



Colorectal cancer screening disparities in Asian Americans: the influences of patient-provider communication and social media use

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Abstract

Purpose We examined the role of patient-provider communication (PPC) during in-person visits and via electronic communication and social media use on colorectal cancer (CRC) screening among Asian Americans (AAs) and Non-Hispanic Whites (NHWs) aged 50 and older.

Methods Health Information National Trends Survey 2017–2020 data were analyzed.

Results AAs tended to evaluate the quality of PPC during their in-person visits to a health care provider lower than NHWs. AAs' CRC screening rate was lower than the rate of NHWs (78.8% vs. 84.4%). After adjusting for sociodemographics, healthcare access, and health status, the quality of PPC was the only significant predictor associated with a lower probability of CRC screening among AAs (Adjusted OR 0.74; 95% CI 0.56, 0.96); while the Internet to communicate with a health care provider was the only significant predictor of CRC screening among NHWs (Adjusted OR 1.76; CI 1.11, 2.79). AAs were more likely to use YouTube to watch a health-related video than NHWs (43.5% vs, 24%). However, social media use was not associated with CRC screening in both AAs and NHWs.

Conclusion Use of electronic communication technology may contribute to improve health information literacy and reduce the disparity. On-line communication may empower the culturally and linguistically diverse AAs by improving their confidence in communication with health care providers. Thus, communication technologies need to be strategically utilized and tailored to better meet the communication needs of racial/ethnic minorities. Online communication technologies may reduce the disparities in PPC related to cancer screening and cancer burden experienced by AAs.

Keywords Health-related internet use · Asian Americans · Colorectal cancer screening · Health disparity

Introduction

The number of Asian Americans (hereafter AAs) living in the United States (US) has increased significantly over the past decade to about 22.9 million in 2019, and were the fastest-growing racial or ethnic group in the U.S. from 2000 to 2019 [1, 2]. The AA population is extremely diverse, with more than 50 countries of origin and 100 languages. The top six subgroups in the AA population in 2019 were Chinese Americans (24%), Asian Indians (21%), Filipino Americans (19%), Vietnamese Americans (10%), Korean Americans (9%), and Japanese Americans (7%) [2]. About 60% of AA are foreign-born, however, each ethnic subgroup varies in foreign-born status, history of recent immigrants, religions, health beliefs and behaviors, lifestyles, socioeconomic status, and many other factors, resulting in heterogeneous health conditions [1–5]. AAs experience challenges such

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as lack of access to health insurance and health care [6]. In addition, the lack of quality patient-provider communication (PPC) and social media use may exacerbate the disparity in the flow of health information that eventually may lead to suboptimal colorectal cancer (CRC) screenings in AAs.

CRC and CRC screening in Asian Americans

AAs are more likely to die from cancer. CRC is the second leading type of cancer incidence and mortality when gender-specific malignancies are excluded in AAs [7]. AAs had the lowest colorectal cancer incidence and mortality and the best CRC survival outcomes among racial and ethnic groups [7, 8].

Screening is the most efficient prevention of CRC and facilitates the detection of early-stage cancer and removal of precancerous growths at low cost and has a high success rate [9, 10]. Data shows regular CRC screenings result in a significant reduction of premature death over a lifetime [9]. The American Cancer Society (ACS) guidelines recommend men and women at average risk for CRC be regularly screened beginning at 45 years of age, with more individualized decision-making from ages 76 to 85 years based on health status, life expectancy, patient preferences, and prior screening history [9].

In recent decades, CRC screening is credited for reducing the CRC incidence and mortality rates in the US [8, 11]. Despite the high burden from cancer among AAs, previous studies consistently reported lower CRC screening rates among AAs than the general US population. According to the recent report by American Cancer Society [8], AAs reported the lowest up-to date CRC screening rate among racial and ethnic groups. Approximately 55% of eligible AAs were up-to date with CRC screening while 68% of eligible of NHWs. A recent study [12] that adapted the Health Information National Trends Survey (HINTS) and administered with 376 adults ages 50–75 years in San Francisco to assess the associations between socioeconomic status and CRC screening. The results of the study indicated that there was evidence of heterogeneity in associations between SES and CRC screening by race/ethnicity. Among AAs, those disabled was significantly associated with nonadherence to CRC screening as compared to employed people.

Factors influencing CRC screening participation in Asian Americans

Previous research suggests the cost of colon cancer screening, limited health literacy, and lack of access to medical service, transportation, education, and knowledge about CRC screening as major barriers of colon cancer preventive care [13, 14]. Lack of acculturation to the US seems to be a critical barrier to receiving preventive health services. Among

the Asian immigrant population, those who have been in the US for 10 years or more are significantly more likely to have received CRC screenings compared to more recently arrived persons (58% vs. 30% over 50 years; 26% vs. 56% under 50 years) [15]. In addition to the level of acculturation, cultural beliefs may influence CRC screening behaviors among AAs [16].

Health communications in Asian Americans

According to the Prevent Cancer Foundation (PCF), the most preferred health information resource for AAs was healthcare providers (22%), followed by family (14%), friends (13%), newspaper (12%), and internet (11%) [17]. Among the South Asian communities, healthcare providers were the preferred modality for health communication, Chinese Americans preferred ethnic newspapers, and Korean Americans preferred the Internet [17]. Despite the abundance of health information available online, online health information-seeking remains challenging based on individuals' age, socioeconomic status, language, and race/ethnicity [18].

