

Short communication

## Burden of arrhythmia in recreational marijuana users

 Rupak Desai <sup>a,\*</sup>, Upenkumar Patel <sup>b</sup>, Abhishek Deshmukh <sup>c</sup>, Rajesh Sachdeva <sup>d,e</sup>, Gautam Kumar <sup>a,e</sup>
<sup>a</sup> Division of Cardiology, Atlanta VA Medical Center, Decatur, GA, USA<sup>b</sup> Division of Public Health, National University, San Diego, CA, USA<sup>c</sup> Division of Cardiology, Mayo Clinic, Rochester, MN, USA<sup>d</sup> Division of Cardiology, Morehouse School of Medicine, Atlanta, GA, USA<sup>e</sup> Division of Cardiology, Emory University School of Medicine, Atlanta, GA, USA

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## ABSTRACT

Marijuana or Cannabis is extensively used as a recreational substance globally. Case reports have reported cardiac arrhythmias immediately following recreational marijuana use. However, the burden of arrhythmias in hospitalized marijuana users have not been evaluated through prospective or cross-sectional studies. Therefore, we planned to measure temporal trends of the frequency of arrhythmias in hospitalized marijuana users using National Inpatient Sample (NIS) database in the United States.

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Marijuana or Cannabis is widely used as a recreational substance worldwide. Case reports have reported cardiac arrhythmias immediately following recreational marijuana use [1,2]. The burden of arrhythmias in hospitalized marijuana users have not been evaluated through prospective or cross-sectional studies. Therefore, we proposed to measure temporal trends of the frequency of arrhythmias in hospitalized marijuana users.

We queried 2010–2014 National Inpatient Sample (NIS) database, a part of *Healthcare Cost and Utilization Project* (HCUP) sponsored by an agency for healthcare research and quality, to assess the burden of arrhythmias in hospitalized marijuana users. It is the largest all-payer publically obtainable inpatient database in the United States. It comprises of >7 million inpatient stays (unweighted) each year that turns into >35 million hospitalizations on weighted. Discharge weights provided by HCUP were implemented to acquire national estimates. Institutional review board (IRB) approval was not mandatory since NIS is a de-identified dataset. International Classification of Diseases, Ninth Revision, and Clinical Modification (ICD-9-CM) codes were utilized to recognize hospitalized marijuana users (304.30, 304.31, 304.32, 305.20, 305.21, 305.22) and sub-types of arrhythmias (ICD-9-CM codes for Atrial Fibrillation (Afib) 427.31, Atrial flutter (AF) 427.32, Wolff-Parkinson-White (WPW) 426.7, Supraventricular tachycardia

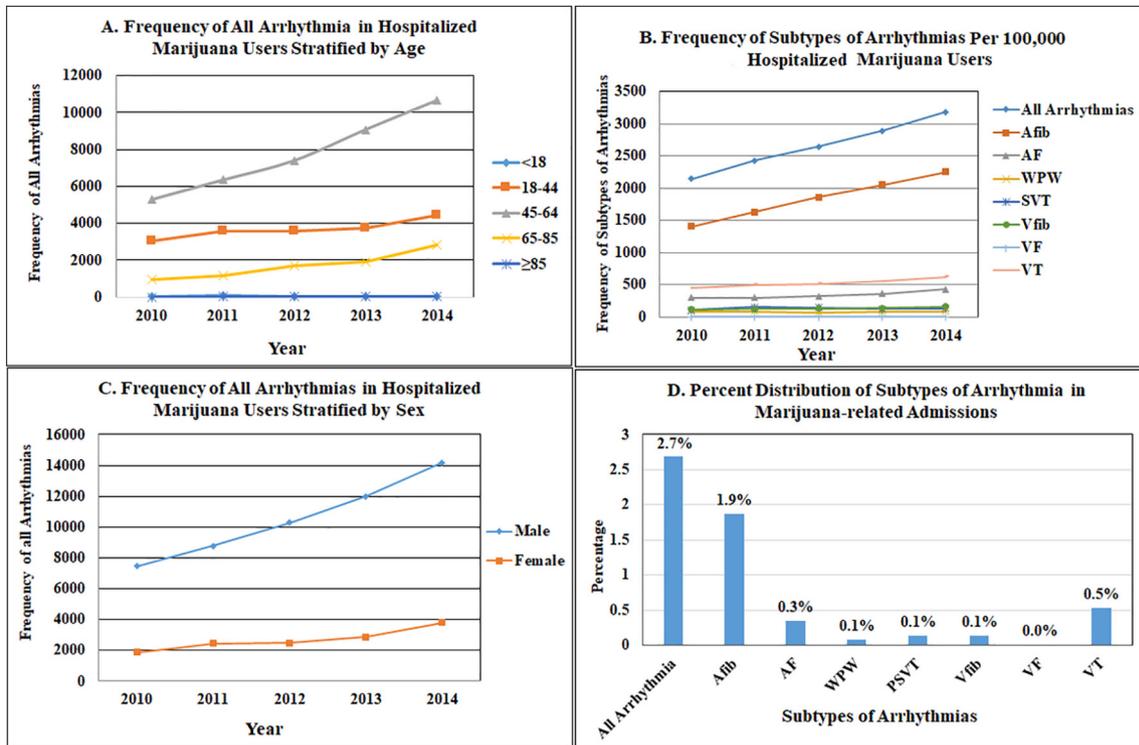
(SVT) 427.0, ventricular fibrillation (VFib) 427.41, ventricular flutter (VF) 427.42, and ventricular tachycardia (VT) 427.1). These ICD-9 CM codes and dataset have been documented and validated from previously published studies [3,4]. All age groups (<18, 18–44, 45–64, 65–84, ≥85) were incorporated in our study. Pearson chi-square test and Student's *t*-test were used for categorical and continuous variables, respectively. The trends in the frequency of arrhythmias in hospitalized marijuana users were measured by Cochran–Armitage test. SPSS version 22 (IBM Corp, Armonk, New York) was utilized to perform all statistical analyses.

