

Prevalence and Factors Associated With Oral Cavity and Pharyngeal Cancer Screening in a Rural Population

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OTO Open
2021, Vol. 5(4) 1–7
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DOI: 10.1177/2473974X211065018
http://oto-open.org


Abstract

Objective. (1) To quantify the prevalence of provider recommendation and receipt of oral cavity and pharyngeal cancer (OCPC) screening and (2) to examine the factors associated with OCPC screening recommendation and receipt among adults.

Study Design. Cross-sectional.

Setting. Rural counties in central Illinois.

Methods. This study among adults (N = 145) was conducted between January 1 and June 30, 2017. The outcomes of interest were provider recommendation and receipt of OCPC screening. Multivariable logistic regression models were used to examine the association between (1) sociodemographic, health care access and utilization, and OCPC risk factors and (2) provider recommendation and receipt of OCPC screening.

Results. The prevalence of provider recommendation and receipt of OCPC screening was 12.4% and 28.3%, respectively. Approximately 15% of current smokers, 13% of participants who consume alcohol, and 10% of participants with ≥ 5 lifetime sexual partners had received an OCPC screening recommendation. OCPC screening rates were 19% for current smokers, 30% for those who consume alcohol, and 32% for those with ≥ 5 lifetime sexual partners. In the adjusted analyses, respondents with ≥ 5 partners (adjusted odds ratio, 3.10 [95% CI, 1.25–7.66]) had a higher odds of receiving OCPC screening than those with < 5 . There were no significant associations between other OCPC risk factors and provider recommendation and receipt of OCPC screening.

Conclusion. OCPC screening recommendation and receipt were low; only number of lifetime sexual partners was associated with OCPC screening receipt. Our findings suggest that rural populations may be vulnerable to late-stage diagnosis of OCPC, and interventions to help improve screening rates are warranted.

Keywords

rural residents, provider recommendation, oral cavity and pharyngeal cancer, cancer screening, oral cancer risk factors

Received October 11, 2021; accepted November 13, 2021.

The leading risk factors for oral cavity and pharyngeal cancer (OCPC)—tobacco use (smoking and chewing), excessive alcohol consumption, and human papilloma-virus (HPV) infection—disproportionately affect people residing in rural areas in the United States.^{1–3} Because these factors are modifiable through behavior change, OCPC is considered a preventable disease. In addition to lifestyle modification, the American Cancer Society, the American Dental Association, the American Head and Neck Society, and the American Academy of Otolaryngology–Head and Neck Surgery recommend routine OCPC screening through physical examination for individuals at high risk of developing head and neck cancer.^{4–9} These societies also recommend educating patients on the risk factors for developing head and neck cancer. Screening and appropriate education are believed to prevent cancer development through early detection and mitigation of risk factors.⁹

Although screening is noninvasive and low risk, uptake is limited.⁶ The barriers to screening are multifactorial but include disparities attributable to race, level of education, access to health and dental insurance, knowledge of OCPC, and socioeconomic status.¹⁰ Minority racial/ethnic groups, as well as patients who are less educated, uninsured/Medicaid insured, and of low income, are less likely to receive intra- or

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This article was presented at the 2018 Partnerships to Advance Cancer Health Equity Meeting (Center to Reduce Cancer Health Disparities, National Institutes of Health); July 23, 2018; Rockville, Maryland.

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extraoral oral cancer screening examinations.¹⁰ These disparities are disproportionately characteristic of rural populations as compared with urban centers and remain true for rural Illinois.¹¹⁻¹³ In the absence of timely and consistent OCPC screening, most patients present with later-stage cancers, when treatment is more complex, survivorship is worse, and quality of life among survivors is lower.^{3,7,14} There is a paucity of research focusing on provider recommendation of OCPC screening. Previous studies have focused on urban populations and used the NHANES (National Health and Nutrition Examination Survey) to gauge the prevalence of OCPC screening.¹⁵⁻¹⁷ However, none of these studies examined OCPC screening in a rural population.

The primary objectives of this study were (1) to assess the prevalence of provider recommendation and receipt of OCPC screening and (2) to examine the factors associated with recommendation and receipt of OCPC screening among rural populations. We hypothesize that there are deficiencies in screening recommendation and receipt, which may be related to variables such as tobacco use, alcohol consumption, or sexual habits. Further characterization of the prevalence of OCPC screening recommendation and receipt in rural populations will allow for the development of more targeted and effective interventions for early detection as well as a reduction of OCPC disparities in rural communities.