The internet and social media have revolutionized communication and become powerful sources of health-related information which may significantly impact healthcare, health knowledge, and health behaviors. Advanced technology and increased internet usage make health information more accessible and attainable. About 90% of the US population currently have internet access, resulting in an increase in the use of the Internet to seek health information [19]. As of April 2021, the Pew Research Center reported that approximately 81% of US adults use YouTube, making it the most popular social media platform [20, 21]. YouTube is a widespread phenomenon because of the myriad of health-related videos and the ease of searching and finding relevant information based on individual needs. Also, people with a chronic health condition are more likely to seek information online [22]. Although national surveys of US adults have observed significant increases in health-related internet and social media use, little is known about cancer- and health-related information-seeking behaviors and health outcomes among racial and ethnic minorities [17].

In 2007, the National Cancer Institute developed a framework for patient-centered communication to improve face-to-face PPC across the cancer care continuum [23]. Recommended communication tasks differ across the phases of cancer care: prevention, screening, diagnosis, treatment, survivorship, and end of life [23]. During the screening phase, providers should provide individualized, linguistically accessible information about the screening tests; encourage shared decision-making about screening when risks/benefits are unclear or when multiple options exist; help the patient

navigate the health care system to follow up on test results; and address patient worries and concerns [23].

There is significant empirical evidence associating effective PPC to improved patient satisfaction and adherence to medical recommendations [24–29]. Despite the impact of effective PPC on important health outcomes, many patients still report they do not receive appropriate informative communication from their providers [30]. A review found that provider recommendation is necessary but not sufficient for optimal adherence to cancer screening guidelines [31, 32]. Furthermore, some studies report that patients from racial and ethnic minority groups, such as AAs, experience distinct PPC barriers [33, 34]. An analysis of electronic health records indicated that CRC screening completion was negatively associated with patient-physician language discordance [35].

There have been conflicting results on whether patients' perceptions of the quality of PPC increase their likelihood of receiving preventive cancer screenings and most previous studies on the relationship between the quality of PPC and CRC screening were conducted more than a decade ago. Several studies [36–38] found that the quality of PPC was significantly associated with receiving CRC, but no significant association was found in other studies [39–41]. Kindratt et al. [31] used 2011–2014 HINTS data to examine the associations between CRC screening and face-to-face and electronic modes of PPC. The findings revealed that face-to-face PPC was significantly associated with CRC screening, while there was not a significant relationship between electronic PPC and CRC [31].

The use of electronic health technology in PPC offers plentiful opportunities for personalizing health information. Communicating electronically in health care is efficient, economical, and convenient. Electronic medical records (EMRs) were developed to manage clinical information, not to engage patients, but patient access to their EMR data through online portals or mobile applications represents a potential tool for improving patients' health management [42]. These electronic networks resulted in improved patient access to their personal medical data and subsequently impacting patient engagement and empowerment. The use of EMRs facilitates PPC via electronic messaging, which allows for real-time information exchange and the maintenance of a strong and trusting patient-provider relationship [43]. Despite the robust patient portal features across many US healthcare systems, only 15% to 30% of patients use even a single portal feature [44].

A study using the 2018 HINTS data indicated that the levels of perceived quality of communication with health care providers were lower among AAs than NHWs [45]. Although communication technology is widely adopted across minority groups, its use appeared to play distinct roles in communication with health care providers in different

racial/ethnic populations. Among AAs, social media and mobile communication seemed to have an important role in impacting communication experiences with healthcare providers, however, there is little empirical evidence regarding its roles in adherence to medical recommendations.

Theoretical framework

The Structural Influence Model (SIM) assumes effective communication allows individuals access to information, which grants significant social benefits. Communication may have a role in linking social determinants with health outcomes [46]. The benefits of health information are not evenly distributed across social groups with disparities in health communication paralleling these health disparities. [47]. Disparities in health communication have been indicated as one potential mediator linking social determinants to health outcomes in the SIM [46].

Health communication informs and influences individual and community decisions that enhance health. Health communication strategies include exchanging information between individuals and providing different ways for people to access health information, and ensuring that health information meets the needs of people at different health literacy levels [48]. No single theory or model is capturing all the factors that influence health communication. To better understand the process of health communication, theories could be combined. According to the Health Information National Trends Survey (HINTS) framework [38], the quality of patient-provider communication may influence how a patient's health information needs are met, which may affect their health information-seeking behaviors, leading them to seek health information on the internet and social media platforms.

Despite an abundance of research reporting health inequalities by race and ethnicity, knowledge gap still exists in the understanding of health communication-related factors generating disparities in health outcomes across race and ethnicity. Few studies examined disparities in the quality of PPC across racial and ethnic groups, serving as a barrier to receiving CRC screening [36–41]. However, their results were inconsistent. Considering the result of a recent study using nationally represented data [21] that examined the relationship between PPC and watching health-related videos on YouTube, social media use for health purposes could play an important role as a confounder or effect modifier in the relationship between PPC and CRC screening. The findings of the study [21] indicate that higher perceived quality of patient-provider communication is associated with lower odds of watching health-related videos on YouTube, while providers do not spend enough time or give an opportunity

to ask questions, patients are more likely to pursue health information on social media.

Unequal access to internet-based communication and information technologies as key instruments to improve patient empowerment may widen disparities in health status across population subgroups. To address the gaps in our understanding of how PPC and social media use are related and the influences of PPC and social media use on CRC screening, we used a nationally representative sample.

This study aimed to (1) examine racial disparities in PPC (two modes: face-to-face and electronic), social media use, CRC screening, and the association between PPC and social media use and (2) assess the roles of PPC and social media use in explaining why screenings for CRC of a widespread public health threat could vary between AAs and NHWs.

