

Factors Associated With Inadequate Health Literacy: An Academic Otolaryngology Clinic Population Study

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Abstract

Objective. To characterize the prevalence of inadequate health literacy among otolaryngology patients and assess the association of individual patient factors with inadequate health literacy.

Study Design. Cross-sectional study.

Setting. Tertiary academic medical center otolaryngology clinic.

Methods. Adult patients presenting to the clinic were recruited from March to June 2022. Participants completed a validated health literacy questionnaire in the waiting room. Data on age, sex, race, insurance, county of residence, and language were extracted from the electronic medical record, linked to the survey responses, and deidentified for analysis. Logistic regression analyses assessed the association between inadequate health literacy and patient factors.

Results. Of 374 participants, the mean age was 54.8 years (SD = 17.8) and most were white (79%) and native English speakers (95%). The median health literacy score was 14.5 (Q1-Q3: 12.0-15.0) and 43 participants (12%) had inadequate health literacy. Bivariate analysis showed the odds of inadequate health literacy were 2.5 times greater for those with public insurance (95% confidence interval [CI]: 1.24-5.20, $P = .011$), 3.5 times greater for males (95% CI: 1.75-6.92, $P < .001$), and significantly different among race groups ($P = .003$). When all factors were evaluated simultaneously with multivariable regression, only sex ($P < .001$) and race ($P = .005$) remained significant predictors of inadequate health literacy. There were no significant associations between health literacy and age or rurality.

Conclusion. Inadequate health literacy was associated with sex and race, but not with age or rurality. 12% of patients had inadequate health literacy, which may perpetuate disparities in care and necessitate interventions to improve care delivery in otolaryngology.

Keywords

academic otolaryngology, health literacy, patient demographics, screening

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Adequate health literacy is the ability to process and understand basic health information and services to make appropriate health decisions.¹ A patient's health literacy significantly impacts their interactions within the health care system. Those with poor health literacy report worse health status and a limited understanding of their medical conditions.² Prior studies have estimated that approximately half of hospitalized patients have adequate health literacy, leading to problems with patients' understanding of disease, follow-up, and comprehension of instructions.^{3,4} Low health literacy has also been associated with lower quality of life, higher emergency department utilization, increased health care costs, and higher rates of mortality.⁵⁻⁷

Within the realm of surgery, inadequate health literacy strongly influences the care and outcomes of vulnerable patient populations, leading to disparities in shared decision making, surgical treatment, and outcomes.^{8,9} Although the relationship between health literacy and health outcomes is multifactorial, not identifying patient literacy levels can lead to suboptimal care. Physician awareness about patients' health literacy has been shown to positively influence the delivery of patient education and care instructions.¹⁰ To address gaps in health literacy, the Brief Health Literacy Screen (BHLS) was developed by Chew et al and has since been validated to identify the

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health literacy levels of patients in the health care setting (Supplemental Appendix 1, available online).¹¹

Previous studies of otolaryngology patients have detected inadequate health literacy levels ranging from 3% to 14%. These single-institution studies analyzed the importance of demographic factors such as age, race, and gender.¹²⁻¹⁵ The aim of our study was to further characterize the prevalence of inadequate health literacy among otolaryngology patients at an academic center and assess the association of individual patient factors, including rurality, with inadequate health literacy.

Methods

Data Collection

English-speaking adult patients (≥ 18 years of age) who presented to the study's academic medical center for an Otolaryngology–Head and Neck Surgery appointment from March to June 2022 were recruited to participate. When patients checked in for an appointment, they were asked by the front desk staff to complete a 1-page survey that included 3 health literacy screening questions. This data were transcribed into a secure online file and linked to electronic medical record data using patient's medical record number and date of birth. The data was then deidentified to protect patient privacy before subsequent analysis. The study was deemed as exempt by the Penn State Institutional Review Board due to its quality improvement nature.

