ethnicity			
Asian Indian	16,826 (42.2%)	2,030 (18.0%)	4,693 (22.5%)
Japanese	1,680 (4.2%)	1,114 (9.8%)	1,833 (8.8%)
Chinese	13,553 (34.0%)	5,196 (46.1%)	9,492 (45.6%)
Filipino	4,780 (11.9%)	2,082 (18.4%)	3,309 (15.9%)
Korean	1,471 (3.6%)	339 (3.0%)	554 (2.6%)
Vietnamese	1,045 (2.6%)	309 (2.7%)	550 (2.6%)
Native Hawaiian, Pacific Islander	490 (1.2%)	198 (1.7%)	362 (1.7%)
Enrolled in "My health online"			
No	25,189 (63.2%)	7,530 (66.8%)	13,807 (66.4%)
Yes	14,656 (36.7%)	3,738 (33.1%)	6,986 (33.5%)
Primary language[a]			
English	34,211 (85.8%)	9,116 (80.9%)	17,201 (82.7%)
Not English, but provider speaks patient's primary language	1,075 (2.6%)	399 (3.5%)	711 (3.4%)
Not English, and provider does not speak patient's primary language	4,559 (11.4%)	1,753 (15.5%)	2,881 (13.8%)
Patient requires an interpreter			
No	39,288 (98.6%)	10,884 (96.5%)	20,147 (96.8%)
Yes	557 (1.3%)	384 (3.4%)	646 (3.1%)
Primary care visits in last 2 y			
Median (interquartile range)	3 (4)	4 (4)	3 (3)
1 visit	8,463 (21.2%)	1,513 (13.4%)	3,187 (15.3%)
2–3 visits	13,398 (33.6%)	3,770 (33.4%)	7,484 (35.9%)
4–6 visits	9,763 (24.5%)	3,703 (32.8%)	6,586 (31.6%)
7+ visits	8,221 (20.6%)	2,282 (20.2%)	3,536 (17.0%)

[a]Preferred spoken language as reported by patient.

language, among which Chinese was the most common (4%).

Cancer screening rates

Cancer screening rates are presented in Table 3. Up-to-date screening includes screenings performed by the primary care physician or screenings reported by the patient during a primary care visit. Patient self-reports comprised 9% of up-to-date screenings across all 3 cancer types (data not shown). Aggregated, Asians had similar rates to non-Hispanic whites but when disaggregated, we detected significant heterogeneity between Asian ethnicities, with Asian Indians and native Hawaiian/Pacific Islanders having the lowest screening rates across all 3 cancer screening types. Asian Indians had about 18% lower rates of colorectal cancer screening than non-Hispanic whites with up-to-date screening by only 46% of the population. The largest Asian group, Chinese, had similar-to-slightly higher rates of screening than non-Hispanic whites across all 3 cancer types (79% cervical cancer screening, 77% mammography, 67% colorectal cancer screening).

Table 2. Primary care provider characteristics according to cancer screening type

	Cervical cancer screening	Mammography screening	Colorectal cancer screening
All providers	316 (100.0%)	301 (100.0%)	306 (100.0%)
Sex			
Male	102 (32.2%)	100 (33.2%)	103 (33.6%)
Female	214 (67.7%)	201 (66.7%)	203 (66.3%)
Degree			
MD	291 (92.0%)	281 (93.3%)	285 (93.1%)
DO	19 (6.0%)	17 (5.6%)	17 (5.5%)
NP or PA	6 (1.8%)	3 (0.9%)	4 (1.3%)
Specialty			
Family medicine	168 (53.1%)	161 (53.4%)	162 (52.9%)
Internal medicine	148 (46.8%)	140 (46.5%)	144 (47.0%)
Language proficiency[a]			
Any Asian language	25 (7.9%)	25 (8.3%)	25 (8.1%)
Chinese	12 (3.7%)	12 (3.9%)	12 (3.9%)
Vietnamese	4 (1.2%)	4 (1.3%)	4 (1.3%)
Indian	9 (2.8%)	9 (2.9%)	9 (2.9%)

[a]Providers who report language capability of "Very good," "Excellent," or "Fluent" in an Asian language.