Methods

Data

The HINTS is a National Cancer Institute (NCI)-sponsored survey of American adults that have been annually administered since 2003. The primary goal of the HINTS is to describe US adults regarding access to, and the use of cancer-related health information, cancer risk perceptions, and cancer-preventive behaviors [49]. HINTS is a nationally representative cross-sectional survey of non-institutionalized adults aged 18 and over in the United States. To obtain a robust sample size of AAs, data from HINTS 5 cycles 1, 2, 3, and 4 administered during the period of 2017 and 2020 were merged into 1 data set; cycle 1, 2, 3, and 4 were administered to 3285 adults, 3504 adults, 5438 adults, and 3865 adults, respectively. HINTS 5 cycle 1, 2, and 4 utilized a single-mode mail survey, but HINTS 5 cycle 3 employed a standard mail survey and the HINTS web pilot. In cycle three of HINTS web pilot, respondents were allowed to answer on paper in English or Spanish or using an English-only web-based survey [50]. The overall response rates for cycle 1, 2, 3 (Paper only), 3 (Web based), and 4 were 32.4%, 32.9%, 30.2%, 30.6%, and 36.7%, respectively (Tables 1, 2).

By applying a two-stage sampling strategy, a stratified sample of addresses was selected from a file of residential addresses, followed by a selection of one adult within each sample household. Under this sampling strategy, the samples in this study were considered representative of the national population. The sample size of AAs ($n = 340$) is relatively small. Using weights for analyzing complex surveys has been recommended for over three decades [51], but the debate over using weights in regression analyses of survey data have been debate, with equivocal conclusions [52–55]. While we acknowledge the importance of correcting for complex sampling in statistical inference, especially

when using datasets that combine multiple or all subgroups, our study's focus is less affected by complex sampling and modification techniques as we only analyzed two ethnic groups (AAs and NHWs). We conducted separate logistic regression analyses for each group and provided regression coefficients and p values individually, without comparing statistical differences between the groups (refer to Tables 3, 4). Consequently, we did not apply sample weighting in this study. A similar approach was taken in a recent study that analyzed HINTS 5 data [56]. Additional information about survey design, data collection, and population-specific response rates is available on the HINTS website [49].

HINTS data are publicly available and de-identified. This study was therefore exempt from the requirement for Institutional Review Board approval.

Study sample

To achieve the current study's research aims, this study was limited to NHWs and AAs. Our analytical sample included a total of 340 AAs and 6317 NHWs. For Asian ethnic groups, those who self-identified their ethnicity as Indian, Chinese, Filipino, Japanese, Korean, Vietnamese, or other Asian were included. Additionally, according to CRC screening guidelines by U.S. Preventive Services Task Force (USPSTF) [57], only data of adults aged 50 or older were included from this analysis (see Table 1 for sample details).

Measures

Colorectal cancer screening

CRC was measured by the question: Have you ever had one of three CRC tests (a colonoscopy, a sigmoidoscopy, or a stool blood test) to check for colon cancer? (yes or no).

Social media use for health or cancer information

Survey questions regarding the use of social media for health-related information were selected from the data including in the past 12 months (1) "Have you used the internet to watch a health-related video on YouTube?" (yes or no), (2) "Have you used the internet to participate in an online forum or support group for people with a similar health or medical issue?" (yes or no).

Face-to-face PPC

Seven items, each focusing on a specific element of communication with all doctors, nurses, and health professionals the respondents saw during the past 12 months, were used to assess the quality of PPC during in-person visits. Respondents were asked how often the provider

Table 1 Sociodemographic characteristics of the sample

Variables	NHW (n=6317) n(column%)	Asian (n=340) n(column%)	P value ^a
<i>Sociodemographics</i>			
Gender			
Female	2638 (55.1)	108 (43.4)	<0.001
Male	2153 (44.9)	141 (56.6)	
Age^a			
50–64	2855 (45.2)	168 (49.4)	0.303
65–74	2131 (33.7)	104 (30.6)	
75+	1331 (21.1)	68 (20.0)	
Education			
<High school	244 (3.9)	24(7.1)	<0.001
High school graduate or GED	1222 (19.4)	30 (8.8)	
Some college, technical school, college or higher graduate	4832 (76.7)	285 (84.1)	
Income Level			
Less than \$20,000	1037 (18.6)	79 (25.6)	<0.001
\$20,000 to less than \$35,000	738 (13.3)	54 (17.5)	
\$35,000 to less than \$50,000	729 (13.1)	53 (17.2)	
\$50,000 to less than \$75,000	999 (17.9)	47 (15.2)	
\$75,000 or more	2063 (37.1)	76 (24.6)	
Marital Status			
Married or living with a partner	3546 (56.3)	246 (72.4)	<0.001
Divorced, widowed, separated, or single	2750 (43.7)	94 (27.6)	
English Proficiency			
Very well	4513 (94.3)	113 (45.4)	<0.001
Well	254 (5.3)	92 (36.9)	
Not well or Not at all	17 (0.4)	44 (17.7)	
Geographical Area			
Urban	5555(87.9)	297 (87.4)	0.747
Rural	762 (12.1)	43 (12.6)	
<i>Health care access</i>			
Health insurance			
Yes	6094 (97.6)	324 (97.6)	0.944
No	153 (2.4)	8 (2.4)	
Access to a usual health care provider			
Yes	5215 (83.6)	210 (63.1)	<0.001
No	1026 (16.4)	123 (36.9)	
<i>Health status</i>			
Self-reported general health			
Excellent, very good, or good	5278 (84.4)	277 (81.2)	0.021
Fair or poor	978 (15.6)	61 (18.8)	

