

Exploring Demographic Characteristics and Clinical Manifestations of Skull Base Osteomyelitis: A Comparative Analysis of Two Academic Hospital Systems

Shreya Jain, BA¹, Marco A. Campioli, BA¹, Kaitlyn A. Brooks, MD²; Angela Peng, MD²

¹School of Medicine, Baylor College of Medicine, Houston, TX.

²Bobby R. Alford Department of Otolaryngology-Head and Neck Surgery, Baylor College of Medicine, Houston, TX.

Baylor
College of
Medicine

Abstract

Background: Skull base osteomyelitis (SBO) is a rare, life-threatening infection with significant potential co-morbidities. Because of our experience managing SBO among a diverse patient population, we aimed to evaluate how clinical and demographic characteristics impact risk of SBO diagnosis between different healthcare settings.

Methods: A retrospective case-control study was performed with aggregate patient electronic health data from 2000-2025 at two urban healthcare institutions: a private academic center (Institution-A) and a public, safety-net hospital (Institution-B).

Adult patients with SBO were identified through ICD coding and compared against adults without SBO ICD codes. Odds ratios evaluated the effect size of SBO diagnosis and association among demographic factors, co-morbidities, and symptomatology.

Results: Institution A had 351 cases and 4,309,144 controls. Institution B had 539 cases and 4,067,562 controls. The odds of SBO diagnosis were significantly higher at Institution B vs. Institution A (OR 1.63, 95% CI 1.42-1.86). Otolgic symptoms and/or otitis media were strong predictors of an SBO diagnosis across both institutions (Tables 1-2). Female patients, patients with BMI ≥ 30 kg/m², and patients of Hispanic/Latino ethnicity had significantly increased odds of diagnosis (Table 3). Institution B, however, demonstrated significantly stronger association for Hispanic/Latino ethnicity and history of MI, atrial fibrillation, HLD compared to Institution A. Payor mix varied between institutions (Figure 1).

Conclusions: Healthcare setting, otologic symptoms, and chronic comorbidities are strongly associated with developing SBO. Our results indicate that patients who seek care at safety-net hospitals with chronic health conditions have increased odds of SBO diagnosis compared to similar patients who seek care at private academic institutions. These findings may be explained by lack of access to consistent management of co-morbid conditions and require further investigation.

Introduction

- Skull base osteomyelitis (SBO) is a rare, life-threatening infection influenced by patient co-morbidities.^[1]
- Social determinants of health likely reduce healthcare access and affect risk of diagnosis.^[2-3]
- We hypothesized that certain comorbidities would be more prevalent and strongly linked to SBO in patients at the public hospital.

Objective:

- Evaluate factors influencing SBO diagnosis between private versus public healthcare settings.

Methods and Materials

- Retrospective case-control study:
 - Outpatient clinic and private hospital (Baylor St. Luke's Medical Center)
 - Public hospital (Ben Taub Hospital, Harris Health System)
- Institutional databases were queried for SBO and patients' demographic characteristics, co-morbidities, and symptomatology (Figure 1).
- Primary outcome:**
 - Odds ratio of SBO diagnosis (95% CI reported)
- Secondary outcome:**
 - Insurer payor-mix between institutions