Methods

This was a cross-sectional study of adults residing in rural counties in central Illinois conducted between January 1 and June 30, 2017. Potential participants were recruited by researchers from the Southern Illinois University School of Medicine during cancer outreach and awareness events hosted by the Montgomery County Cancer Association. English-speaking individuals ≥ 20 years old were eligible and were asked to participate in the study by the researchers at the event. Participants were then asked to complete a survey about their sociodemographic and health care–related factors, OCPC risk factors, and provider recommendation for and receipt of OCPC screening. OCPC risk factors (smoking habits, alcohol consumption, and sexual history) were assessed with items from national surveys (eg, National Survey on Drug Use and Health, Behavioral Risk Factor Surveillance System, and National Survey of Family Growth). The age criterion was based on the American Cancer Society’s recommendation that oral cancer screening begin at age 20 years.¹⁸ Individuals with a history of cancer (except nonmelanomatous skin cancers) were excluded, as their knowledge of risk factors and preventive behaviors may affect the outcomes of interest. Potential participants were informed of the anonymous nature of the survey and the objective of the study, and informed consent was obtained. The survey was extensively edited prior to administration to ensure unambiguity and understandability by nonmedical participants. Care was taken to ensure that there was no medical jargon, and the research team was available during survey completion to explain any questions related to survey items. Upon completion of the survey, participants received a

\$10 gift card. The study was approved by the university’s Institutional Review Board (Springfield Committee for Research Involving Human Subjects).

Measures

The outcome variables were provider recommendation for and receipt of OCPC screening. Provider recommendation of OCPC screening was assessed with the question “Has a doctor ever recommended or referred you to get screened for mouth and/or throat cancer?” Participants who answered *yes* were categorized as having gotten an OCPC screening recommendation and *no* as not having gotten a recommendation. Receipt of OCPC screening was assessed with the question “Have you been screened for mouth and/or throat cancer?” Participants who answered *yes* were deemed to have received the OCPC screening.

The covariates in the study were as follows: age (continuous), sex (female, male), marital status (married, not married), education (college graduate or higher, some college/associate degree, some or high school graduate), household income ($\geq \$75,000$, $\$50,000$ – $\$74,999$, $< \$50,000$), health insurance and dental insurance status, number of doctor visits within 12 months (≥ 3 , 1 or 2, none), most recent dentist visit (within past 12 months, > 12 months ago), smoking status (never, former, current), alcohol use (no, yes), age at sex initiation (≥ 18 , < 18 years), number of sexual partners (1–4, ≥ 5), ever performed oral sex (no, yes), and ever received oral sex (no, yes).

Statistical Analysis

Descriptive statistics were used to characterize the study sample: mean and standard deviations for continuous variables or proportions for categorical variables. Two multivariable logistic regression models were used to examine the association of sociodemographic variables, health care access and utilization, and OCPC risk factors (age, sex, marital status, education level, household income, health insurance, dental insurance, number of doctor visits within past year, dental visit, and smoking status) on 2 primary outcomes of interest: provider recommendation and receipt of OCPC screening. Adjusted odds ratios and confidence intervals were reported for each variable. A 2-sided alpha of 0.05 and 95% CIs were used to assess statistical significance. All analyses were performed with SAS version 9.4 (SAS Institute).

Results

A total of 145 survey respondents were included in the study. **Table 1** summarizes the characteristics of the survey respondents, overall and by provider recommendation and receipt of OCPC screening. The mean (SD) age was 45.4 (16.2) years. Most respondents were women (69.0%) and married (66.2%) with health insurance (71.0%) and dental insurance (65.5%). Approximately 18% were current smokers; 69% used alcohol; 61.4% had a sexual debut before age 18 years; and 57.9% had ≥ 5 sexual partners. There were no association between doctor’s recommendation of OCPC screening and respondents’ characteristics. When respondents’ characteristics were

Table 1. Demographic Characteristics, Health Factors, and Oral Cavity and Pharyngeal Cancer Risk Factors of Rural Residents in Central Illinois.^a