The presence of bold indicates statistical significance at the P<0.05 level

^a χ^2 tests were used

gave them a chance to ask questions, gave them the attention needed for feelings and emotions, involved them in decisions, confirmed their understanding of what was needed to take care of their health, explained so they could understand, spent enough time with them, and

helped them deal with feelings of uncertainty. Likert scale responses (4 level) were re-coded so that higher ratings corresponded to higher PPC summed to create a composite score rating from 7 to 28. Consistent with previous studies [58, 59], a dichotomous variable was created to

Table 2 Perceived patient-provider communication, social media use and colorectal cancer screening of NHW and Asian adults aged 50 years or older

Variables	NHW (n=6317) n (column %)	Asian (n=340) n (column %)	P value ^c
Patient-provider communication (PPC)			
Face-to-face PPC			
Chance to ask question ^a	3663 (67.8)	136 (52.7)	< 0.001
Addressed feelings ^a	2749 (51.1)	100 (39.5)	< 0.001
Involved in decisions ^a	3203 (59.4)	101 (39.8)	< 0.001
Understood next steps ^a	3511 (65.2)	130 (50.8)	< 0.001
Clear explanation ^a	3616 (67.0)	138 (54.1)	< 0.001
Spent enough time ^a	2869 (53.3)	96 (37.6)	< 0.001
Helped uncertainty ^a	2570 (48.0)	87 (34.3)	< 0.001
Composite score (Possible Score: 7–28) ^b (Mean ± SD)	24.2 ± 4.2	22.7 ± 4.6	< 0.001
Electronic PPC			
Used e-mail or the Internet to communicate with a health care provider	2673 (42.8)	128 (38.0)	0.08
Messaged health care provider through online Medical record	1310 (52.6)	70 (51.5)	0.79
Social media use for health information			
Watched a health-related video on YouTube	1495 (24.0)	146 (43.5)	< 0.001
Participated in an online forum support group	293 (4.7)	13 (3.9)	0.491
CRC cancer screening practice			
Ever had a CRC screening test	4169 (84.4)	212 (78.8)	0.01

The presence of bold indicates statistical significance at the P<0.05 level

^aRated as ‘Always’ from 4 pre-coded responses: Always, Usually, Sometimes, and Never

^bMean values are presented for the variable. Likert scale responses (4 levels) of 7 questions were recoded so that higher ratings corresponded to higher Patient Centered Communication summed to create a composite score ranging from 7 to 28

^cChi-square tests or t-tests were used

compare providers who “always” versus “not always (usually, sometimes, or never).

Electronic PPC

Respondents were asked whether they used email or the internet to communicate with a doctor or a doctor’s office and messaged a health care provider or staff through online medical record (yes or no).

Background characteristics

Socio-demographic variables included gender, age, education, income, marital status, English fluency, geographical area (urban or rural). Health care access was measured by health insurance status and access to usual health care provider. Health status was measured by self-reported health.

Data analysis

All statistical analyses were conducted using SPSS version 27. X^2 test and t test were used to compare AAs and NHWs in

socio-demographic characteristics, health care access, health status, social media for health information-seeking, PPC, and CRC screening. Univariate logistic regression models were built to examine the association between social media use for health information: use of YouTube and participation of online forums or support groups (dependent variables) and seven PPC items and a composite score of PPC (independent variables). To assess the role of social media use and PPC for CRC screening performance, univariate logistic regression models were built for AAs and NHWs. In addition, multivariate logistic regression models for AAs and NHWs with backward stepwise method were built using a p value < 0.05 as the cut-off for the inclusion in the final combined model. Sociodemographic variables (gender, age, education, income, marital status, health insurance, and access to usual health care provider) and general health were adjusted. All variables, including sociodemographic variables, general health, social media use and PPC were included in one model. To control for type I errors, the alpha was set at 0.05.

Table 3 Association of face-to-face and electronic patient-provider communication quality on social media use among NHW and Asian adults aged 50 years or older

Variables	NHW				Asian			
	Social media use for health information				Social media use for health information			
	YouTube ^c		Online Forum Support Group ^d		YouTube ^c		Online forum Support group ^d	
	OR (95% CI)	P value	OR (95% CI)	P value	OR (95% CI)	P value	OR (95% CI)	P value
Patient-provider communication (PPC)								
Face-to-face PPC								
Chance to ask question ^a	0.9 (0.79, 1.03)	0.13	0.99 (0.76, 1.28)	0.92	1.05 (0.64, 1.72)	0.84	0.54 (0.13, 2.33)	0.41
Addressed feelings ^a	0.88 (0.78, 0.99)	0.04	1.02 (0.80, 1.30)	0.87	0.97 (0.59, 1.62)	0.91	0.91 (0.21, 3.88)	0.89
Involved in decisions ^a	0.97 (0.86, 1.10)	0.64	1.18 (0.91, 1.52)	0.21	1.25 (0.75, 2.07)	0.39	1.55 (0.38, 6.34)	0.54
Understood next steps ^a	0.83 (0.73, 0.94)	<0.01	1.01 (0.78, 1.30)	0.96	1.01 (0.66, 1.76)	0.77	0.95 (0.23, 3.89)	0.95
Clear explanation ^a	0.95 (0.83, 1.08)	0.39	1.01 (0.78, 1.30)	0.96	0.90 (0.54, 1.47)	0.66	0.95 (0.23, 3.89)	0.95
Spent enough time ^a	0.81 (0.72, 0.92)	<0.01	0.92 (0.72, 1.18)	0.52	0.99 (0.59, 1.65)	0.96	0.99 (0.23, 4.22)	0.98
Helped uncertainty ^a	0.89 (0.78, 1.00)	0.06	0.99 (0.77, 1.27)	0.93	1.02 (0.61, 1.72)	0.94	7.95 (0.48, 8.00)	0.35
Composite score (Possible score: 7–28) ^b (Mean ± SD)	0.99 (0.97, 1.00)	0.05	0.99 (0.97, 1.03)	0.82	1.01 (0.95, 1.06)	0.85	0.97 (0.83, 1.23)	0.66
Electronic PPC								
Used e-mail or the Internet to communicate with a health care provider	2.66 (2.36, 3.00)	<0.001	3.30 (2.55, 4.26)	<0.001	2.04 (1.30, 3.21)	<0.01	5.81 (1.57, 21.52)	<0.01
Messaged health care provider through online Medical record	1.60 (1.35, 1.90)	<0.001	1.63 (1.19, 2.22)	<0.01	0.57 (0.29, 1.13)	0.11	0.55 (0.13, 2.38)	0.42