Results

Figure 1: Study Design

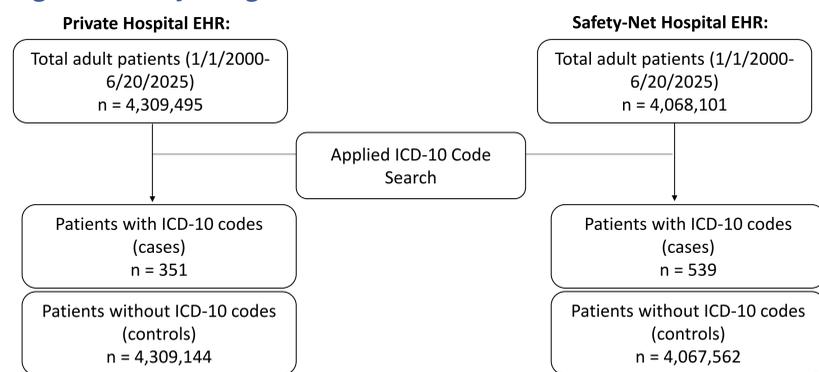


Table 1: Baseline Demographic Characteristics*

	Private Hospitals, N (%)		Public Hospital, N (%)	
	Cases	Controls	Cases	Controls
BMI (kg/m²)				
< 18.5	6 (4.8%)	23,678 (3.6%)	40 (4.1%)	98,920 (5.5%)
18.5 to < 25.0	27 (21.6%)	211,868 (31.9%)	210 (21.3%)	480,870 (26.5%)
25.0 to < 30.0	36 (28.8%)	224,832 (33.8%)	334 (33.9%)	608,762 (33.5%)
≥ 30.0	56 (44.8%)	204,906 (30.8%)	402 (40.8%)	627,355 (34.6%)
Sex				
Female	194 (55.3%)	1,967,694 (45.7%)	325 (60.3%)	2,021,753 (49.8%)
Male	157 (44.7%)	2,334,000 (54.3%)	214 (39.7%)	2,036,716 (50.2%)
Ethnicity				
Hispanic/Latino	57 (42.2%)	330,933 (21.2%)	318 (66.1%)	441,336 (20.6%)
Not Hispanic/Latino	78 (57.8%)	1,232,095 (78.8%)	163 (33.9%)	1,701,484 (79.4%)

*All patients without recorded data were excluded; some patients had multiple BMI measurements

Results

Table 2: Demographics associated with SBO Diagnosis

	Private Hospitals		Public Hospital	
	OR (95% CI)	p-value	OR (95% CI)	p-value
BMI ≥ 30 vs. BMI ≥ 18.5 to < 25:	2.14 (1.37, 3.44)	0.00113	1.47 (1.24, 1.74)	<0.001
BMI ≥ 30 vs. BMI ≥ 25 to < 30:	1.71 (1.13, 2.62)	0.012	1.17 (1.01, 1.35)	0.036
Female vs. Male	1.47 (1.19, 1.81)	<0.001	1.53 (1.29, 1.82)	<0.001
Hispanic/Latino vs. Not Hispanic/ Latino	2.72 (1.93, 3.82)	<0.001	7.52 (6.24, 9.10)	<0.001

Figure 2a and 2b: Comorbid diagnoses and symptomatology associated with SBO Diagnosis. *All ORs significant with p < 0.01, 95% CI depicted. **Non-overlapping 95% CI between patient cohorts.