Multivariable models

Results from multivariable models of Asian patients only, with Chinese patients as the reference category, are presented in Table 4. After controlling for important covariates, compared with Chinese, odds of pap smear completion were lower for Asian Indians (OR, 0.66; CI, 0.62–0.71) and native Hawaiian/Pacific Islander (OR, 0.57; CI, 0.46–0.70); odds of mammogram completion were lower for Asian Indians (OR, 0.53; CI, 0.47–0.60), Japanese (OR, 0.72; CI, 0.64–0.82), and native Hawaiian/Pacific Islander (OR, 0.53; CI, 0.39–0.74) and higher for Filipinas (OR, 1.27; CI, 1.07–1.50) and Vietnamese (OR, 1.54; CI, 1.12–2.12); and odds of colorectal cancer screening were lower for Asian Indians (OR, 0.37; CI, 0.34–0.40); Japanese (OR, 0.60; CI, 0.55–0.66), and native Hawaiian/Pacific Islander (OR, 0.48; CI, 0.38–0.60). In other predictor categories, we found females had lower odds of being up-to-date with colorectal cancer screening than men (OR, 0.87; CI, 0.85–0.90). For cervical cancer and colorectal cancer, patient age was associated

Table 3. Screening completion by cancer type, by detailed Asian ethnicity with non-Hispanic whites for reference

	Cervical cancer screening (N = 39,845)		Mammography screening (N = 11,268)		Colorectal cancer screening (N = 20,793)	
	Up-to-date	Overdue or refused	Up-to-date	Overdue or refused	Up-to-date	Overdue or refused
Non-Hispanic whites	47,911 (76.3%)	14,812 (23.6%)	32,105 (76.5%)	9,822 (23.4%)	49,393 (63.7%)	28,119 (36.2%)
All Asian patients	30,268 (75.9%)	9,577 (24.0%)	8,452 (75.0%)	2,816 (24.9%)	12,608 (60.6%)	8,185 (39.3%)
By Asian subgroup						
Asian Indian	12,060 (71.6%)	4,766 (28.3%)	1,362 (67.0%)	668 (32.9%)	2,141 (45.6%)	2,552 (54.3%)
Japanese	1,346 (80.1%)	334 (19.8%)	903 (81.0%)	211 (18.9%)	1,252 (68.3%)	581 (31.6%)
Chinese	10,773 (79.4%)	2,780 (20.5%)	4,001 (77.0%)	1,195 (22.9%)	6,337 (66.7%)	3,155 (33.2%)
Filipino	3,772 (78.9%)	1,008 (21.0%)	1,547 (74.3%)	535 (25.6%)	1,954 (59.0%)	1,355 (40.9%)
Korean	1,130 (76.8%)	341 (23.1%)	248 (73.1%)	91 (26.8%)	367 (66.2%)	187 (33.7%)
Vietnamese	845 (80.8%)	200 (19.1%)	258 (83.4%)	51 (16.5%)	362 (65.8%)	188 (34.1%)
Native Hawaiian, Pacific Islander	342 (69.7%)	148 (30.2%)	133 (67.1%)	65 (32.8%)	195 (53.8%)	167 (46.1%)

Table 4. Patient- and provider-level predictors of screening completion in Asian patients by cancer screening type

