

Arrhythmias in Patients with Diabetes and Chronic Kidney Disease Detected by Long-Term Ambulatory ECG Monitoring

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Results

Background

- Diabetes mellitus (DM) and chronic kidney disease (CKD) are associated with cardiovascular comorbidities.
- Contemporary data on arrhythmia burden in these populations is limited, especially in patients with both CKD and DM.

Objective

- We evaluated arrhythmia burden in a large US population with DM and CKD receiving long-term ambulatory ECG (AECG) monitoring.

Methods

Study Design

- Retrospective cohort study of long-term continuous (LTCM) or mobile cardiac telemetry (MCT) AECG devices prescribed in the US from 2018-2022.
- Devices included a patient-activated button to document symptoms.

Population

- Inclusions: Patients ≥18 years, ≤ 14 days of AECG monitoring (Zio[®] XT or AT; iRhythm Technologies, San Francisco, CA).
- Exclusions: < 1 year lookback for comorbidity assessment.

Comparison Groups

- DM only, CKD only, DM+CKD, and Neither.

Data Sources

- iRhythm clinical data warehouse: ECG data analyzed using an FDA-cleared deep learning algorithm and confirmed by qualified cardiographic technicians.
- Claims: Linkage to commercial fee-for-service and Medicare Advantage data.

Statistical Analysis

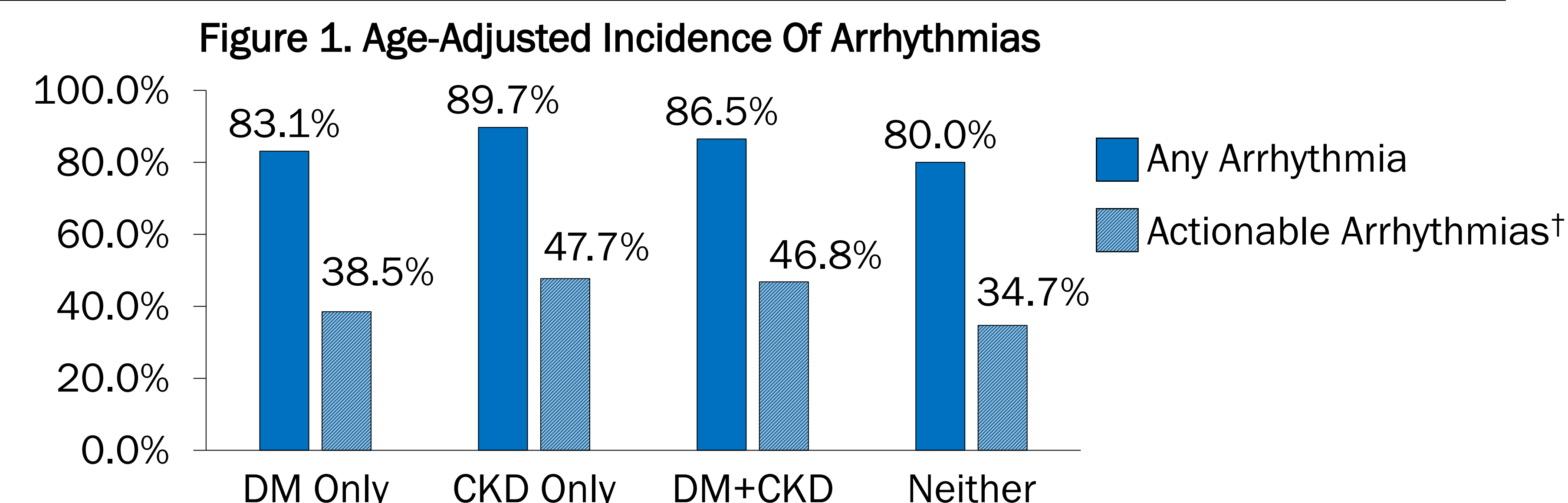
- Statistical analysis: Chi-square or t-test.
- Age-adjusted proportions for baseline comorbidities and arrhythmias calculated using overall cohort age distribution.

