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ORIGINAL RESEARCH

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Association of ethnicity and time to surgery among patients with chronic rhinosinusitis

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Abstract

Objectives: Determine factors associated with delayed endoscopic sinus surgery (ESS) in patients with chronic rhinosinusitis (CRS).

Methods: This is a retrospective cohort study conducted at a tertiary care academic center. Patients were included in the study if they were at least 18 years old and underwent surgery for CRS. Electronic medical records were retrospectively reviewed to collect demographic and clinical data. Patients with CRS secondary to another pathology such as malignancy were excluded. Multiple linear regression was performed to determine factors associated with the number of days between a patient's preoperative consultation and the date of surgery.

Results: A total of 103 patients with a mean age of 46.6 ± 16.8 years were included in the analysis; 51.5% of patients were females, 46.6% identified as White, and 29.1% identified as Hispanic. The majority of patients (67.0%) had preferred provider organization health insurance; 43.7% of patients had nasal polyps, 70.9% had a deviated nasal septum, and the mean preoperative Sinonasal Outcomes Test-22 (SNOT-22) score was 41.0 ± 23.8. The mean time to surgery after the final preoperative visit was 71.7 days ± 65.6 days. Hispanic ethnicity was associated with increased time to surgery ($p < .05$) when controlling for other variables. No other variables were associated with time to surgery on multivariate analysis.

Conclusion: Hispanic ethnicity may be an independent predictor of increased time to sinus surgery independent of disease severity and other demographic variables.

Level of Evidence: 2b

KEYWORDS
chronic rhinosinusitis, endoscopic sinus surgery, health disparities

1 | INTRODUCTION

Chronic rhinosinusitis (CRS) is a condition that affects millions of people worldwide and has a detrimental impact on quality of life similar to diseases such as heart failure and chronic obstructive pulmonary diseases.[1,2] Endoscopic sinus surgery (ESS) has revolutionized CRS management and offers high rates of quality of life improvement and symptom severity reduction in patients who do not respond to

medical therapy.[3–5] However, the decision to undergo ESS is complex and multifactorial. Despite meeting candidacy for surgery, patients may delay undergoing ESS for a variety of reasons. These include mild sinus symptom severity, fears about the risks and complications of surgery, financial concerns, and personal or work-related obligations.[6]

Previous studies have shown that delayed surgery for CRS may be associated with reduced symptom improvement postoperatively and greater health care utilization compared to those with early surgical intervention. This manifests as more frequent office visits and increased use of prescription medications.[7,8] Understanding the patient demographic variables and sinus disease characteristics that are associated with delayed surgery could enable physicians to better counsel patients through their decision-making process. This would optimize the utilization of healthcare resource, improve patient outcomes, and ensure that patients receive timely care. At this time, it is not known what demographic or clinical factors, if any, are associated with delayed ESS for CRS patients. Therefore, we retrospectively identified demographic and clinical characteristics associated with delayed ESS for CRS.

2 | METHODS

A retrospective cohort study of all consecutive patients undergoing ESS for CRS was conducted at an academic tertiary care center in Los Angeles from January 2021 to January 2023. A power calculation to determine sample size was not performed. Patients were included in the study if they were older than 18 years of age, diagnosed with CRS based on established criteria from the American Academy of Otolaryngology–Head and Neck Surgery, and underwent ESS after failing appropriate medical therapy, including nasal saline irrigation, and either antibiotics or topical/oral corticosteroids.[9] Patients were included only after failing appropriate medical therapy in order to maintain consistency in the treatment algorithm as patients going straight to surgical management may have avoided certain logistical barriers that could delay surgery. Patients who were under 18 years of age were excluded from this study. Patients with concomitant sinonasal pathologies including nasal neoplasms, history of nasal trauma, odontogenic sinusitis, or chronic fungal sinusitis were also excluded. All included patients attended preoperative office visits and had surgery performed at an outpatient surgery center or the academic institution's main tertiary care hospital. This study was exempt from IRB review by the University of Southern California Institutional Review Board.