	Cervical cancer screening ($N = 39,845$)		Mammography screening ($N = 11,268$)		Colorectal cancer screening ($N = 20,793$)	
	n[a]	OR (95% CI)[b]	n[a]	OR (95% CI)[b]	n[a]	OR (95% CI)[b]
Patient characteristics						
Sex						
Male	—	—	—	—	9,363	1.00
Female	—	—	—	—	11,430	0.88 (0.83–0.95)
Age (per year)		1.03 (1.02–1.03)		0.99 (0.98–0.99)		1.04 (1.04–1.05)
Race/Ethnicity						
Chinese	13,553	1.00	5,196	1.00	9,492	1.00
Asian Indian	16,826	0.66 (0.62–0.71)	2,030	0.53 (0.47–0.60)	4,693	0.37 (0.34–0.40)
Filipino	4,780	0.96 (0.84–1.10)	2,082	1.27 (1.07–1.50)	3,309	0.96 (0.85–1.08)
Japanese	1,680	0.91 (0.83–0.99)	1,114	0.72 (0.64–0.82)	1,833	0.60 (0.55–0.66)
Korean	1,471	0.88 (0.77–1.01)	339	0.78 (0.60–1.02)	554	0.92 (0.76–1.11)
Vietnamese	1,045	1.14 (0.96–1.34)	309	1.54 (1.12–2.12)	550	0.99 (0.82–1.21)
Native Hawaiian, Pacific Islander	490	0.57 (0.46–0.70)	198	0.53 (0.39–0.74)	362	0.48 (0.38–0.60)
Enrolled in "My health online"						
No	25,189	1.00	7,530	1.00	13,807	1.00
Yes	14,656	1.31 (1.24–1.37)	3,738	1.32 (1.20–1.46)	6,986	1.04 (0.98–1.11)
Primary language						
English	34,211	1.00	9,116	1.00	17,201	1.00
Not English, physician–patient concordant	1,075	0.94 (0.79–1.12)	339	0.86 (0.64–1.15)	711	0.94 (0.77–1.15)
Not English, physician–patient discordant	4,559	1.02 (0.94–1.10)	1,753	0.81 (0.71–0.92)	2,881	0.79 (0.72–0.87)
Patient requires an interpreter						
No	39,288	1.00	10,884	1.00	20,147	1.00
Yes	557	0.81 (0.66–1.01)	384	0.97 (0.74–1.27)	646	0.79 (0.65–0.95)
PCP visits in past 2 y (per visit)		1.13 (1.12–1.14)		1.22 (1.20–1.25)	20,793	1.14 (1.12–1.15)
Provider characteristics						
Sex						
Male	5,817	1.00	2,417	1.00	8,732	1.00
Female	34,028	1.66 (1.51–1.82)	8,851	1.16 (1.00–1.34)	12,061	1.05 (0.91–1.21)
Degree						
DO or NP/PA	2,970	1.00	523	1.00	872	1.00
MD	36,875	0.97 (0.83–1.13)	10,745	0.93 (0.69–1.24)	19,921	1.02 (0.76–1.36)
Specialty						
Family medicine	22,149	1.00	5,470	1.00	10,087	1.00
Internal medicine	17,696	1.09 (1.01–1.18)	5,798	1.05 (0.92–1.19)	10,706	1.23 (1.07–1.40)
Any Asian language capability						
No	32,430	1.00	9,473	1.00	17,410	1.00
Yes	7,415	0.95 (0.85–1.08)	1,795	0.96 (0.78–1.17)	3,383	0.84 (0.67–1.05)
ICC		0.014		0.033		0.061

[a]Sample sizes (count of patients) provided for categorical variables only.

[b]ORs generated using hierarchical multivariable logistic models with random intercept by provider and fixed effects at the provider-level (sex, degree, specialty, Asian language capability) and patient-level (sex, age, detailed race/ethnicity, enrolled in "My health online," primary language concordance with provider, use of interpreter, PCP visits in the past 2 years).