Measures

The BHLS was used to measure health literacy among the study population using 3 Likert-style questions that assess a patient's confidence in using hospital materials, written information, and forms related to their care.¹¹ Answers to each of the questions were assigned a score from 1 to 5, which was summed to calculate a health literacy score (minimum: 3, maximum: 15), with a score of 9 or less indicating inadequate health literacy.¹⁶

Participant demographic data including age, sex, race, primary language, insurance status, and county of residence was extracted from the electronic medical record. Participant's otolaryngology diagnoses were identified using International Classification of Disease-10 codes. The 2013 US Department of Agriculture Rural-Urban Continuum Coding (RUCC) system, which is based on population density, was used to classify participants as rural or urban by their county of residence.¹⁷ A RUCC code of 1 to 3 identified urban counties and 4 to 9 identified rural counties.¹⁸

Statistical Analysis

Descriptive statistics were utilized to summarize the frequency and distribution of demographic characteristics and otolaryngology diagnoses among the study cohort. Median health literacy was estimated for categorical

variables including age, sex, race, insurance type, and rurality. Age was analyzed using a binary variable to stratify patients <60 years old versus $60+$ given prior literature identifying a higher risk of limited health literacy in older adults.¹⁹ Bivariate logistic regression was used to assess the association of these variables with inadequate health literacy. Patient factors with $P < .10$ from the bivariate analysis were investigated further in a multivariable logistic regression model to estimate the strength of association when the factors were evaluated simultaneously as predictors of inadequate health literacy. Factors were removed one at a time until all remaining predictors had $P < .05$ to achieve the best model. Results were interpreted in terms of adjusted odds ratios and 95% confidence intervals (CIs). All statistical analyses were performed using SAS statistical software version 9.4. Significance was defined as a $P < .05$.

Results

Cohort Description

Of the adult patients who presented to the clinic during the study period, a total of 374 adults (36.49%) completed the survey. Demographic characteristics of the study cohort are outlined in **Table 1**. Most participants were female (57%), white (79%), primary English speakers (95%), and residents of urban counties (95%). The clinical characteristics of the cohort are outlined in **Table 2**. The most common diagnoses were disease of the ear and mastoid and upper respiratory tract disease. Health literacy levels among the cohort ranged from 3 to 15, with a median score of 14.5, as displayed in **Figure 1**. Differences in median health literacy score by patient's

Table 1. Sample Description (n = 374)

	n	%
Mean age (SD)	55 (17.8)	
Sex		
Female	212	57
Male	162	43
Race		
White	295	79
Black	14	4
Asian	8	2
Other	42	11
Unknown	15	4
Native English speaker	356	95
Insurance status		
Private	160	43
Public	203	54
Other	11	3
Residence		
Rural	20	5
Urban	348	95

demographic factors are displayed in **Figure 2**. Overall, a total of 43 patients (12%) had inadequate health literacy.

Bivariate Associations

A summary of the bivariate analysis results is provided in **Figure 3**. Of the demographic variables evaluated, race and sex were significantly associated with inadequate

health literacy. The odds of inadequate health literacy were 3.5 times greater for males versus females (95% CI: 1.75-6.92, $P < .001$). There was also a significant association between insurance type and inadequate health literacy ($P = .040$). The odds of inadequate health literacy were 2.5 times greater for those with public versus private insurance (95% CI: 1.24-5.20, $P = .011$). No significant association between inadequate health literacy and age or rurality was identified.

Table 2. Cohort Otolaryngology Diagnoses

	n	%
Disease of the ear and mastoid	117	33
Other	98	26
Upper respiratory tract disease	86	23
Head and neck cancer	59	16
Voice and swallowing disorders	45	12
Obstructive sleep apnea	5	1.3

Multivariable Associations

Multivariable analysis demonstrated male sex ($P < .001$) and race ($P = .005$) as significant predictors of inadequate health literacy, which is outlined in **Table 3**. The odds of inadequate health literacy were 3.7 times greater for males versus females (95% CI: 1.79-7.81), with adjustment for race. The overall significant effect of race ($P = .005$) appears to be driven by the comparisons of each of the other race groups versus Asian. The odds of inadequate health literacy were 19.1 times greater for Asian versus white (95% CI:

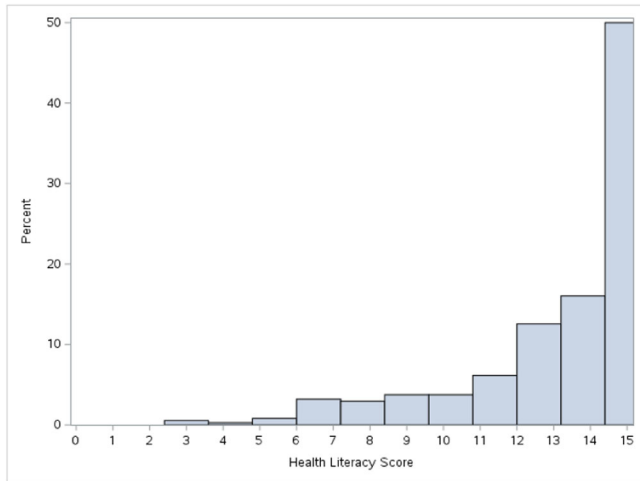


Figure 1. Health literacy scores. A histogram representing the distribution of health literacy scores, with a minimum score of 3 and a maximum score of 15. The median score for the study population was 14.5, with a lower quartile of 12 and an upper quartile of 15.

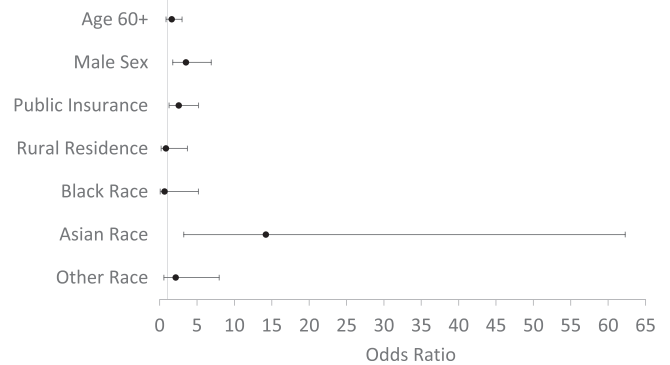


Figure 3. Bivariate analysis of potential predictors of inadequate health literacy. Forest plot representing the odds of inadequate health literacy for each patient factor evaluated via bivariate analysis. There was no significant association for factors that cross 1. The odds ratio estimate for race was calculated using the white race as a reference.