Patient demographic and clinical information were obtained from electronic medical records. The demographic information collected included age (years), gender, race, ethnicity (Hispanic, Non-Hispanic), primary spoken language (English, Non-English), and insurance type. This information is filled out by all patients during new patient visits. The Social Vulnerability Index (SVI) was collected to control for socioeconomic status. It uses census tract data to calculate a score from 0 to 1 with 1 representing minimal social vulnerability and 0 representing extreme social vulnerability. It takes into account factors such as education level, housing type and access to transportation. Because it is not based on zip code, it is not changed frequently and represents a more stable, homogenous set of demographics. It has been used in prior otolaryngology literature as a measure of socioeconomic status.[10–12] Clinical information was also collected from each patient and included the presence of a deviated nasal septum (DNS), presence of nasal polyps, referral status (self-referral, otolaryngologist, allergist, primary care physician, other physician referral), history of prior sinus surgery, and preoperative Sinonasal Outcomes Test (SNOT-22) score. These data were taken from the new patient visit note written by their attending rhinologist. The SNOT-22 is a validated 22-item survey that assesses quality of life in patients with CRS, with higher SNOT-22 scores correlating with reduced quality of life.[13] The SNOT-22 was routinely collected at the new patient visit and uploaded to the electronic medical record. A Charlson Comorbidity Index (CCI) score was calculated for all patients by reviewing several medical notes including at a minimum a rhinologist note, a primary care physician note, and the anesthesia preoperative note. The CCI is a calculator used to guage overall survival prognosis by adding points for various comorbidities such as prior myocardial infarction, diabetes mellitus, and chronic kidney disease. The date of each patient's preoperative visit when ESS was first recommended by the surgeon after failure of appropriate medical management, and the date when each patient underwent sinus surgery, were recorded. The number of days to surgery was calculated as the time interval between the date when surgery was recommended and the date of ESS. No other variables were investigated. All demographic and clinical data collection was performed blindly by authors Benjamin Tam, Casey Collet, and Jessica Le, and data were not reviewed until analysis was performed. Notably, one of the rhinologists at this institution does not collect SNOT-22 scores so his patients could not be included, decreasing the sample size.

Continuous variables were expressed as means and standard deviations (SDs), while categorical variables were expressed as percentages. Continuous independent variables included age and the SNOT-22 score. Two-tailed unpaired *t* tests were performed to assess for differences in mean number of days to surgery for normally distributed variables, whereas the Mann–Whitney *U* test was performed to assess for differences in mean days to surgery among non-normally distributed variables. Pearson's correlation coefficient was utilized to assess for relationships between continuous variables and number of days to surgery. To identify independent predictors of days to surgery, variables having a p value of <.25 on univariate analysis were entered into a multiple linear regression. This p value was selected to ensure the multilinear regression model included enough variables for analysis but not an excessive number as to cloud potential findings. The α level was set at <.05 for statistical significance. Statistical analysis was performed using R 4.2.2 (R Core Team, 2022). Participants found to have any missing data were excluded from analysis.

3 | RESULTS

A total of 103 patients were included for analysis. The demographic and clinical characteristics of the patients included in this study are

TABLE 1 Demographic and clinical characteristics.