	Total	Doctor recommended throat cancer screening			Ever received throat cancer screening		
		Yes	No	P value	Yes	No	P value
Participants	145 (100)	18 (12.4)	127 (87.6)		41 (28.3)	104 (71.7)	
Age, y	45.4 ± 16.2	46.5 ± 16.5	45.3 ± 16.3	.762	47.2 ± 16.0	44.7 ± 16.3	.414
Sex				.159			.138
Female	100 (69.0)	15 (83.3)	85 (66.9)		32 (78.1)	68 (65.4)	
Male	45 (31.0)	3 (16.7)	42 (33.1)		9 (21.9)	36 (34.6)	
Marital status				.307			.470
Married	96 (66.2)	10 (55.6)	86 (67.7)		29 (70.7)	67 (64.4)	
Not married	49 (33.8)	8 (44.4)	41 (32.3)		12 (29.3)	37 (35.6)	
Education				.523			.191
College graduate or higher	58 (40.0)	8 (44.4)	50 (39.4)		21 (51.2)	37 (35.6)	
Some college/associate degree	56 (38.6)	8 (44.4)	48 (37.8)		14 (34.2)	42 (40.4)	
Some or high school graduate	31 (21.4)	2 (11.2)	29 (22.8)		6 (14.6)	25 (24.0)	
Household income, \$				.694			.084
≥75,000	41 (28.3)	5 (27.8)	36 (28.4)		17 (41.5)	24 (23.1)	
50,000 to 74,999	37 (25.5)	6 (33.3)	31 (24.4)		9 (22.0)	28 (26.9)	
<50,000	67 (46.2)	7 (38.9)	60 (47.2)		15 (36.6)	52 (50.0)	
Health insurance				.663			.960
Private	103 (71.0)	12 (66.7)	91 (71.6)		29 (70.7)	74 (71.2)	
Public	42 (29.0)	6 (33.3)	36 (28.4)		12 (29.3)	30 (28.9)	
Dental insurance				.523			.223
Yes	95 (65.5)	13 (72.2)	82 (64.6)		30 (73.2)	65 (62.5)	
No	50 (34.5)	5 (27.8)	45 (35.4)		11 (26.8)	39 (37.5)	
No. of doctor visits with 12 mo				.144			.819
≥3	66 (45.5)	12 (66.7)	54 (42.5)		20 (48.8)	46 (44.2)	
1 or 2	59 (40.7)	5 (27.8)	54 (42.5)		15 (36.6)	44 (42.3)	
None	20 (13.8)	1 (5.6)	19 (15.0)		6 (14.6)	14 (13.5)	
Dentist visit				.456			.022
Within past 12 mo	92 (63.5)	10 (55.6)	82 (64.6)		32 (78.1)	60 (57.7)	
Over past 12 mo	53 (36.5)	8 (44.4)	45 (35.4)		9 (21.9)	44 (42.3)	
Smoking status				.860			.332
Never	82 (56.6)	10 (55.6)	72 (56.7)		27 (65.9)	55 (52.9)	
Former	37 (25.5)	4 (22.2)	33 (26.0)		9 (21.9)	28 (26.9)	
Current	26 (17.9)	4 (22.2)	22 (17.3)		5 (12.2)	21 (20.2)	
Alcohol use				.750			.492
No	45 (31.0)	5 (27.8)	40 (31.5)		11 (26.8)	34 (32.7)	
Yes	100 (69.0)	13 (72.2)	87 (68.5)		30 (73.2)	70 (67.3)	
Age at sex initiation, y				.980			.752
≥18	56 (38.6)	7 (38.9)	49 (38.6)		15 (36.6)	41 (39.4)	
<18	89 (61.4)	11 (61.1)	78 (61.4)		26 (63.4)	63 (60.6)	
No. of lifetime sexual partners				.068			.225
1-4	61 (42.1)	4 (22.2)	57 (44.9)		14 (34.2)	47 (45.2)	
≥5	84 (57.9)	14 (77.8)	70 (55.1)		27 (65.8)	57 (54.8)	
Ever gave oral sex				.070			.376
No	20 (13.8)	0 (0.0)	20 (15.8)		4 (9.8)	16 (15.4)	
Yes	125 (86.2)	100 (100)	107 (84.2)		37 (90.2)	88 (84.6)	
Ever received oral sex				.945			.134
No	25 (17.2)	3 (16.7)	22 (17.3)		4 (9.8)	21 (20.2)	
Yes	120 (82.8)	15 (83.3)	105 (82.7)		37 (90.2)	83 (79.8)	

^aValues are presented as mean ± SD or No. (%). Bold indicates $P < .05$.