The presence of bold indicates statistical significance at the P<0.05 level

Univariate logistic regression models using social media use for health information: use of YouTube and participation of online forums or support groups (yes or no) as dependent variables controlling for each independent variable (7-PPC items and a composite score of PPC)

OR odds ratio, CI confidence interval

^aRated as ‘Always’ from 4 pre-coded responses: Always, Usually, Sometimes, and Never

^bMean values are presented for the variable. Likert scale responses (4 levels) of 7 questions were recoded so that higher ratings corresponded to higher Patient Centered Communication summed to create a composite score ranging from 7 to 28

^cWatched a health-related video on YouTube

^dParticipated in an online forum support group for people with similar health or medical issue

Results

Characteristics of the study sample

Table 1 presents the descriptive sample characteristics by racial group. Most AAs in this sample were married, had higher education, lower-income, and less access to a regular healthcare provider compared to the NHW comparison group. The AAs reported an English proficiency with 82.3% describing their ability to understand and use the English language as “very well” or “well”. In addition, while the AAs were more highly educated than the NHWs with regards to formal education past high school, the AAs did report a higher percentage (7.1%) of respondents that did not complete high school compared to NHWs (3.9%).

Perceived patient-provider communication and social media use for health information

Table 2 and Fig. 1 show the racial disparities in the qualities of face-to-face PPC and electronic PPC and social media use for health information.

AAs tended to evaluate a lower quality of PPC during their in-person visits than NHWs on all seven questions addressing the domains of PPC (chance to ask questions, addressed feelings, involved in decisions, understood next step, clear explanation, spent enough time, helped with feelings of uncertainty). Particularly, we found a large disparity between AAs (39.8%) and NHW (59.4%) in rating the quality of PPC involving in decisions about health care.

AAs (38%) were less likely to use e-mail or the internet to communicate with health care providers than NHWs

Table 4 The impact of patient-provider communication and social media use on colorectal cancer screening: multivariate-stepwise regression for NHWs and Asians aged 50 years or older

Variables	NHW				Asian			
	Univariate model ^a		Multivariate model ^b		Univariate model ^a		Multivariate model ^b	
	OR (95% CI)	P value	AOR (95% CI)	P value	OR (95% CI)	P value	AOR (95% CI)	P value
Face-to-face PPC								
Composite score ^c	1.03 (1.01, 1.06)	< 0.01			1.00 (0.93, 1.09)	0.94	0.74 (0.56, 0.96)	0.02
Electronic PPC								
Used e-mail or the Internet to communicate with a health care provider	1.96 (1.66, 2.31)	< 0.001	1.76 (1.11, 2.79)	0.02	1.65 (0.88, 3.10)	0.12		
Messaged health care provider through online medical record	1.43 (1.06, 1.92)	0.02			3.93 (1.49, 10.42)	< 0.01		
Social Media Use								
Watched a health-related video on YouTube	1.07 (0.89, 1.29)	0.45			0.96 (0.53, 1.74)	0.90		
Participated in an online forum support group	1.17 (0.80, 1.70)	0.42			0.44 (0.13, 1.58)	0.21	0.02 (0.00, 2.40)	0.11

The presence of bold indicates statistical significance at the $P < 0.05$ level

AOR adjusted odds ratio

^aUnivariate logistic regression models for NHWs and Asians, using having had a CRC screening (yes or no) as the dependent variable controlling for each independent variable of social media use and PPC

^bMultivariate logistic regression models using backward stepwise method were built for NHWs and Asians to examine the association of social media use and PPC on CRC screening after adjusting for sociodemographic variables (gender, age, education, income, marital status, health insurance, and access to usual health care provider) and general health. All variables, including sociodemographic variables, general health, social media use and PPC were included in one model. Gender, age, education, insurance, and 'Used e-mail/Internet to communicate with a health care provider' remained in the final model for NHWs. Health insurance, income, access to usual health care provider, 'face-to-face PPC', and 'participation in an online forum support group' remained in the final model for AAs. NHWs: Model $X^2 = 72.11$, $df = 5$, $p < 0.001$; Nagelkerke $R^2 = 0.14$. Asians: Model $X^2 = 15.30$, $df = 5$, $p < 0.01$; Nagelkerke $R^2 = 0.45$

^cLikert scale responses (4 levels) of 7 questions were recoded so that higher ratings corresponded to higher Patient Centered Communication summed to create a composite score ranging from 7 to 28

(42.8%). There was no significant difference between AAs and NHWs in messaging health professionals through online medical records.