	All patients ($n = 103$)	Non-Hispanic ($n = 73$)	Hispanic ($n = 30$)	p-value
Age (years, mean ± SD)	46.55 ± 16.76	47.01 ± 17.35	45.43 ± 15.44	.82
Gender				
Male	53 (51.46%)	38 (52.05%)	12 (40.00%)	.39
Female	50 (48.54%)	36 (49.32%)	18 (60.00%)	
Insurance				
PPO	69 (66.99%)	51 (69.86%)	18 (60.00%)	.31
HMO	17 (16.50%)	9 (12.33%)	8 (26.67%)	
Medical	2 (1.94%)	1 (1.37%)	1 (3.33%)	
Medicare	12 (11.65%)	8 (10.95%)	3 (10.00%)	
Other	3 (2.91%)	3 (4.11%)	0 (0%)	
Primary language				
English	93 (90.29%)	67 (91.78%)	26 (86.67%)	.49
Other	10 (9.71%)	6 (8.22%)	4 (13.33%)	
Marital status				.26
Married	52 (50.49%)	38 (52.05%)	14 (46.67%)	
Single	30 (29.13%)	23 (31.51%)	7 (23.33%)	
Widowed/divorced/separated	11 (13.75%)	5 (6.85%)	6 (20.00%)	
Unknown	10 (9.71%)	7 (9.59%)	3 (10.00%)	
Days to surgery (mean ± SD)	71.67 ± 65.56	47.97 ± 56.90	78.53 ± 40.52	<.01*
SNOT-22 (mean ± SD)	40.97 ± 23.76	38.76 ± 20.50	48.60 ± 31.66	.22
Referral status				.56
Self-referral	41 (39.81%)	31 (42.47%)	10 (33.33%)	
ENT	30 (29.13%)	19 (26.03%)	11 (36.67%)	
PCP	17 (16.50%)	12 (16.44%)	5 (16.67%)	
Allergist	9 (8.74%)	7 (9.59%)	2 (6.67%)	
Other physician	6 (5.83%)	4 (5.48%)	2 (6.67%)	
History of surgery for CRS				.63
Yes	29 (28.16%)	22 (30.14%)	7 (23.33%)	
No	74 (71.84%)	51 (69.86%)	23 (76.67%)	
Nasal polyps				.51
Yes	45 (43.69%)	30 (41.10%)	15 (50.00%)	
No	58 (56.31%)	43 (58.90%)	15 (50.00%)	
DNS				.10
Yes	73 (70.87%)	48 (65.75%)	25 (83.33%)	
No	30 (29.13%)	25 (34.25%)	5 (16.67%)	

Abbreviations: CRS, chronic rhinosinusitis; DNS, deviated nasal septum; ENT, otolaryngologist; HMO, Health Maintenance Organizations; PCP, primary care physician; PPO, Preferred Provider Organizations; SD, standard deviation; SNOT-22, Sinonasal Outcomes Test.
*Indicates statistical significance.

listed in Table 1. The mean age of patients was 46.6 years and 51.5% were female; 46.6% of patients identified as White, 24.3% identified as Asian, and 26.2% identified as Other. In terms of ethnicity, 70.9% of patients identified as non-Hispanic, while 29.1% identified as Hispanic. The most common health insurance types were Preferred Provider Organizations (PPO, 67.0%), Health Maintenance Organizations (HMO, 16.5%), Medicare (11.7%), and MediCal (1.9%). The primary spoken language was English in 90.3% of patients. The mean SVI was 0.52 ± SD 0.26. When comparing Hispanic and non-Hispanic patients on univariate analysis, there were no differences in clinical variables between the two subgroups except for mean days to surgery. Table 2 lists the demographic characteristics of our cohort with the associated mean number of days to surgery. No variables were found to be significantly associated with mean number of days to surgery.

Table 3 lists the clinical characteristics of patients in this study and the associated mean number of days to surgery. Most patients

TABLE 2 Demographic characteristics and associated time to surgery.

	N (%)	Days (mean ± SD)	*p*-value
Gender			.24
Female	53 (51.46%)	51.21 ± 33.16	
Male	50 (48.54%)	79.25 ± 60.07	
Race			.32
White	48 (46.60%)	61.24 ± 50.33	
Asian	25 (24.27%)	82.96 ± 92.90	
Other	27 (26.21%)	80.21 ± 59.77	
Ethnicity			.17
Non-Hispanic	73 (70.87%)	47.97 ± 56.90	
Hispanic	30 (29.13%)	78.53 ± 40.52	
Insurance			.45
PPO	69 (66.99%)	66.42 ± 55.43	
HMO	17 (16.50%)	69.47 ± 50.01	
Medical	2 (1.94%)	143.50	
Medicare	12 (11.65%)	92.83 ± 116.36	
Other	3 (2.91%)	72.33 ± 71.25	
Primary language			.13
English	93 (90.29%)	74.37 ± 67.66	
Other	10 (9.71%)	46.60 ± 33.72	
Marital status			.80
Married	52 (50.49%)	77.06 ± 73.40	
Single	30 (29.13%)	62.07 ± 45.57	
Widowed/divorced/separated	11 (13.75%)	69.91 ± 41.99	
Unknown	10 (9.71%)	74.40 ± 74.26	
	Mean ± SD	Pearson's coefficient	
Age, years	46.55 ± 16.76	0.49	.21
SVI	0.52 ± 0.26	−16.29	.21

