Adult Inpatient Acute Rhinosinusitis Management and Outcomes Stratified by Age and Sex

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Abstract

Objective: This study aims to compare the management of male and female inpatients with acute rhinosinusitis (ARS) within the following age cohorts: 18-40 years, 41-59 years, and 60 years.

Study Design: Retrospective cohort study.

Setting: National administrative database.

Methods: The 2017 National Inpatient Sample was queried for adult inpatients (>18 years old) with ARS (ICD-10: J01). Orbital and intracranial sequelae were selected via ICD-10 codes. Statistical associations by sex were determined via univariate and multivariable analyses. Weighted measures are reported to provide national estimates.

Results: Of the 4,355 patients identified with ARS, 2,555 (58.7%) were female and 1,800 (41.3%) were male. Males were younger than females (mean, 56.89 vs 61.14 years; P<.001). Multivariable analysis indicated that males had greater total charges ($44,878 vs $37,188, P<0.001), length of stay (LOS) (4.09 vs 3.66 days, P=.003), and odds for intracranial complications (OR, 5.740; P<0.001) than females. Although males underwent a similar number of total procedures as females (1.25 vs 1.02, P=0.053), age stratification revealed males aged 60 years had greater total charges, length of stay, and numbers of procedures undergone (1.13 vs 0.78, P < 0.001) than females in this age group.

Conclusion: In a cohort of adult inpatients with ARS, males had greater total charges, LOS, and odds for intracranial complications. Males aged 60+ years also had a greater number of procedures undergone than females in this age group.

Introduction

- ARS is a common condition in adults, which in severe cases can lead to hospitalization, often due to complications.[1,2]
- Severe complications include intracranial abscess, periorbital and orbital cellulitis, meningitis, venous sinus thrombosis, osteomyelitis, and sepsis.[3,4]
- Many studies have investigated sex-dependent differences in the incidence, management, and outcomes of chronic rhinosinusitis.[1]
- This study aimed to highlight the age-stratified impact of sex on the management of ARS in adult inpatients.

Methods

- A population-based retrospective analysis of the 2017 National Inpatient Sample (NIS) was performed to identify adults with acute rhinosinusitis.
- Patient demographics, hospital stay information, comorbidities, and complications were collected and analyzed.
- Univariate and multivariable analyses were utilized to assess for potential statistical associations between sex and ARS management, procedures, and complications.
- Further analyses were conducted among age-stratified groups to analyze the impact of age.

Results

Table 1. Univariate Analysis of Demographics, Comorbidities, and Sinusitis Location in Adult Patients with Acute Rhinosinusitis

		Total (N=4,355)	Male (N=1,800)	Female (N=2,555)	P value
Age	Age, y, mean (SE)	59.38	56.89	61.14	**<0.001**
Race	White	70.5%	73.0%	68.7%	**0.008**
	Black	13.3%	12.6%	13.8%	
	Other	16.2%	14.4%	17.4%	
Household income quartile, %	0-25	28.0%	26.2%	29.2%	**0.045**
	26-50	26.5%	28.5%	25.2%	
	51-75	23.3%	23.7%	23.0%	
	76-100	22.2%	21.7%	22.6%	
Primary payer status	Medicare	51.2%	44.4%	56.%	**<0.001**
	Medicaid	12.6%	14.2%	11.5%	
	Private Insurance	30.0%	33.1%	27.8%	
	Other	6.2%	8.3%	4.7%	
Admission Month	January-March	32.2%	29.5%	34.1%	**<0.001**
	April-June	24.8%	22.0%	26.8%	
	July-September	19.0%	22.3%	16.6%	
	October-December	24.0%	26.2%	22.5%	
Hospital Region	Northeast	32.9%	21.9%	21.1%	0.324
	Midwest	25.2%	24.4%	22.5%	
	South	18.7%	40.0%	42.1%	
	West	23.2%	13.6%	14.3%	
Teaching Status	Rural	11.0%	10.0%	11.7%	0.190
	Urban/nonteaching	23.0%	23.1%	22.9%	
	Urban/teaching	66.0%	66.9%	65.4%	
Comorbidities	Asthma	14.8%	9.7%	18.4%	**<0.001**
	Obesity	9.4%	10.3%	8.8%	0.102
	Type I diabetes mellitus	1.1%	1.7%	0.8%	**0.007**
	Allergic rhinitis	2.9%	2.8%	2.9%	0.759
Sinusitis location	Unspecified sinusitis	35.9%	35.6%	36.2%	**<0.001**
	Maxillary sinusitis	26.9%	26.7%	27.0%	
	Frontal sinusitis	5.3%	4.7%	5.7%	
	Ethmoid sinusitis	5.2%	7.2%	3.7%	
	Sphenoid sinusitis	6.4%	5.6 %	7.0%	
	Pansinusitis	13.1%	14.2%	12.3%	
	Other sinusitis	7.2%	6.1%	8.0%	