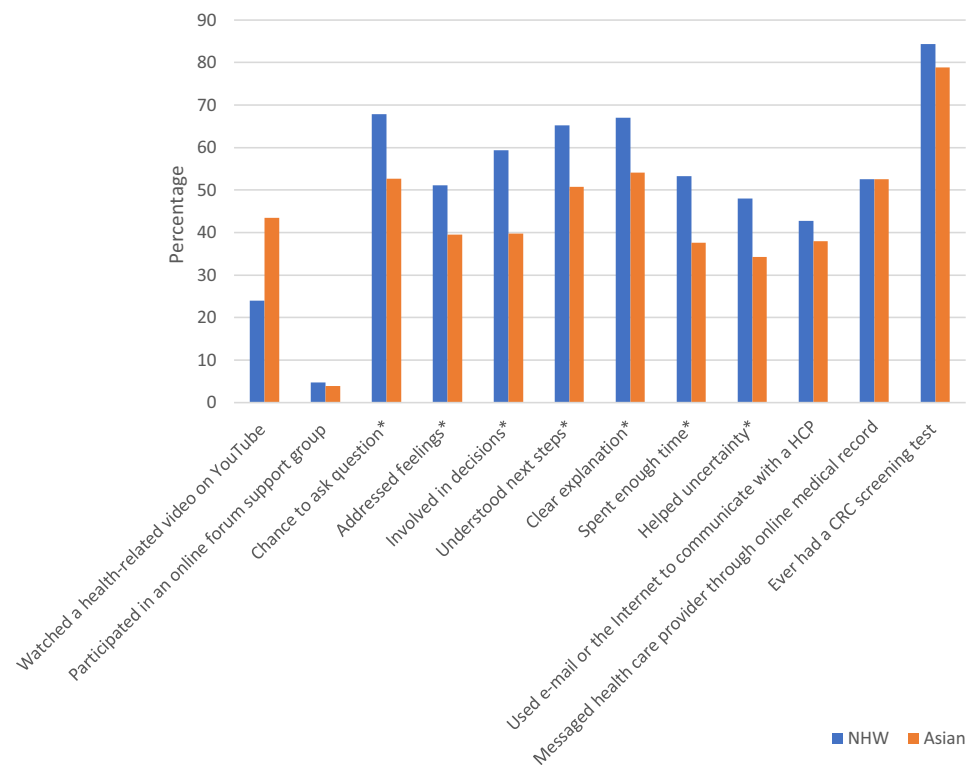
There were no significant differences between AAs and NHWs in the participation of online forums or support groups for health issues, significant differences were seen between AAs and NHWs with regards to the use of YouTube for health information, with 43.5% of the AA group compared to 24% of the NHW group receiving health information via YouTube.

NHWs who reported that their health care provider always gave them the attention needed for feelings and emotions (OR 0.88; 95% CI 0.78, 0.99), spent enough time with them (OR 0.81; 95% CI 0.72, 0.92), and confirmed their understanding of what was needed to take care of their health (OR 0.83; 95% CI 0.73, 0.94) had lower odds of watching a health-related video on YouTube compared to those whose providers did not. Perceived overall quality about face-to-face PPC was negatively associated with odds of watching a health-related video on YouTube (OR 0.99;

95% CI 0.97, 1.00). Their association was marginally significant from a statistical standpoint, but the odds ratio and practical significance are minimal. However, no statistically significant associations were observed between face-to-face PPC quality and the use of YouTube among AAs.

The association between electronic PPC using email or the internet and social media use was not different between NHWs and AAs. Both groups who used email or Internet to communicate with a health care provider were more likely to watch a health-related video on YouTube and participate in an online forum or support group for people with a similar health or medical issue than those did not. However, the same pattern of association between PPC through online medical records and social media use was not found in NHWs and AAs. NHWs who messaged a health care provider through online medical records were significantly more likely to use social media for health-related information than those who did not. However, the association was insignificant and the direction of the association was opposite in AAs.

Fig. 1 Social media use, perceived patient-provider communication, and colorectal cancer screening among NHW and Asian adults aged 50 years and older



Note: * Rated as 'Always' from 4 pre-coded responses: Always, Usually, Sometimes, and Never

Colorectal cancer screening practices

AAs were less likely to participate in CRC screening than NHWs (Table 2). A statistically significant difference revealed that 78.8% of AA respondents had CRC screening tests compared to 84.4% of NHW respondents. Adjusted logistic regression models for AAs and NHWs were built to assess the role of social media use, face-to-face PPC, and electronic PPC for CRC screening performance (Table 4).

To assess the role of social media use and PPC for CRC screening performance, univariate logistic regression models were built for AAs and NHWs. A higher perceived overall quality about face-to-face PPC (OR 1.03; 95% CI 1.01, 1.06) was significantly associated with higher likelihood of undergoing CRC screening among NHWs, however significant association was not found in AAs. In both NHWs (OR 1.42; 95% CI 1.06, 1.92) and AAs (OR 3.93; 95% CI 1.49, 10.42), those who messaged a health care provider via online medical records were more likely to undergo CRC screening compared those who did not. NHWs who used email or Internet to communicate with a health care provider (OR 1.96; 95% CI 1.66, 2.31) were more likely to undergo CRC screening than those who did not, but significant association was not found in AAs.