with a 3% to 4% increase in odds of screening completion. Enrollment in "My Health Online" was associated with a 30% increase in the odds of screening completion for cervical and breast cancer but had no impact on colorectal cancer screening. Frequency of primary care visits in the past 2 years also had a strong positive association with cancer screenings: we observed a 13% to 22% increase in odds of screening, per additional

visit. English language proficiency variables, including requiring an interpreter and primary language other than English, revealed evidence of less screening completion for non-English speakers and patient–physician language discordance was associated with a significant decrease in odds of mammography screening (concordant: OR, 0.86; CI, 0.64–1.15; discordant: OR, 0.81; CI, 0.71–0.92) and colorectal cancer screening (concordant: OR, 0.94; CI, 0.77–1.15; discordant: OR, 0.79; CI, 0.72–0.87). Having a female provider was associated with higher odds of completion for female cancer screenings (cervical screening: OR, 1.66; CI, 1.51–1.82; mammography: OR, 1.16; CI, 1.00–1.34). We did not detect any differences between other provider characteristics, including degree (MD vs. DO/NP/PA) or specialty (family vs. internal medicine). ICC values, indicating the percent of overall variance in the model attributable to between-provider differences, were 1% for cervical cancer screening, 3% for mammography, and 6% for colorectal cancer screening.

Discussion

We calculated rates of compliance with 3 routine cancer screenings (cervical, breast, and colorectal cancer) among self-identified Asians from an active EHR population and compared them with non-Hispanic whites. We found that aggregation of Asian subgroups masked heterogeneity in screening rates. Asian Indians and native Hawaiians and Pacific Islanders had the lowest rates of screening in our sample, well below those of non-Hispanic whites. In multivariable models restricted to Asian patients only, we identified several significant associations with screening completion, including lower screening rates for non-English speaking patients whose physicians did not also speak their primary language (language discordance) in mammography and colorectal cancer screening, whereas having a female provider was associated with increased screening for female cancers, and patient enrollment in online health services was associated with increased screening for breast and cervical cancers.

Studies presenting cancer screening rates using the California Health Interview Survey (CHIS) data from 2001, 2003, and 2005 (18, 30) also found that South Asians tend to have lower breast (71.4%) and colorectal (42.3%) cancer screening rates than non-Hispanic whites and most other Asian subgroups. In contrast with our study, however, the Asian ethnicity with the lowest cancer screening rates across all 3 cancer types, according to CHIS, was Korean, with rates of 57.1%, 79.2%, and 32.7% for breast, cervical, and colorectal cancer screening, respectively. Compared with CHIS, higher rates of screening are generally seen among our study population for breast and especially colorectal cancer but not for cervical cancer screenings. However, comparisons between the data presented in this study and other sources must be made with caution. Patients in our study population were selected on the basis of recent use of healthcare services, were predominantly insured, and resided in a greater metropolitan area that tends to have higher than average socioeconomic status, thus making the study population relatively homogenous and reducing the likelihood that differential access barriers or other factors confounded our findings.

In this population with presumed equal-access and standardized screening guidelines implemented within the healthcare system, there remained vast differences in adherence to screening guidelines between Asian subgroup populations. Kandula and colleagues reported using CHIS data that foreign-born Asians feel that screenings are not necessary if they do not have any current health problems (31). A recent qualitative study in our patient population described a normative model of healthcare use that does not typically involve routine health visits. One 27-year-old female participant in the study said "*Yeah, why do we need to see a doctor for no reason?*" . . . ***I have not known of an annual checkup happening in India.***" (32) Similar findings have been noted for recent immigrant Chinese and Korean women in describing barriers to cancer screening (33, 34). According the 2010 American Community Survey (35), Asian Indians have one of the highest proportion of new immigrants (>70% foreign born) compared with other Asian populations. New immigrant populations from countries where routine preventive care is not established may be less willing to adopt the prevention paradigm and may require culturally tailored targeted interventions.

The strong association of recent primary care visits with screening completion is likely an indicator of healthcare engagement; patients who see their physician more are more likely to be screened. This association may also be partially explained by symptomatic patients presenting to their primary care physician and then undergoing screening, but this would not be discernible in the cross-sectional analysis performed for this study. Similar studies in Asian populations have shown a relationship between number of primary care visits and screening (36, 37), whereas avoidance of physician visits has been noted as an important barrier to reducing the cancer burden in Asian Americans (5).

