



RAPID COMMUNICATION

Burden of arrhythmias in transgender patients hospitalized for gender-affirming surgeries

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Abstract

Background: We sought to describe the burden of arrhythmias and their impact on in-hospital outcomes in transgender patients who underwent gender re-assignment surgery.

Methods: The study utilized data from the National Inpatient Sample from January 2012 to September 2015.

Results: 16 555 adult transgender patients were included in this study. A total of 610 adults developed arrhythmia out of which atrial fibrillation (N = 475, 2.87%) was the most frequent arrhythmia. In-hospital mortality increased substantially with arrhythmias.

Conclusions: New-onset arrhythmias, while infrequent in the inpatient setting is associated with significantly higher in-hospital mortality and resource utilization.

KEYWORDS

arrhythmia, atrial fibrillation, mortality, transgender

1 | INTRODUCTION

There is an increasing trend in the number of gender-affirming surgeries in the United States, with mastectomy being the most frequently performed.¹ Typically, patients receive gender-affirming hormone (GAH) therapy before undergoing the surgical procedure.² GAH have been shown to be associated with higher incidence of venous thrombosis, myocardial infarctions, transient ischemic attacks in transgender patients than the general population.^{3,4} This study aims to describe the incidence of arrhythmias in transgender patient who underwent gender-affirming surgeries in the United States from 2012 to 2015 using the National Inpatient Sample (NIS).

2 | METHODS

This study includes hospitalizations from the NIS which has been described elsewhere.^{5,6} We included hospitalizations from January 2012 to September 2015 and identified hospitalizations using International Classifications of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) diagnostic codes. This study included previously utilized ICD-9-CM codes to identify study population (N = 18 525).⁷ We excluded patients below 18 years of age (N = 1970). New-onset arrhythmias were identified using ICD-9-CM diagnosis codes in the secondary columns. This method and ICD-9-CM codes have been utilized in the past.⁸⁻¹⁰ We used Jonckheere-Terpstra trend analysis for assessment of the trend in gender-affirming

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surgeries from January 2012 to September 2015. The study was considered exempt from the institutional review board review as it utilized already available deidentified hospitalizations data.

3 | RESULTS

We identified 16 555 transgender adult who were hospitalized for gender-affirming surgeries from 2012 to 2015 and included in the final analysis (Table 1). The mean age of the population was 39.4 ± 15.3 years. We observed an increasing trend in the number of gender-affirming surgeries performed during the period ($P_{\text{trend}} < .001$, Figure 1B). The incidence of arrhythmia for the entire cohort was 3.68%. Arrhythmia occurred significantly more in those who historically identified as female ($P = .0029$), and those who were significantly older (Table 1). Fifty-three percent of the patients historically identified as male. Although black patients represented 21% of the cohort, significantly more

arrhythmias occurred in this racial group ($N = 430$, $P < .0001$). Atrial fibrillation ($N = 475$, 2.87%) was the most common arrhythmia followed by atrial flutter and ventricular tachycardia (Figure 1A). Both ventricular fibrillation and atrioventricular block occurred with equal frequency and were the least common arrhythmias ($n = 15$ each, 0.09%). The incidence of arrhythmia was highest in patients who had their surgery in hospitals located in the West of the country. The mean length of stay was 6.5 days in those with arrhythmia and was significantly longer than the 5.1 days in those without. Mean cost of hospitalization was about \$11 000 in the no arrhythmia group and \$19 000 in the arrhythmia group.

4 | DISCUSSION

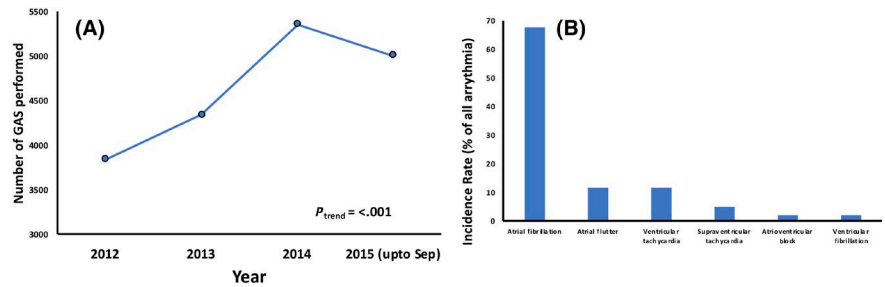
This study shows a significant increase in the number of gender-affirming surgeries and associated arrhythmias. However, frequency of arrhythmia is similar to what we have seen in general population or those