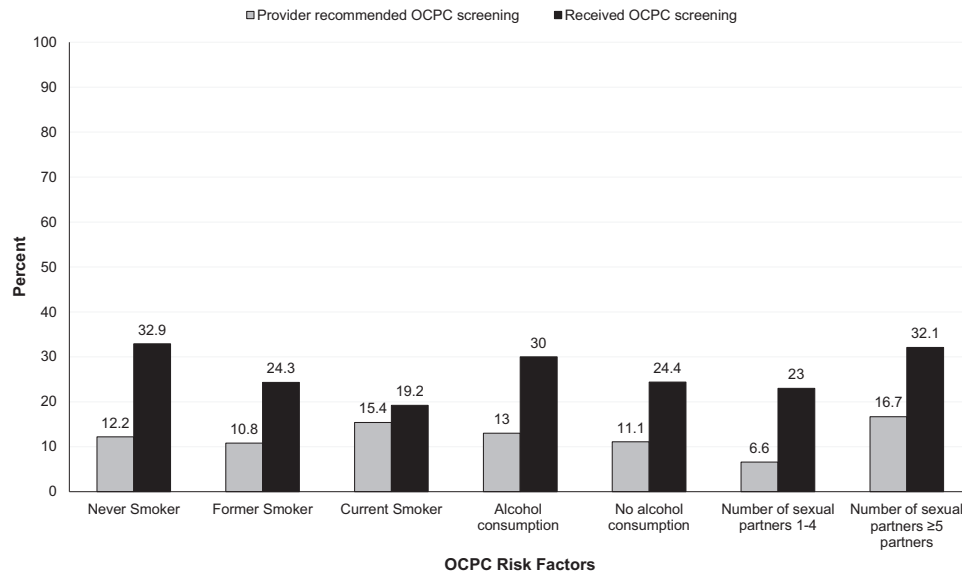


Figure 1. OCPC risk factors by provider recommendation and receipt of screening among rural residents in Illinois (N = 145). No statistically significant association was found ($P > .05$). OCPC, oral cavity and pharyngeal cancer.

stratified by receipt of OCPC screening, there were no associations except for dentist visit ($P = .0219$).

Provider Recommendation of OCPC Screening

Approximately 12.0% of survey respondents indicated that they had ever received a provider recommendation of OCPC screening (**Table 1**). More women (15%) were recommended screening than men (6.7%). Nonmarried individuals (16.3%) were more likely to be recommended OCPC screening than married participants (10.4%). Those with “some or high school graduate” education (6.0%) were recommended OCPC screening less than those in the higher education levels (some college/associate degree, 14.3%; college graduate or higher, 13.8%). The group with the lowest household income, <\$50,000, received the fewest OCPC screening recommendations at 10.4%, as compared with the middle-income group, \$50,000 to \$74,999 (16.2%), and the highest income group, >\$75,000 (12.2%). However, age, sex, marital status, education level, and household income did not have a significant relationship with provider recommendation of OCPC screening.

Only 15.4% of current smokers had received an OCPC screening recommendation, followed by 12.2% of never smokers and 10.8% of former smokers ($P = .860$; **Figure 1**). Approximately 13.0% of respondents who consumed alcohol were recommended for OCPC screenings as compared with 11% of those who did not consume alcohol ($P = .750$). Respondents with ≥ 5 and <5 lifetime sexual partners had received OCPC screening recommendations at rates of 16.7% and 6.6%, respectively ($P = .068$). In the multivariable regression, none of the covariates were significantly associated with receiving a provider recommendation for OCPC screening (**Table 2**).

Receipt of OCPC Screening

Overall, 28.3% of the survey participants indicated that they had received an OCPC screening (**Table 1**). More women

(32%) were screened than men (20%). Married individuals (30.2%) were more likely to be screening than nonmarried participants (24.5%). The “some or high school graduate” education level (19.4%) had fewer screenings than the higher education levels (some college/associate degree, 25%; college graduate or higher, 36.2%). The group with the highest household income, >\$75,000, was the most likely to receive an OCPC screening (41.5%), while the lowest-income group, <\$50,000, was screened the least (22.4%). However, age, sex, marital status, education level, and household income did not significantly correlate with receipt of OCPC screening.