We identified 2,459,856 weighted hospitalized marijuana users between 2010 and 2014, out of these, 66,179 (2.7%) patients experienced arrhythmias. The mean ( $\pm$ SD) age of hospitalized marijuana users and marijuana users with arrhythmias were 36( $\pm$ 14) and 51( $\pm$ 13) years, respectively. The trends of marijuana use showed 14.74% relative increase (from 25.1% in 2010 to 28.8% in 2014,  $p < 0.001$ ) in 45–64 age group and 100% relative increase (from 1.4% in 2010 to 2.8% in 2014,  $p < 0.001$ ) in 65–84 age group.

As shown in Fig. 1, The prevalence of arrhythmias in hospitalized male and female marijuana users nearly increased two-fold between 2010 and 2014; 7464 to 14,195 in males and 1876 to 3800 in females,  $p < 0.001$ . Males with recreational marijuana use more often experienced arrhythmias. The all-cause inpatient mortality in hospitalized marijuana users with arrhythmias increased from 3.7% in 2010 to 4.4% in 2014 (relative increase 15.9%,  $p < 0.001$ ). The frequencies of arrhythmias recorded per 100,000 hospitalized marijuana users were as

\* Corresponding author at: Division of Cardiology, Atlanta VA Medical Center, Room 2A 225, Decatur, GA, USA.

E-mail address: [drrupakdesai@gmail.com](mailto:drrupakdesai@gmail.com) (R. Desai).



**Fig. 1.** A. Frequency of arrhythmias in hospitalized marijuana users stratified by age. B. Frequency of subtypes of arrhythmias in per 100,000 hospitalized marijuana users. C. Frequency of all arrhythmias in hospitalized marijuana users stratified by sex. D. Percent distribution of subtypes of arrhythmia in marijuana-related admissions. Burden of arrhythmia in recreational marijuana users

following all-cause arrhythmia (2690 per 100,000), Afib (1865 per 100,000), VT (532 per 100,000), AF (346 per 100,000), SVT (132 per 100,000), VFib (136 per 100,000), WPW (80 per 100,000), VF (2 per 100,000). Among hospitalizations with known marijuana use, the 45–64 years age group showed highest arrhythmia incidence whereas 65–84 years age group showed a maximum rise in arrhythmia incidence over time (from 931 in 2010 to 2820 in 2014, 3-fold increase). There were consistently increasing trends of all-cause arrhythmia (2145 in 2010 to 3183 in 2014, trend  $p = 0.03$ ) and Afib (1405 in 2010 to 2252 in 2014,  $p = 0.03$ ) in hospitalized marijuana users. The frequency of AF, SVT, VFib, and VT per 100,000 hospitalized marijuana users also increased 1.3 to 1.4 fold between 2010 and 2014 ( $p < 0.001$ ).

NIS also shares a few limitations. We cannot overlook the administrative coding errors. The arrhythmia incidence was not observed immediately post-marijuana exposure so direct causal relationship cannot be estimated. Follow-up data, the cause of death, duration and amount of marijuana use were not incorporated in the dataset. However, this is the first ever-observational study that evaluates the burden of arrhythmias in hospitalized marijuana users in nationally representative data.

Concisely, the frequency of arrhythmias increased over time in hospitalized marijuana users. Therefore, all electrocardiographic and clinical features of arrhythmias should be prudently examined in

hospitalized marijuana users. However, further prospective studies are required to endorse our study results.

#### Conflict of interest

None.

#### Disclosure

None. No grant, contract, or other source of financial support was used.

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