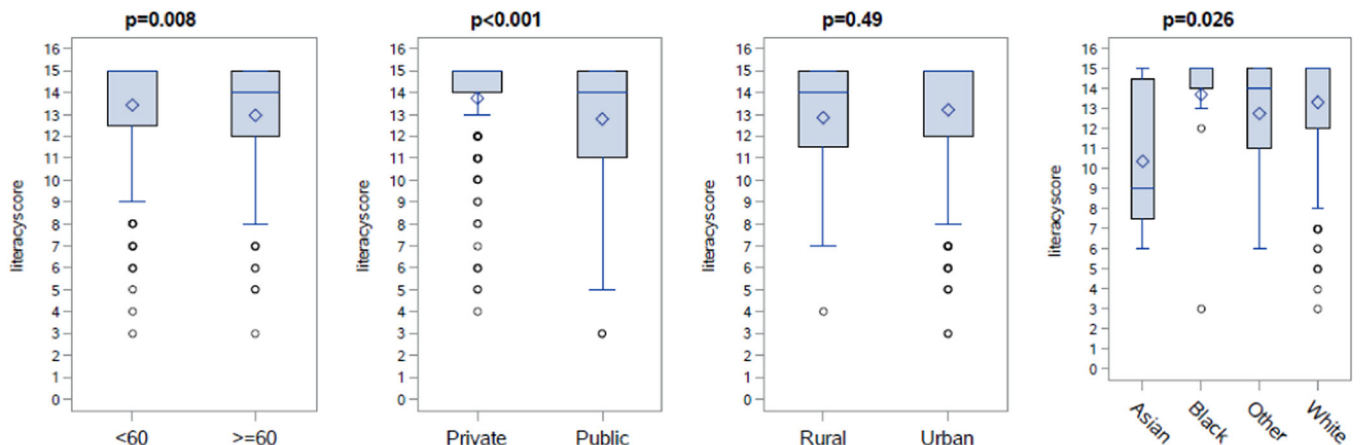


Figure 2. Median health literacy score by patient factors. Comparison of median health literacy score by each patient factor evaluated.

Table 3. Multivariable Analysis of Potential Predictors of Inadequate Health Literacy

Characteristic	Overall P	Comparisons	OR	95% CI
	value			
Sex	<.001	Male vs female	3.74	1.79, 7.81
Race	.005	Asian vs white	19.12	3.99, 91.70
		Asian vs black	26.89	2.08, 347.97
		Asian vs other	10.77	1.44, 80.56
		Black vs white	0.71	0.08, 5.80
		Black vs other	0.40	0.04, 4.60
		Other vs white	1.78	0.46, 6.87

Abbreviations: CI, confidence interval; OR, odds ratio.

3.99-91.70). There was no significant association between health insurance and inadequate health literacy after controlling for sex and race.

Discussion

Patients with low health literacy may be less familiar with the severity of their condition, less engaged, and may not express their lack of understanding.^{20,21} Multiple screening instruments have been developed to screen for health literacy including the Newest Vital Sign, the Short version of the Test of Functional Health Literacy in Adults, Rapid Estimate of Adult Literacy in Medicine, and the BHLS.^{11,22-24} Some tests have a high time burden, while the BHLS can be done rapidly. The BHLS identifies gaps in health literacy levels between patients that may not be apparent through conversation.¹¹ Screening is important because health literacy is often over-estimated by physicians and may not always be associated with education level.^{4,25} In our study, we found that collecting the BHLS questionnaire was a feasible and efficient way to estimate the health literacy levels of our patient population. We found that 12% of otolaryngology patients had inadequate health literacy, meaning they may not understand or be able to participate in their care in a meaningful way.

The rate of health literacy inadequacy in our population is comparable to prior literature in otolaryngology.^{12,14} Rates of inadequate health literacy in other populations range from 10% to greater than 25%.^{26,27} Our patients' median score of 14.5 on the BHLS is slightly higher than other studies.^{12,14} We did not delineate literacy levels by new versus established patients, and Tolisano et al found no significant difference in literacy between these cohorts.¹⁴

Similar to previous studies looking at health literacy in otolaryngology patients, the present study took place at an academic medical center.¹²⁻¹⁴ Health literacy measurement in this setting may have contributed to higher-than-expected health literacy levels via selection bias. Obtaining care at a specialty center likely requires some baseline health literacy

by requiring patients to perform tasks including scheduling their appointment, arranging for transportation to their visit, and completing patient forms. Ultimately, some patients with low health literacy levels may not make it into the clinic and thereby they may be underrepresented in our sample.

Of the variables evaluated, male sex, Asian race, and public insurance, but not age or rurality of residence, were significantly associated with inadequate health literacy. The association between insurance status and health literacy evident on bivariate analysis was insignificant after controlling for other sociodemographic variables in multivariable analysis. This suggests that some of the differences in health literacy observed by insurance status were explained by differences in sex and/or race. A similar study of an adult otolaryngology population by Megwalu et al, found no significant association between inadequate health literacy and age or sex.¹³ The relationship between age and health literacy is not consistent across studies and there is limited information on health literacy in different subgroups of older aged patients.¹²⁻¹⁴ We analyzed the association of age using a binary variable centered at 60 years of age, which may have influenced the strength of association between age and health literacy. However, other studies support our finding that higher health literacy was seen in females.^{14,28,29} The reason for variation in health literacy by sex is not fully known and there are varying degrees to which factors such as income and educational attainment influence literacy.³⁰