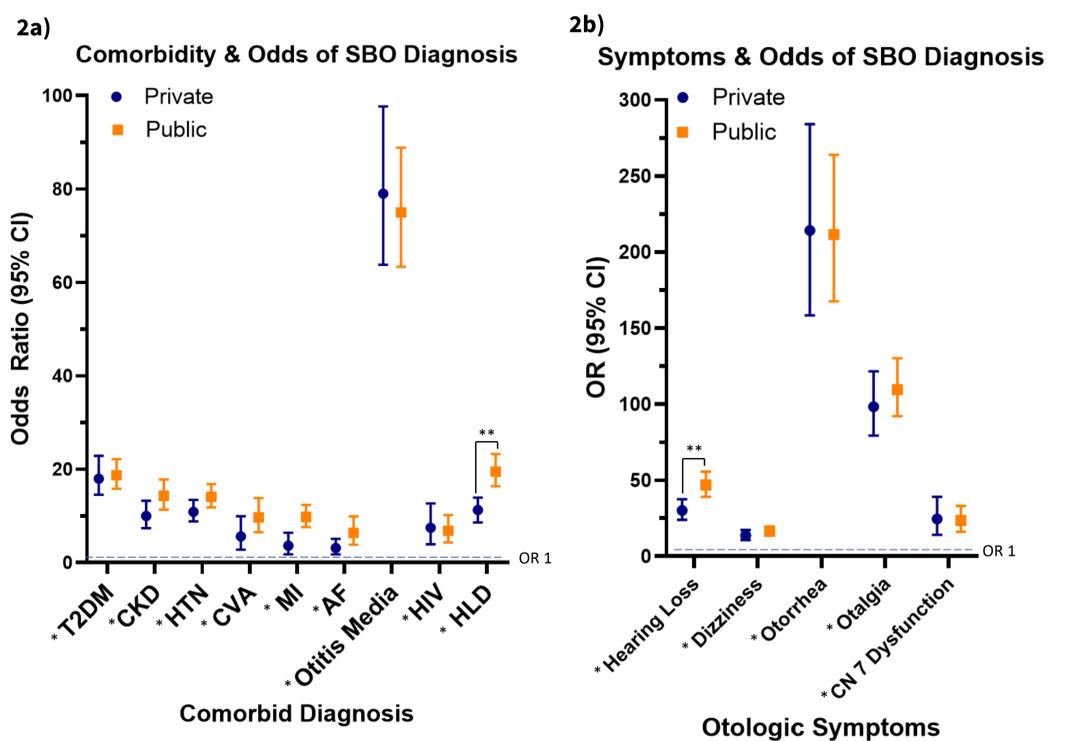
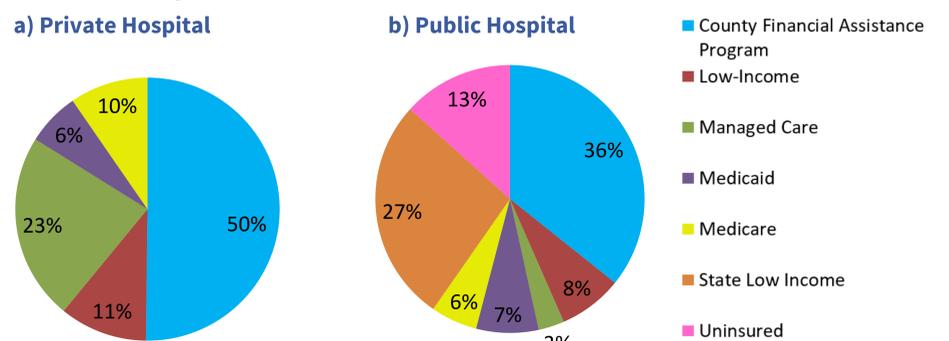


Figure 3: Comparing Top 10 Insurers Across Institutions



County financial assistance was the most frequent insurer at both institutions, followed by managed care (private) at the private hospitals versus federal insurers at the safety-net hospital.

Discussion & Conclusion

- Otolgic symptoms and diagnoses, such as history of otitis media, otorrhea and otalgia, were the strongest predictors of SBO.
- Certain predictors (HLD, hearing loss) did differ in effect size between the two patient populations.
- Limitations:**
 - Aggregate data collection rather than individual patient level data
 - Retrospective bias possible
- Conclusion:**
 - Risk of SBO and influencing background factors differ between populations at treating institutions.
 - We hypothesize that healthcare access is a significant driving factor in effective chronic condition management, influencing SBO risk. Future goals include patient level data examining different socioeconomic factors and severity of SBO.

Contact

Angela Peng, MD
1977 Butler Blvd
Houston, TX 77030
Angela.Peng@bcm.edu

References

- Chapman PR, Choudhary G, Singhal A. Skull Base Osteomyelitis: A Comprehensive Imaging Review. *AJNR Am J Neuroradiol*. 2021;42(3):404-413. doi:10.3174/ajnr.A7015
- Herring J, Park YH, Luo Q, Vichare A, Erikson C, Pittman P. Medicaid Primary Care Utilization and Area-Level Social Vulnerability. *JAMA Health Forum*. 2025;6(9):e253020. Published 2025 Sep 5. doi:10.1001/jamahealthforum.2025.3020
- Ioerger P, Mills K, Wagoner SF, et al. Inequities Associated With Advanced Stage at Presentation of Head and Neck Cancer: A Systematic Review. *JAMA Otolaryngol Head Neck Surg*. 2024;150(8):727-740. doi:10.1001/jamaoto.2024.1180