

## Introduction

Angioedema is a potentially life-threatening edema of subcutaneous and/or submucosal tissues that can affect the oral cavity, face, larynx, neck, extremities, and GI tract. Etiology may be histamine or bradykinin-mediated. Both forms may result in airway swelling and subsequent asphyxiation, which is why diagnosis and appropriate treatment are crucial. This study evaluates patient demographic factors that influence inpatient admission rates among emergency department cases of angioedema. While angioedema disposition principally depends on airway and respiratory stability, we hypothesize that there are demographic trends underlying admission patterns that reflect disease epidemiology and approaches to management.

## Methods

Data were extracted from the National Emergency Department Sample (NEDS) for patients diagnosed with angioedema in 2015, 2017, and 2019. Results were extrapolated to the entire US emergency department population using established sampling weights. Odds of inpatient admission for the national angioedema population were generated with multivariate logistic regression. *P*-values < 0.05 were considered statistically significant.

## Results

A total of 242,315 ED visits were included in this study. Statistically significant trends were identified across all demographic variables. Females, patients less than 10-years-old, self-pay and private insurance patients, non-metropolitan hospitals, and non-trauma facilities experienced the lowest admission odds. Demographics associated with increased admission odds include patients aged 45 to 64, patients from zip codes with a median household income in the lowest quartile, metropolitan teaching hospitals, and Level I trauma centers. Increased scores on the Charlson Comorbidity Index also confer greater odds of admission, especially for patients scoring 3+.

Age	Odds ratio	p-value	95% conf. interval	
0-10 [ref]				
11-20	2.08	<b>0.000</b>	1.42	3.039
21-44	5.44	<b>0.000</b>	3.97	7.44
45-64	7.56	<b>0.000</b>	5.50	10.4
65+	6.52	<b>0.000</b>	4.72	9.00

Zip code median household income	Odds ratio	p-value	95% conf. interval	
0-25th percentile [ref]				
26-50th percentile	0.88	<b>0.003</b>	0.806	0.958
51-75th percentile	0.89	<b>0.010</b>	0.807	0.972
76-100th percentile	0.89	<b>0.036</b>	0.798	0.992

Modified Charlson Comorbidity Index	Odds ratio	p-value	95% conf. interval	
0 [ref]				
1	2.65	<b>0.000</b>	2.46	2.85
2	4.81	<b>0.000</b>	4.36	5.30
3+	10.44	<b>0.000</b>	9.43	11.5

Hospital teaching status	Odds ratio	p-value	95% conf. interval	
Metropolitan non-teaching [ref]				
Metropolitan teaching	1.27	<b>0.000</b>	1.12	1.44
Non-metropolitan hospital	0.42	<b>0.000</b>	0.346	0.506

Sex	Odds ratio	p-value	95% conf. interval	
Male [ref]				
Female	0.92	<b>0.002</b>	0.873	0.971

Primary Payer	Odds ratio	p-value	95% conf. interval	
Medicare [ref]				
Medicaid	0.93	0.195	0.833	1.038
Private Insurance	0.72	<b>0.000</b>	0.651	0.788
Self-Pay	0.62	<b>0.000</b>	0.535	0.714
No charge	1.46	0.092	0.940	2.28
Other	0.90	0.257	0.747	1.081

Hospital region	Odds ratio	p-value	95% conf. interval	
Northeast [ref]				
Midwest	0.67	<b>0.000</b>	0.568	0.792
South	0.82	<b>0.000</b>	0.712	0.953
West	0.63	<b>0.000</b>	0.519	0.765

Hospital trauma level	Odds ratio	p-value	95% conf. interval	
Not a trauma center [ref]				
Trauma center level I	1.54	<b>0.000</b>	1.302	1.83
Trauma center level II	1.28	<b>0.000</b>	1.13	1.45
Trauma center level III	1.20	<b>0.012</b>	1.041	1.37

## Discussion

Admission criteria for angioedema depend on the cause, management, risk of progression, and treatment response. Demographic-level trends in angioedema admission may be reflective of disease patterns. For example, children most commonly experience angioedema due to mast cell activation after allergen exposure or due to infection.<sup>1</sup> In most cases of pediatric angioedema, avoiding triggers may be sufficient treatment, potentially supporting the lower admission rates among patient 0-10 years of age in this study. Alternatively, hereditary angioedema and ACE-inhibitor induced angioedema are more likely to warrant admission for airway monitoring. ACE-inhibitor-induced angioedema is seen in an older patient population and has been previously reported to account for half of all angioedema admissions, corroborating increased admission rates as well.<sup>2</sup>

While previous studies indicate higher angioedema incidence in women, these results show lower admission rates.<sup>3</sup> Additionally, while there is no reported geographic differences in angioedema incidence, these results outline increased rates of admission in the northeast, possibly reflecting different etiology or management culture.

Shortcomings of the NEDS database limit this study. Results assume accurate diagnosis via ICD-9 codes and do not specify maxillofacial angioedema. Further, the database does not include post-admission or emergency room data for contextualization of results. While the results demonstrate strong demographic-level trends, this study alone cannot elucidate the specific mechanisms underlying admission patterns, including the role of etiology, presentation severity, healthcare resources, and socioeconomic factors.

## Conclusion

These results highlight strong demographic-level trends in angioedema admission. However, further research is warranted to determine the causes underlying these differences.

## References

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