Consistent with prior findings (17, 25, 38–41), we found that screening completion was lower among Asian Americans whose self-reported primary language was not English and who reported requiring an interpreter. In the absence of data on immigration or cultural factors, patient primary language could reflect barriers associated with language itself, and/or acculturation and health literacy, as discussed above. In addition, adding to previously mixed results regarding the role of language concordance on cancer screening among Asian Americans (25, 42–44), we found

lower mammography and colorectal cancer screening completion among patient–provider language discordant pairs but not among concordant pairs. This provides additional support toward the conclusion that patient–provider language concordance may, in fact, be an important factor for ensuring adherence with breast and colorectal cancer screening among Asian patients with limited English proficiency.

This study also found that enrollment in an online patient portal was associated with timely completion of cervical and mammography screening but not colorectal screening. This should be interpreted with caution however, as the use of health information technology (IT) may be confounded by frequently unmeasured or unobserved characteristics in the EHR, namely, income and education level. As primary care physicians nationwide begin to adopt increasingly sophisticated health IT systems (45), the ability to communicate electronically with patients, to send patients electronic reminders, for patients to view laboratory results online and other functionalities represent important tools for improving health quality and outcomes, including cancer screening activities (46–48). The patient portal in use by this population was only provided in English, thus non–English-speaking ethnicities (especially new immigrants) may not be as likely to enroll or use such services. Patient-oriented health IT that is culturally and linguistically appropriate may also help moderate racial disparities in preventive care, although evidence on this remains limited (47, 49).

Several limitations must be noted. We did not have data on socioeconomic status, education, health literacy, nativity, acculturation, or recent immigration, which have been identified as important predictors in screening completion among Asians and may contribute to the explanation of some of our findings. Also, proportions of non-English speakers and native Hawaiian and Pacific Islanders in our population were small, so results in these subgroups should be interpreted with caution. Other study limitations include using data from a single healthcare organization located in northern California, which has relatively small Korean and Vietnamese populations. However, this region has the most diversity in Asian subgroups in the United States. The study population is also highly insured and underrepresentative of the medically underserved, but these geographic and socioeconomic limitations also minimize unmeasured confounding between subgroups. Because clinical and administrative records rarely include any socioeconomic data on the individual level, this relative homogeneity in economic status improves the internal validity of our comparisons. As a cross-sectional analysis, we were unable to examine the temporal relationships between predictors of screening and screening behaviors.

Many studies have found that economic, healthcare access, institutional/provider, and cultural/language/immigration/acculturation factors seem to account for lower screening rates among Asian and Pacific Islander ethnicities. In this study, we were able to control for the first two sets of factors, allowing us to focus exclusively on the role of the latter 2 sets of factors. Providing a language-concordant primary care provider for non-English speakers, culturally tailored online health resources, and encouraging enrollment in such resources may help improve preventive cancer screening in Asian patient populations and thus also cancer morbidity and mortality.

Disclosure of Potential Conflicts of Interest

No potential conflicts of interest were disclosed.

Authors' Contributions

Conception and design: C.A. Thompson, C. Olson, L.P. Palaniappan
Development of methodology: C.A. Thompson, S.L. Gomez, L.P. Palaniappan
Acquisition of data (provided animals, acquired and managed patients, provided facilities, etc.): C. Olson, L.P. Palaniappan
Analysis and interpretation of data (e.g., statistical analysis, biostatistics, computational analysis): C.A. Thompson, S.L. Gomez, A. Chan, J.K. Chan, S.R. McClellan, S. Chang, L.P. Palaniappan
Writing, review, and/or revision of the manuscript: C.A. Thompson, S.L. Gomez, A. Chan, J.K. Chan, S.R. McClellan, S. Chang, V. Nimbal, L.P. Palaniappan
Administrative, technical, or material support (i.e., reporting or organizing data, constructing databases): C. Olson, V. Nimbal, L.P. Palaniappan
Study supervision: L.P. Palaniappan

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