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 has been shown to have a negative relationship with CHF and AF burden.[3,4]

  ↑ HRV ⟶ ↓ CHF , ↓ AF Burden
- Activity has been shown to have a negative relationship with CHF and AF burden.[5,6]

  ↑ Activity ⟶ ↓ CHF , ↓ AF Burden
- TI's effect on CHF and AF has yielded mixed results, suggesting a need for more research[1,2]

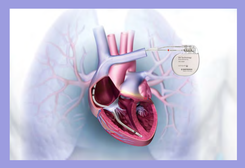
  ↑ TI ⟶ ? CHF , ? AF Burden

RESEARCH AIM

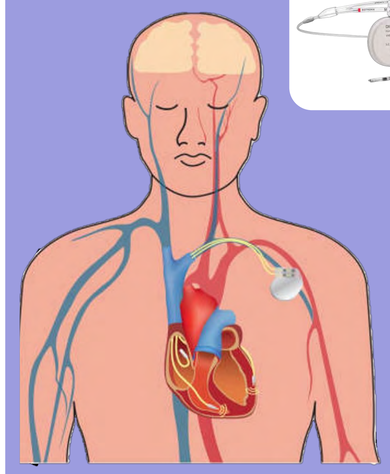
How do heart rate variability and activity influence the relationship between thoracic impedance and atrial arrhythmias?

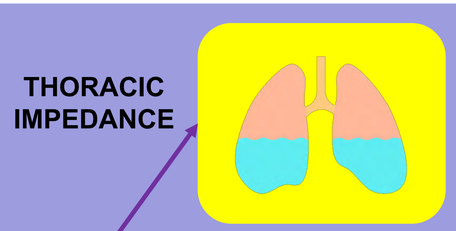
SIGNIFICANCE

- 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



BIOTRONIK DX ICDs are implanted single-chambered devices that can uniquely use one lead in the right ventricle to provide accurate information on atrial arrhythmias.





HYPOTHESIS

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

METHODS

- 484 ECU Health patients implanted with an ICD
- Home monitoring data from 2019-2023
- Includes daily ICD values for each patient, spanning 3 months to 4 years
- A Multivariate Regression Analysis will be completed

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

ANTICIPATED RESULTS

- β_0 Atrial burden when all predictors are 0.
- β_1 Direct effect of TI on AF burden.
- β_2 Direct effect of HRV on AF burden.
- β_3 Direct effect of Activity on AF burden.
- β_4 How HRV modifies the effect of TI on AF burden.
- β_5 How activity influences the relationship between TI and AF burden.
- β_6 How activity and HRV together affect AF burden.
- β_7 How the combined effect of TI, HRV, and activity on AF burden.

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SCAN ME

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