Abbreviations: HMO, Health Maintenance Organizations; PPO, Preferred Provider Organizations; SD, standard deviation; SVI, Social Vulnerability Index.

were self-referred (39.8%) or referred by an otolaryngologist (30.1%); 28.2% of patients had previously undergone surgery for CRS, and the majority of patients had a DNS (70.9%). Most patients (56.3%) did not have evidence of nasal polyps on endoscopy or computed tomography imaging. The mean CCI was 0.83 ± SD 0.99.

Table 4 shows the results of the stepwise multiple linear regression comparing the number of days until surgery among different subgroups of patients. When controlling for other variables, Hispanic ethnicity was found to be a statistically significant independent predictor of increased time to surgery. Hispanic patients waited 28.3 days longer to undergo sinus surgery compared with non-Hispanic patients (95% CI: 14.95–43.27, $p = .04$). Despite a p-value < .25 on univariate analysis, Referral status was not included in the multilinear regression as only the "Other physician" category ($n = 6$) appeared to be different from other referral statuses. Similarly, Non-English primary language was not included despite significance on univariate analysis as sample size was too small ($n = 10$) to be deemed reliable. No other variables were found to be statistically significant predictors of time to surgery on multivariate analysis.

4 | DISCUSSION

In our study, we investigate demographic and clinical factors associated with the time interval between a patient's preoperative consultation and date of sinus surgery. Previous studies have shown that delayed ESS for patients with CRS may be associated with worse postoperative SNOT-22 scores, need for more frequent office visits with an otolaryngologist, and increased use of prescription medications.[7,8] Due to the unfavorable results associated with delayed surgery and given the known benefits of ESS on improving the quality of life for patients with CRS, it is important to understand what factors are associated with delayed surgery.

We found that Hispanic ethnicity was associated with an approximately 1-month delay to surgery compared to non-Hispanic patients after controlling for clinical and demographic variables that may impact time to surgery. Prior studies have shown similar disparities in the treatment of CRS among patients from minority groups, including those identifying as Hispanic.[14] For example, Levine et al. found that among patients with CRS, Hispanic ethnicity was associated with

TABLE 3 Clinical factors and associated time to surgery.

	N (%)	Days (mean ± SD)	*p*-value
Referral status			.12
Self-referral	41 (39.81%)	67.12 ± 70.14	
ENT	31 (30.10%)	65.97 ± 54.16	
PCP	17 (16.50%)	64.24 ± 52.42	
Allergist	8 (7.77%)	58.50 ± 33.79	
Other physician	6 (5.83%)	155.86 ± 92.02	
History of surgery for CRS			.87
Yes	29 (28.16%)	63.55 ± 42.17	
No	74 (71.84%)	74.85 ± 72.71	
Nasal polyps			.54
Yes	45 (43.69%)	78.33 ± 78.73	
No	58 (56.31%)	66.50 ± 53.33	
DNS			.41
Yes	73 (70.87%)	75.61 ± 70.62	
No	30 (29.13%)	54.26 ± 31.13	
	Mean ± SD	Pearson's coefficient	
SNOT-22	40.97 ± 23.76	−0.25	.37
CCI	0.83 ± 0.99	4.22	.52

Abbreviations: CCI, Charlson Comorbidity Index; CRS, chronic rhinosinusitis; DNS, deviated nasal septum; ENT, otolaryngologist; PCP, primary care physician; SD, standard deviation; SNOT-22 = Sinonasal Outcomes Test.

TABLE 4 Results of multiple linear regression analysis of factors associated with time to surgery.