Results

Table 2. Univariate Analysis of Charges, Management, Procedure Type, and Complications Associated with Male Sex in Adult Patients with Acute Rhinosinusitis

	Total (N = 4,355)	Male (N=1,800)	Female (N=2,555)	P value
Mean Values				
Total charges, $	40,366.88	44,878.04	37,188.77	**<0.001**
Length of stay, d	3.84	4.09	3.66	**<0.001**
No. of procedures	1.12	1.25	1.02	**<0.001**
Time until first procedure, d	1.72	1.66	1.77	0.509
Percentages				
Procedure				
Excision: ear, nose, sinus	10.1	12.5	8.4	**<0.001**
Drainage: ear, nose, sinus	8.8	10.3	7.8	**0.005**
Drainage: nervous system	4.4	3.6	4.9	**0.042**
Complication				
Orbital or intracranial	96.3	94.4	97.7	**<0.001**
Orbital	2.9	4.4	1.8	**<0.001**
Intracranial	1.1	1.7	0.8	**0.007**

Table 3. Adjusted Multivariable Analysis of Charges, Management, Procedure Type, and Complications Associated with Male Sex in Adult Patients with Acute Rhinosinusitis

	Adjusted	95% CI	P value
Marginal Values			
Total charges, $	8,585	4,605 to 12,566	**<0.001**
Length of stay, d	0.497	0.165 to 0.830	**<0.003**
No. of procedures	0.144	-0.002 to 0.289	0.053
Time until first procedure, d	0.002	-0.309 to 0.313	0.990
Odds Ratios			
Procedure			
Excision: ear, nose, sinus	1.717	1.364 to 2.161	**<0.001**
Drainage: ear, nose, sinus	1.224	0.952 to 1.574	0.115
Drainage: nervous system	0.535	0.371 to 0.772	**0.001**
Complication			
Orbital or intracranial	1.922	1.269 to 2.911	**0.002**
Orbital	1.092	0.651 to 1.824	0.739
Intracranial	5.740	2.357 to 13.979	**<0.001**

Table 4. Univariate Analysis of Charges, Management, Procedure Type, and Complications Associated with Male Sex in Adult Patients with Acute Rhinosinusitis Stratified by Age Group