The association of race with health literacy in otolaryngology is variable and is likely determined by each patient population's composition.^{13,15} Our finding of Asian race being associated with a higher likelihood of inadequate health literacy is likely a result of sampling bias. Only 8 individuals (2%) identified as having Asian race in our study. Another possible explanation is our institution's high percentage of patients who are Nepali refugees.³¹ Refugees often have low health literacy levels and a lack of English proficiency can present significant health-related barriers.^{32,33} Megwalu et al reported that white race and having English as a primary language were associated with adequate health literacy. However, in contrast to our study, their study did not further delineate non-white racial groups, limiting conclusions about specific minority groups.¹³ In our study, we included patients able to understand English and 95% of patients reported being a native-English speaker. Given that we did not directly assess functional fluency in English, there is a possibility that the level of patients' language proficiency may have influenced the health literacy survey results. The surveys were self-administered and study participants not completely comfortable with English may or may not have used assistance such as a dictionary or family member when answering the health literacy questions. Ultimately, the small number of non-native English speakers and Asian patients in this study

makes it hard to make any strong conclusions regarding these groups.

Our study's finding of a negative association between private insurance and inadequate health literacy on bivariate analysis was expected. Having private insurance likely reflects a higher socioeconomic status which has been positively correlated with health literacy.³⁴ Our study's conclusion that rurality does not significantly impact health literacy is limited by the small proportion of patients from rural residences. We were surprised by the small number of patients considered rural in the study sample; this may be a result of classifying patients' rurality based on their county of residence alone, as there is variation of population density within each county. Previous literature has identified that health literacy levels may be lower among rural patients but that other sociodemographic factors may be stronger determinants of health literacy.³⁵ Some studies report higher rates of health literacy in urban populations, but factors such as income and educational attainment, which were not collected in our study, may account for lower reported levels of health literacy in rural patients.^{36,37}

While our study may be limited in that it was conducted at a single academic institution, our center is a large tertiary center serving a large population which should improve generalizability. The results may be influenced by sampling bias and self-reporting bias given the study design. Patients may have already required higher health literacy levels to obtain care at our academic specialty clinic. Patient demographic data were collected retrospectively from the electronic medical record, so information on education level was not known which may have influenced the results of the BHLS.¹³ With a 36.49% response rate in our study, there may be a sampling bias. However, survey distribution was done by our clinic's front desk staff randomizing this process and our study took place over several months, capturing a large variety of patients. Strengths of our study were that it included a large sample of patients with a variety of otolaryngology conditions and utilized a highly validated survey to assess health literacy. To our knowledge, our study was the first otolaryngology health literacy study to assess the impact of rurality. The data presented may be important for quality improvement as a strong starting point for implementing interventions to improve health literacy.

Physicians and health care workers can help minimize the gaps in patient health literacy by relaying information in a way that aligns with the patient's health literacy level to maximize their understanding. In otolaryngology, patient education materials are often not written at accessible reading levels, such as the patient materials from the Academy of Otolaryngology–Head and Neck Surgery Foundation which were found to be written at reading levels above the recommended sixth-grade level.³⁸ In this context, knowledge about the prevalence of inadequate health literacy is critical for highlighting a need for systematic changes in otolaryngology improve

communication for vulnerable patients. Future research is needed to identify interventions that promote understanding among these patients given the complex nature of the surgeries and management plans within our field.

Conclusion

In our study of adult otolaryngology clinic patients, 12% of patients had inadequate health literacy. On multivariate analysis, sex and race remained significantly correlated with health literacy.

Author Contributions

Madison Hearn, study conception and design, data collection, data interpretation, manuscript preparation, and final review; **Bao Y. Sciscent**, data interpretation, manuscript preparation, and final review; **Tonya S. King**, data analysis, manuscript final review; **Neerav Goyal**, study conception and oversight, manuscript final review.

Disclosures


Competing interests: None.

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Supplemental Material

Additional supporting information is available in the online version of the article.

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