Current smokers had the lowest OCPC screening rate (19.2%), and never smokers had the highest (32.9%, $P = .332$; **Figure 1**). OCPC screening rate among survey respondents who consumed alcohol (30.0%) was a little higher than those who did not consume alcohol (24.4%, $P = .492$). The proportion of respondents with ≥ 5 lifetime sexual partners (32.1%) who had received OCPC screening was higher than those with <5 partners (23.0%, $P = .225$). In the adjusted regression model, none of the covariates were significantly associated with receipt of OCPC screening except number of lifetime sexual partners. When compared with respondents with <5 sexual partners, those with ≥ 5 were more likely to receive OCPC screening (adjusted odds ratio, 3.10 [95% CI, 1.25-7.66]; **Table 2**).

Discussion

Timely and consistent OCPC screening improves patient treatment, survivorship, and quality of life. However, there are lifestyle and health care accessibility barriers that influence OCPC screening recommendation and receipt. It is important to characterize the prevalence of OCPC screening recommendation and receipt to develop effective interventions for early detection. In this study, we quantified the number of people who had gotten a provider recommendation for OCPC screening and those who had received the

Table 2. Logistic Regression Analysis Estimating Factors Associated With Provider Recommendation and Receipt of Oral Cavity and Pharyngeal Cancer Screening (N = 145).

	Adjusted odds ratio (95% CI)	
	Provider recommendation for screening	Received throat cancer screening
Smoking status		
Never	Reference	Reference
Former	0.92 (0.24-3.60)	0.69 (0.26-1.86)
Current	1.07 (0.23-4.86)	0.66 (0.19-2.29)
Alcohol use		
No	Reference	Reference
Yes	1.08 (0.30-3.93)	1.45 (0.55-3.81)
No. of lifetime sexual partners		
1-4	Reference	Reference
≥5	3.26 (0.90-11.83)	3.10 (1.25-7.66)
Age	1.02 (0.98-1.06)	1.04 (1.00-1.07)
Sex		
Female	Reference	Reference
Male	0.38 (0.09-1.57)	0.44 (0.17-1.16)
Marital status		
Married	Reference	Reference
Not married	1.50 (0.35-6.37)	1.10 (0.36-3.32)
Education		
College graduate or higher	Reference	Reference
Some college/associate degree	0.74 (0.21-2.50)	0.60 (0.23-1.56)
Some or high school graduate	0.29 (0.04-2.14)	0.38 (0.10-1.50)
Household income, \$		
≥75,000	Reference	Reference
50,000 to 74,999	1.60 (0.35-7.29)	0.49 (0.16-1.53)
<50,000	0.78 (0.13-4.89)	0.49 (0.14-1.67)
Health insurance		
Private	Reference	Reference
Public	1.84 (0.42-8.13)	2.83 (0.84-9.50)
Dental insurance		
Yes	Reference	Reference
No	0.63 (0.15-2.66)	0.48 (0.16-1.43)
No. of doctor visit with 12 mo		
≥3	Reference	Reference
1 or 2	0.45 (0.13-1.49)	1.01 (0.41-2.46)
None	0.40 (0.03-4.07)	1.29 (0.32-5.22)
Dentist visit		
Within past 12 mo	Reference	Reference
Over past 12 mo	1.13 (0.33-3.93)	0.30 (0.11-0.84)

screening. We also examined factors that were associated with these outcomes. We found a low rate of provider OCPC screening recommendation among residents in rural central Illinois, and provider recommendations did not significantly correlate with known risk factors for OCPC in the adjusted analysis, such as tobacco use, alcohol consumption, and sexual habits.

Similarly, there was a low rate of receipt of OCPC screening among survey respondents. We found that never smokers had a higher OCPC screening rate than current smokers and that the rate for patients with ≥5 lifetime sexual partners was

higher than for those with <5; however, these differences were not statistically significant. Previous studies examining urban populations and using the NHANES database have shown that <38% of those aged ≥18 years reported ever having an oral cancer examination.^{1-8,10,15} Our findings indicate a lower rate of OCPC screening than previous literature, with only 28.3% of respondents indicating that they had received OCPC screening.