	Age 20-39 y (n = 745)			Age 40-60 y (n = 1,310)			Age 60+ y (n = 2,300)		
	Male (N = 425)	Female (N = 320)	P value	Male (N=480)	Female (N=830)	P value	Male (N=895)	Female (N=1,405)	P value
Mean Values									
Total charges, $	41,897	43,703	0.705	40,433	36,159	0.163	48,677	36,330	**<0.001**
Length of stay, d	4.01	3.30	0.141	3.68	3.71	0.887	4.35	3.72	**0.005**
No. of procedures	1.58	1.63	0.791	1.20	1.19	0.933	1.13	0.78	**0.001**
Time until first procedure, d	1.18	1.67	**0.028**	2.17	1.87	0.380	1.67	1.72	0.806
Percentages									
Procedure									
Excision: ear, nose, sinus	20.0	14.1	**0.035**	9.4	10.2	0.613	10.6	6.0	**<0.001**
Drainage: ear, nose, sinus	12.9	17.2	0.106	8.3	8.4	0.950	10.1	5.3	**<0.001**
Drainage: eye or orbit	2.4	0.0	**0.006**	0.0	0.6	0.088	0.6	0.4	0.471
Drainage: nervous system	5.9	9.4	0.071	6.3	4.2	0.103	1.1	4.3	**<0.001**
Complication									
Orbital or intracranial	12.9	1.6	**<0.001**	4.2	3.0	0.269	2.8	2.1	0.314
Orbital	11.8	1.6	**<0.001**	4.2	2.4	0.075	1.1	1.4	0.528
Intracranial	3.5	0.0	**0.001**	0.0	1.2	**0.016**	1.7	0.7	**0.030**

Table 5. Adjusted Multivariable Analysis of Charges, Management, Procedure Type, and Complications Associated with Male Sex in Adult Patients with Acute Rhinosinusitis Stratified by Age Group

	Age 20-39 y (n = 745)			Age 40-60 y (n = 1,310)			Age 60+ y (n = 2,300)		
	Adjusted	95% CI	P value	Adjusted	95% CI	P value	Adjusted	95% CI	P value
Marginal Values									
Total charges, $	1,515	-8,472 to 11,502	0.766	3,344	-2,780 to 9,468	0.670	14,878	8,982 to 20,776	**<0.001**
Length of stay, d	0.892	-0.142 to 1.926	0.091	-0.095	-0.571 to 0.382	0.697	0.784	0.318 to 1.250	**0.001**
No. of procedures	-0.047	-0.399 to 0.305	0.793	-0.161	-0.423 to 0.101	0.228	0.416	0.216 to 0.617	**<0.001**
Time until first procedure, d	-0.812	-1.300 to -0.324	**0.001**	0.333	-0.385 to 1.051	0.362	-0.090	-0.517 to 0.336	0.677
Odds Ratios									
Procedure									
Excision: ear, nose, sinus	2.144	1.041 to 4.290	0.038	0.939	0.583 to 1.512	0.796	2.601	1.780 to 3.799	**<0.001**
Drainage: ear, nose, sinus	0.153	0.060 to 0.391	**<0.001**	0.701	0.403 to 1.219	0.208	3.706	2.404 to 5.174	**<0.001**
Drainage: eye or orbit	*	*	*	*	*	*	*	*	*
Drainage: nervous system	0.118	0.023 to 0.611	**0.011**	1.069	0.545 to 2.096	0.846	0.129	0.047 to 0.352	**<0.001**
Complication									
Orbital or intracranial	*	*	*	3.917	1.318 to 11.638	**0.014**	1.475	0.668 to 3.260	0.336
Orbital	*	*	*	3.133	1.066 to 9.206	**0.038**	0.019	0.000 to 1.546	0.078
Intracranial	*	*	*	*	*	*	*	*	*

*For these cells, adjusted odds ratio not reported because of sparse data and model non-convergence produced an unstable estimate (odds ratio extremely large and 95 % CI not defined).

Multivariable models (Tables 3 and 5) adjusted for age, race, household income, primary payer status, admission month, hospital region, teaching status, comorbidities, and sinusitis location.

Conclusions

- Males had greater total charges, length of stay, and increased odds for intracranial complications compared to females.
- Differences between sexes were most significant in patients aged 60+ years.
- Males aged 60+ years underwent more procedures than females in this age group and were more likely to undergo the following procedures:
  - Excision procedure of the ear, nose, or sinus
  - Drainage procedure of the ear, nose, or sinus
- Females aged 20-39 and 60+ years were more likely to undergo drainage procedure of the nervous system.
- Higher resource utilization in older males underscores the need for early recognition and targeted management of acute rhinosinusitis to prevent severe intracranial complications and reduce hospital costs.

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