A backwards stepwise multivariate logistic regression analyses were additionally performed with $p < 0.05$ as the cut-off for including independent variables in the final

model. All variables, including sociodemographic variables, general health, social media use and PPC were included in one model. In the final model for NHWs, gender (Female, Adjusted OR 0.63; 95% CI 0.39, 1.00), age (Adjusted OR 1.08; 95% CI 1.05, 1.12), education (Adjusted OR 1.36, 95% CI 1.16, 1.59), insurance (No, Adjusted OR 0.09, 95% CI 0.02, 0.52), and using e-mail or the Internet to communicate with a health care provider (Adjusted OR 1.76; 95% CI 1.11, 2.79) remained. In the final model AAs, health insurance (No, Adjusted OR 0, 95% CI 0.0, 1.0), income (Adjusted OR 0.5, 95% CI 0.22, 1.12), access to usual health care provider (No, Adjusted OR 0.09, 95% CI 0.01, 0.96), participation in an online forum support group (Adjusted OR 0.02, 95% CI 0.00, 2.40) and perceived quality of PPC during in-person visits (Adjusted OR 0.74, 95% CI 0.56, 0.96) remained.

After adjusting for sociodemographic variables and general health, perceived quality of PPC during in-person visits (Adjusted OR 0.74, 95% CI 0.56, 0.96) was the only significant predictor associated with a lower probability of CRC screening among AAs. In contrast, after the same adjustments, using e-mail or the Internet to communicate with a health care provider (Adjusted OR 1.76; 95% CI 1.11, 2.79) was the only significant predictor of CRC screening among NHWs, but perceived quality of PPC during in-person visits was not included in the final model. NHWs were 1.76 times more likely to undergo CRC screening if they

communicated via e-mail or internet with a health care professional (Adjusted OR 1.76; 95% CI 1.11, 2.79).

Discussion

Our findings address disparities in perceived quality of PPC, the use of social media to obtain health information, CRC screening, and the significant role of health communication in explaining cancer health disparities among AAs and NHWs.

Face-to-face patient-provider communication

Patient-centered communication behaviors exhibited by providers were perceived as suboptimal by AAs compared to NHWs in this study. These findings are similar to previous studies in which racial and ethnic minority groups and patients lacking English fluency were less likely to experience effective PPC [60–62]. Another explanation for the lower scores in perceived PPC in the AA group centers around dissimilar cultural norms and expectations between AA patients and their providers. Gao et al. [63] discussed the cultural imbalance between AA and their American providers, each coming from a distinct cultural background. The AA approach to communication with providers are from a cultural perspective where healthcare providers are respected as knowledgeable and skilled professionals whose recommendations are valued and followed. In contrast, the American healthcare provider comes from a vastly different position where provider and patient are partners in choosing treatments through a shared decision-making process. These contrasting cultural norms lead to potential ambiguity and uncertainty in the communication interaction between AA and provider. For the general population, the results were slightly in a different direction. A recent study by Harper et al. [64] adapted the HINTS and administered to a multiethnic sample of women in Michigan to assess the influence of cancer risk perception and PPC on the uptake of both cervical and CRC screening. Of the 14-risk perception and PPC-related questions, only PPC involving in decisions about health care was significantly associated with women having both screenings.

Electronic patient-provider communication

Poor PPC negatively affects clinical outcomes. Utilizing electronic forms of communication, such as messaging with providers via EMR platforms, may help to improve PPC. Being able to easily access health records and communicate with providers as needed may result in enhanced

patient engagement and improved self-management [42]. Electronic communication alleviates intermediaries to the communication process which helps to build trust and rapport between patients and providers [43]. Despite the numerous potential uses of EMRs, the overwhelming majority of patients in the US fail to optimally use and benefit from these technologies [44]. Our study using the HINTS data collected from 2017 and 2020 found the increased use of electronic communication through electronic platforms in both AAs and NHWs. NHWs were more likely to use electronic PPC, but a statistically significant difference was not found. The current COVID-19 pandemic may have impacted increasing electronic PPC.

Social media use for health information

The difference between AAs and NHWs was not prominent in participation in online forums, or support groups for health issues, however, a large disparity in the use of YouTube to watch health-related videos was evident. AAs tended to use the internet to watch a health-related video on YouTube more than NHWs. Given the popularity of social media, the abundance of available health-related misinformation on social media has become a growing public health concern [65–68]. In previous studies, the patient-provider relationship has been associated with health information-seeking behaviors [69, 70], however, inconsistent findings have been reported. For example, problems with PPC and clinical care coordination were associated with a higher likelihood of independent eHealth engagement, and people with lower levels of education were inclined to use eHealth when they had negative healthcare experiences [71]. Depending on the history of the patient-provider relationship and whether the patient discussed the information with their doctor, internet health information-seeking positively improved the patient-provider relationship [69].

While there are health-related videos on YouTube that are considered educationally informative and are of high quality [72–75], some studies indicated health-related videos on YouTube are often poor quality, misleading, or have commercial content designed to sell products or services [66, 76]. Similarly, a recent content analysis of YouTube videos [72] indicated current YouTube resources related to CRC screening were inadequate in terms of informational quality with less useful videos having higher views and public engagement compared to more useful videos released by more credible sources.

