Exploring the Role of HRV and Activity in Thoracic Impedance and Atrial Arrhythmias Amongst Rural Patients

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BACKGROUND

- Implantable Cardiac Defibrillators (ICDs) continuously capture cardiovascular metrics such as heart rate, rhythm, and thoracic impedance (TI).
- Provide clinicians and patients with important information for managing health outcomes.
- Prior studies have used ICD data to show the causative relationship between atrial fibrillation (AF) and congestive heart failure (CHF) is bidirectional.
- Heart Rate Variability (HRV) has been shown to have a negative relationship with CHF and AF burden.
- Activity has been shown to have a negative relationship with CHF and AF burden.
- TI's effect on CHF and AF has yielded mixed results, suggesting a need for more research.

METHODS

- 484 ECU Health patients implanted with an ICD.
- Includes daily ICD values for each patient, spanning 3 months to 4 years.
- A Multivariate Regression Analysis will be completed.

\[ \text{AF Burden} = \beta_0 + \beta_1 (\text{TI}) + \beta_2 (\text{HRV}) + \beta_3 (\text{Activity}) + \beta_4 (\text{TI} \times \text{HRV}) + \beta_5 (\text{TI} \times \text{Activity}) + \beta_6 (\text{HRV} \times \text{Activity}) + \beta_7 (\text{TI} \times \text{HRV} \times \text{Activity}) \]

ANTICIPATED RESULTS

- \( \beta_0 \): Atrial burden when all predictors are 0.
- \( \beta_1 \): Direct effect of TI on AF burden.
- \( \beta_2 \): Direct effect of HRV on AF burden.
- \( \beta_3 \): Direct effect of Activity on AF burden.
- \( \beta_4 \): How HRV modifies the effect of TI on AF burden.
- \( \beta_5 \): How activity influences the relationship between TI and AF burden.
- \( \beta_6 \): How activity and HRV together affect AF burden.
- \( \beta_7 \): How the combined effect of TI, HRV, and activity on AF burden.

RESEARCH AIM

How do heart rate variability and activity influence the relationship between thoracic impedance and atrial arrhythmias?

SIGNIFICANCE

- Enhances understanding of how TI, HRV, and activity interact in CHF and AF.
- Improves ICD monitoring and management.
- Can be used to identify predictive markers for better clinical outcomes.
- Provides insights for interventions to reduce AF and CHF risks.

HYPOTHESIS

I hypothesize that both heart rate variability and activity will enhance the relationship between thoracic impedance and atrial burden.

REFERENCES


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