Variable name	Without arrhythmia N = 15 945 (%)	With arrhythmia N = 610 (%)	P-value
Age (years): mean age \pm SD	38.6 \pm 14.8	59.8 \pm 14.1	<.001
Biological sex ^a			
Female	6200	295	.002
Male	8600	315	
Race			
Black	2970	430	<.0001
White	9360	70	
Other	3615	110	
Comorbidities			
Cigarette smoking	5335 (33.5)	235 (38.5)	.009
Illicit drug use	3650 (22.9)	55 (9)	<.001
Chronic alcohol use	1790 (11.2)	55 (9)	.09
Chronic lung disease	3100 (19.4)	215 (35.2)	<.001
Hypertension	3995 (25)	380 (62.3)	<.001
Diabetes	1525 (9.6)	155 (25.4)	<.001
Chronic kidney disease	620 (3.9)	110 (18)	<.001
Depression	2315 (14.5)	100 (16.4)	.20
Chronic liver disease	800 (5)	40 (6.6)	.09
Hospital region			
West	5160 (32.4)	220 (36.1)	<.001
Mid-West	3460 (21.7)	150 (24.6)	
North East	4210 (26.4)	125 (20.5)	
South	3115 (19.5)	115 (18.9)	
Patient outcomes			
All-cause mortality	55 (0.4)	30 (5)	<.001
Stroke	70 (0.4)	30 (5)	<.001
Length of stay (mean days \pm SD)	5.1 \pm 7.4	6.5 \pm 6.4	<.001
Cost of hospitalization (mean US\$ \pm SD)	11 072 \pm 17 687	19 302 \pm 21 430	<.001

TABLE 1 Patient and hospital level characteristic of study population

^a1145 missing biological sex. SD = standard deviation.

FIGURE 1 Panel A: Number of GAS performed in the United States from January 2012 to September 2015. $P_{\text{trend}} < .001$. Panel B: Frequency of arrhythmia in transgender patients hospitalized for GAS from January 2012 to September 2015. GAS, gender-affirming surgeries



underwent noncardiac surgeries of the same age.¹¹ It is unknown if these arrhythmias are because of conditions that pertain to the surgeries themselves, that is, the increased stress response, and if preexisting conditions make patients susceptible to specific arrhythmias.¹² The most common arrhythmia in our population, atrial fibrillation (2.87%) is lower than the reported 4% incidence in the general surgery population.¹¹ The finding that atrial fibrillation as the commonest arrhythmia in our cohort, compares well with prior analyses using the NIS for various disease states.^{5,8,9,13} It has been hypothesized that low testosterone in transgender females may increase the risk for atrial and ventricular arrhythmia.¹⁴ There is higher incidence of atrial fibrillation in postmenopausal women on estrogen replacement therapy. Taken together, these studies support a likely influence of GAH, which transgender patients generally take prior to undergoing GAS, on incidence of perioperative arrhythmias. Incident arrhythmias may require increased surveillance, involvement of subspecialists and likely admission to intensive care units, which can affect length of hospital stay, cost of hospitalization, and in-hospital mortality. Patients in the West region experienced significantly more arrhythmia. We speculate that since three of the top five states with the most adults identifying as transgender are in West region (ie, Hawaii, California, and New Mexico) those patients are more likely to have undergone GAS and included in the study.¹⁵ Arrhythmia was also associated with over \$8000 more in cost of hospitalization and this is significant. There was an excess 4.6% all-cause mortality in those who experienced an arrhythmia (NNH = 22).

Limitations of this study stem from our use of the NIS database. Limitations inherent in this database include but not limited to inability to validate the diagnoses, lack of information on the specific cause of death, inability to distinguish if patients were male-to-female or female-to-male transgender, and medication use. We are unable to determine whether the arrhythmias were associated with the surgical procedures themselves or patients were more susceptible to arrhythmia because of the gender-affirming hormones they may have taken. We do not have information of QT interval duration, which is significantly affected by hormone use and psychotropic medications. Finally, these arrhythmias may occur outside of the hospital which were not captured since our analysis is limited to the in-patient setting only.

5 | CONCLUSION

The overall prevalence of arrhythmias is similar to general population and risk does not seem to be elevated in this population

undergoing gender-affirming surgery in the inpatient setting. The most common arrhythmia in this patient population was atrial fibrillation. New-onset arrhythmias while rare, present significantly excess all-cause mortality, longer length of hospitalization, and higher cost of care in transgender patients who had gender-affirming surgeries.

CONFLICT OF INTEREST

The authors of declare no conflict of interest.

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