Cohort Description	
• Total N=657,147 patients	• Overall 67% of patients White race; 33% of patients were Black/Asian/Other/Unknown
• 10.7% DM only, 3.5% CKD only	• Higher % of Black patients (9-10%) in DM and CKD groups
• 4.2% DM+CKD, 81.6% Neither	

Patient Characteristics and Effect of CKD, DM, and DM+CKD on Rhythm Findings

Table 1. Patient Characteristics				
	DM Only (n=70,379)	CKD Only (n=22,875)	DM+CKD (n=27,446)	Neither (n=536,447)
Age and Sex				
Age (years), Mean (SD)	66.2 (12.3)	73.9 (12.0)	71.9 (10.6)	58.9 (17.8)
Sex, female (%)	52.6%	49.8%	46.5%	60.2%
Top 5 Monitoring Indications				
Palpitations	31.7%	21.2%	20.7%	41.0%
Syncope and collapse	8.5%	10.4%	9.8%	8.0%
Paroxysmal AF	8.9%	12.8%	11.7%	7.6%
Unspecified AF	6.8%	9.1%	8.3%	5.0%
Bradycardia	3.9%	6.3%	6.6%	3.5%
Major Baseline Comorbidities				
Hypertension	77.2%	88.0%	93.1%	30.5%
Coronary artery disease	27.0%	31.4%	42.3%	9.3%
Atrial fibrillation	23.9%	38.2%	35.8%	14.1%
Congestive heart failure	15.8%	32.1%	39.2%	6.0%
Obstructive sleep apnea	12.5%	10.4%	16.5%	4.2%
Morbid obesity	9.0%	4.5%	12.2%	2.0%
Anemia	9.8%	26.6%	30.6%	3.8%

Table 2. Unadjusted Incidence of Arrhythmias From AECG Monitoring				
	DM Only (n=70,379)	CKD Only (n=22,875)	DM+CKD (n=27,446)	Neither (n=536,447)
Rhythm Findings				
AF ≥ 30 sec	13.4%	20.4%	18.6%	10.9%
AV Block	2.2%	2.2%	3.2%	1.5%
Pause ≥ 3 sec	4.2%	6.3%	6.5%	3.3%
SVT ≥ 90bpm & ≥ 4 beats	67.6%	71.5%	67.1%	61.5%
VT ≥ 100 bpm & ≥ 4 beats	22.0%	26.9%	26.8%	17.7%
Total arrhythmia yield	80.5%	89.0%	85.9%	71.7%
Actionable arrhythmia yield [†]	37.3%	47.8%	46.8%	30.7%



[†]AF ≥ 30 sec, SVT ≥ 90 bpm & ≥ 30 sec, VT ≥ 100bpm & ≥ 4 beats, any ventricular fibrillation, pause ≥ 3 sec, and AV block (any 2nd deg or complete heart block).
Figure 1: All p<0.0001 compared to Reference group (*Neither).

Discussion

- Comorbidities were most prevalent in the DM+CKD group (Table 1).
- Patients with CKD, DM, or DM+CKD had greater unadjusted yield of all arrhythmias than those without (Table 2).
- Age-adjusted incidence of arrhythmias during AECG was highest in CKD, followed by DM+CKD, then DM (Figure 1).
- CKD was associated with the highest overall and actionable arrhythmia detection (Figure 1).
- DM alone showed increased risk compared to Neither.

Limitations

- DM and CKD were identified using administrative claims, which may result in misclassification.
- Unmeasured confounders (e.g., CKD stage, glycemic control, medication use) may influence observed differences.

Conclusions

- **Patients with DM and CKD demonstrate markedly higher atrial, ventricular, and bradyarrhythmic findings on AECG than those without.**
- **These data support targeted rhythm surveillance and management strategies in kidney-metabolic phenotypes.**

Disclosures

- JM Ashburner, B Wright, and AJ Battisti are employees of and have received equity from iRhythm Technologies, Inc.
- S Schmitt has received compensation from iRhythm.
- Dr. Turakhia has received equity from iRhythm, Connect America, Evidently, PocketRN, AliveCor, and Hippocratic.ai. Dr Turakhia is an employee and corporate officer of iRhythm Technologies Inc.