	Difference in days (mean)	95% confidence interval	*p*-value
Ethnicity (Non-Hispanic, $n = 73$)[a]			
Hispanic ($n = 30$)	28.32	14.95–43.27	.04*
Age	0.51	0.13–0.89	.19
Gender			
Female ($n = 53$)[a]			
Male ($n = 50$)	14.17	1.32–27.02	.27
SVI	−31.25	−55.6 to −6.9	.20

Abbreviation: SVI, Social Vulnerability Index.
[a]Reference variables for statistical comparisons.
*Indicates statistical significance.

increased time to being evaluated by an otolaryngologist despite high disease burden on SNOT-22 testing, while Spielman et al. showed that Hispanic patients were disproportionally excluded from clinical trials for the management of CRS.[15,16] These findings may be explained by a lack of familiarity or confidence with the healthcare system, as well as barriers to healthcare access, which have been documented concerns among Hispanic patients.[17,18] Undergoing surgery also requires overcoming structural barriers, such as transportation to multiple perioperative medical appointments, taking time off of work, financial costs, and possibly necessitating a caretaker at home, which may disproportionally affect Hispanic patients who are more likely to live in intergenerational households and provide informal care for elderly family members.[19] While many of these barriers have been previously shown to impede Hispanic patients' access to otolaryngology care in general, additional research is still necessary to identify barriers impeding access to care for Hispanic patients with CRS. This is particularly important in the West and Southwest regions of the United States where Hispanic or Latino populations are the most prevalent race or ethnicity group in a subset of counties, including Los Angeles.

Another possible explanation of the increased time to surgery among Hispanic patients in our cohort is the disproportional impact of the COVID-19 pandemic on this population, as our data were collected from patients receiving care between 2021 and 2023. The Hispanic population has represented a disproportionately high percentage of overall infections, hospitalizations, and deaths from COVID-19, which likely has implications on the ability to undergo an

elective procedure such as ESS for CRS.[18] Patients with a recent diagnosis of COVID-19 would have been unable to attend preoperative appointments necessary for surgery and may have had surgery postponed if they tested positive for COVID-19 close to the surgical date. Additionally, it has been previously shown that Hispanic patients were more likely to lose employment during the COVID-19 pandemic than many other racial and ethnic demographic groups.[20] Given that approximately 50% of Americans receive health insurance through work,[21] a loss of employment could significantly impact the ability to pay for surgery, and individuals who temporarily lost medical insurance after being offered surgery may also elect to delay surgery until regaining insurance coverage. A limitation of our study is that we were unable to collect information on temporary lapses in insurance coverage due to unemployment. Lapses in insurance coverage could also result in loss to follow up, which would have excluded certain patients from our study and thus biased our results. It is important to understand the factors associated with being lost to follow up as this could not only prolong time to surgery but also prevent patients from undergoing surgery at all.

This study was subject to several other limitations. A major limitation is that due to the retrospective nature of this study, no conclusions can be made about the causal relationship between different variables and increased time to surgery, or the reasons underlying any of the identified associations. The study relied on data from a single institution in a major city and therefore may not be generalizable to other patient populations. Finally, the study had a relatively small sample size, which may have resulted in limited power to identify additional independent predictors of increased time to surgery among patients with CRS. In particular, African Americans have been disproportionately impacted by COVID-19 and low socioeconomic status yet could not be evaluated in this study as it was not powered to analyze this variable.[22–24] A potential future study is a prospective, multi-institution evaluation with a larger and more diverse cohort. This may yield different results and provide greater clarity in determining factors associated with time to ESS.

5 | CONCLUSION

Hispanic ethnicity may be associated with an increased time to ESS among patients with CRS, despite a similar disease burden compared with other subgroups of patients. Otolaryngologists should be aware of this possible disparity, and should consider engaging in culturally sensitive discussions to identify and counsel patients who are at risk of surgical delay. Additional research is necessary to better understand the barriers underlying this disparity in care and whether or not it is replicable in a larger, more diverse, cohort.

CONFLICT OF INTEREST STATEMENT

The authors declare no conflicts of interest.

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