Previous studies examined the relationship between the most common risk factors of OCPC and receipt of screening. They found that adults at higher risk for oral cancer (current

smokers) are less likely to have ever had an oral cancer examination than former smokers or adults who have never smoked.^{15,16} However, in our study, there were no significant differences between smoking status and receipt of OCPC screening in the unadjusted and adjusted analyses, although current smokers had the lower screening rate than never smokers. Gupta et al noted that alcohol consumers were more likely to be screened.¹⁰ In our study, 30% of alcohol consumers were screened versus 24.4% of nonalcohol consumers, although this finding was not statistically significant. Similarly, in the adjusted analysis, alcohol drinkers were no more or less likely to have received OCPC screening when compared with nonalcohol drinkers. An increasing number of sexual partners is significantly correlated with positive HPV status and, as such, is a marker of the risk associated with infection and the subsequent potential for HPV-associated oropharyngeal cancer.¹⁷ Our study found that respondents with a higher number of lifetime sexual partners were more likely to receive OCPC screening. Specifically, OCPC screening rates were higher for respondents with ≥ 5 sexual partners than for those with < 5 partners, although not statistically significant. It should be noted that we did not have information on HPV status and therefore were unable to investigate its effect on screening receipt.

The health belief model states that behavior change is influenced by several constructs, including perceived susceptibility to a disease and the belief that the disease and its consequences are severe. The health belief model is commonly used to guide development of interventions that target behavior change and is applicable to OCPC prevention in rural populations.¹⁹ Rural residents may not believe that they are susceptible to OCPC or that OCPC is a potentially serious outcome that can result from engaging in high-risk behaviors. Failure to consider this lack of perceived susceptibility and severity would limit the effectiveness of current interventions, as rural residents may not consider changing behavior and lifestyle choices or may place greater priority on risk reduction for prevention of other health outcomes. Based on these principles and the findings of this survey, future prevention interventions by health care professionals or groups in rural communities could begin to address these constructs to enact effective educational strategies while continuing to recommend and perform screening on high-risk individuals.

Possible limitations of this study include selection bias, confirmation bias, and response bias. We surveyed participants at local cancer awareness community events, which may be attended by a more health-literate or health-interested population with more awareness of recommended health maintenance through cancer screening and access to care, possibly through health insurance. Nevertheless, OCPC screening recommendation and receipt were both low in our patient sample. Likewise, those who did respond may not be representative of the underlying population but might possess a greater cancer knowledge base and literacy, making them more inclined to respond than nonrespondents. Additionally, we used self-reported provider recommendation and receipt of screening, which may be subject to recall bias or underestimation. It is possible that providers perform an OCPC

physical examination screening without overtly verbalizing or explaining the screening process to survey respondents. Our study was limited to 1 rural geographic area, limiting the generalizability of our findings. However, the incidences of OCPC and OCPC-related socioeconomic risk factors in this population are characteristic of other rural regions and provide some external validity for our results.

Conclusions

Our findings suggest that the rural residents of central Illinois have low rates of OCPC screening recommendation and receipt despite having a high incidence of OCPC risk factors. There were no differences in sociodemographic, health care, and OCPC risk factors and OCPC screening recommendation and receipt, except for number of sexual partners, where those with a higher number were more likely to receive the screening. As a result, these individuals may be vulnerable to diagnosis at a later stage and worse oncologic and functional outcomes. Other disparities shown to prolong the time to diagnosis of OCPC are likewise overrepresented in rural populations: race, level of education, access to health and dental insurance, knowledge of OCPC, and socioeconomic status.¹²⁻¹⁴ It is important to address these disparities in rural communities to facilitate early diagnosis and treatment. Further research should focus on characterizing patient knowledge and attitudes toward OCPC in rural populations to inform development of prevention interventions.

Author Contributions

Sophia Matos, manuscript writing, data acquisition, analysis and interpretation, critical revision of the manuscript for important intellectual content, final approval of manuscript; **Eric Adjei Boakye**, collection and assembly of data, study concept and design, data acquisition, analysis and interpretation, manuscript writing, critical revision of the manuscript for important intellectual content, statistical analysis, final approval of manuscript, study supervision; **Dana Crosby**, study supervision, final approval of manuscript, critical revision of the manuscript for important intellectual content, data acquisition, analysis and interpretation; **Arun Sharma**, collection and assembly of data, study concept and design, data acquisition, analysis and interpretation, critical revision of the manuscript for important intellectual content, final approval of manuscript, study supervision.

Disclosures

Competing interests: None.

Sponsorships: None.

Funding source: None.

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