Our finding indicated AAs were less likely to participate in online forums or support groups for health issues than NHWs, which differed from the other study findings

regarding disparities between racial groups. For example, in a secondary analysis of a study using a national probability sample, Black, Latino, and other races compared to NHWs had higher odds (29%, 66%, and 33%, respectively) of sharing COVID-19 information on social media [77]. Given that social media offers a space not only for seeking health information and social support, but also a venue for self-expression and social connection; more research is needed to understand the benefit and concerns about online forums and support groups on health outcomes among AAs.

Colorectal cancer screening and associated health communication factors

CRC screening is of utmost importance to identify CRC cases at early and curable stages. Our findings indicate AAs' CRC screening rate (ever had a CRC screening, 78.8%) was lower than the rate of NHWs (84.4%). This finding is consistent with the previous findings published in scientific papers. According to the recent National Health Interview Survey data of adults ages 50 and older collected in 2018 [8]. AAs' CRC screening rates were lowest among all racial and ethnic groups. For example, 68% of NHWs reported being up-to date with CRC screening while AAs reported a significantly lower rate (55%). Studies of different databases reported similar screening disparity trends [17, 78, 79].

Among the health communication factors, social media use, face-to-face PPC, electronic PPC, and use of electronic communication through electronic patient platforms were facilitating communication factors of CRC screening among NHWs. In contrast, perceived quality of face-to-face PPC was the only significant predictor associated with a lower probability of CRC screening among AAs. In addition, social media use was not associated with CRC screening in both AAs and NHWs. These results raise the question of whether AAs' unsatisfactory communication experiences with health care providers resulted in AA's relying more often on YouTube for health information when faced with a health problem. The results of a recent study of Asian immigrants [80] may provide a clue to the raised question, indicating low comprehension of provider communication was significantly associated with the Southeast Asian subgroup, less education, limited English proficiency, public health insurance, patient-provider language discordance, and perceived low cultural understanding.

Effective PPC may have the potential to improve CRC screening, but PPC during in-person visits and via electronic technology may not be effectively performed among AAs. Further studies are warranted to enhance patient engagement in both face-to-face and electronic communication and facilitate effective patient-provider communication.

Limitations

Our findings provide an important contribution to the literature given that we examined two aspects of health communication typically examined separately: patient-provider communication and health communication via social media to evaluate their roles in disparities in cancer screening, particularly for CRC. Strengths of this study include the use of HINTS, a large nationally representative survey designed to track changes in health communication and information technology in the United States [49]. Although the questions asked in HINTS allowed us to examine perceived patient-provider communication quality and social media use for health information, some limitations should be noted. The data doesn't inform us about the reasons why participants were watching health-related videos on YouTube, for whom they were watching (e.g., themselves, significant other), or the content and quality of health information on social media used. In addition, it should be noted that AAs include multiple subpopulations with diverse cultures, languages, and health behaviors. Although it would be ideal to compare all these unique racial/ethnic subgroups separately, limitations in sample size rendered this difficult.

ACS recommendations for CRC screening during the majority of the study are for those 50–75 years of age; for individuals ages 76 through 85, the decision is based on a person's prior screening results and other preferences, while people over age 85 are not recommended to be screened for CRC [9]. We included individuals aged 50 and older in the analysis to obtain a robust sample size of AAs. Future research should consider the exact screening guidelines, as well as guidelines published by the ACS in 2018 and the US Preventive Services Task Force (USPSTF) in 2021 to lower the starting age to 45 [9, 57], a recommendation that has not been fully adopted in clinical practice.

It is also important to note that there are many steps between meeting with a primary doctor for a referral and actually getting a screen by a gastrointestinal (GI) doctor, particularly for colonoscopy. Although the measures of PPC in this study is limited to assess the actual PPC process involved in getting a CRC screening, PPC in the primary care setting could be a key influence on CRC screening because primary care often includes a focus on health promotion and disease.

Not using sample weighting in this study may affect the comparability of its findings with other studies that use weighted data, as the results may not accurately represent the population, particularly when comparing statistical differences between groups. This should be considered when interpreting and comparing study results. However, it is expected that there will be little to no difference between the weighted and unweighted regression coefficients considering the results of the study using the national Health and

Nutrition Examination Survey (NHANES) that found little difference between weighted and unweighted regression coefficients and chose to report the unweighted results [81].

Implications for research and practice

This study offers multiple implications for future research and practice. Among many, we suggest research studies to cover the limitations and future studies addressed above. Additionally, the findings from this study support the need for better educational healthcare resources or filtration on widely accessible platforms such as YouTube [72]. Future intervention programs may aim to improve individuals' skills to assess the quality of health information. Particularly, content in YouTube and other online resources in their native languages may not be consistent with the CRC screening guidelines practiced in the US.

Providing consistent and credible information related to cancer screening and further cancer prevention in diverse populations is urgently needed. Also, empowering culturally and linguistically diverse individuals in AAs will improve their confidence in communication with health care providers via electronic communication technology such as EMR/text messaging can be a reasonable alternative or complementary method to in-person communication. Our findings suggest that communication technologies need to be strategically utilized and tailored to better meet the communication needs of racial/ethnic minorities. Effective communication with health care providers will facilitate informed decisions on CRC screening to reduce racial cancer disparities. These efforts will help reduce racial/ethnic disparities in health communication and eventually in CRC screenings.

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Data availability Yes.

Declarations

Conflict of interest The authors declare that they have no conflict of interest.

Ethical approval This study analyzed de-identified, publicly available data. George Mason University Institutional Review Board has confirmed that no ethical approval is required.

Consent to participate This study was conducted on publicly available survey data. Informed consent was not required.

Consent for publication The Authors consent to publication of the manuscript in the *Cancer Cause, & Control*.

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