# Long-term plans

Long term would like to end up with applied physiology lab Want to study more than individual folk Epidemiology to test for mechanisms in larger populations Professor/attending in medicine/cardiology

# Central hypothesis

Autonomic dysfunction leads to decrease in VFT Likely autonomic (e.g. circadian pattern) SCD risk remains large/unexplained No known mechanisms or methods to identify patients at risk No interventions (outside of ICDs) to intervene

# Steps forward

## R series

Epi studies to identify patients with worse outcomes Study effect of interventions on overall outcomes Applied physiology to study stress reactivity

## K grant

Applied physiology studies Focus on HRV/ECG findings and stress reactivity

## F grant

Need tangible/incremental specific aims Don’t make it too “big”, - incorporating projects with MSNA may be overwhelming Needs to be with an R01-funded mentor

### Brainstorming

* measure alternative ECG markers and compare with MSNA data
* use machine learning algorithm to compare ECG data with gold standard of MSNA data… feature identification
* GEH maybe helpful, more as an acute marker than as a chronic marker
* compare mental stress to ECG and MSNA data?
* stress reactivity index of some kind
* occlusion plethysmography as surrogate SNS tone

### What is the story of the F32?

Have 2 years of funding Work with EPICORE group But also dabble in applied physiology and computational bioinformatics Goal is to be academic cardiologist studying autonomic dysfunction Detecting non-invasive surrogates for worse outcomes / autonomic risk

### Specific Aims

#### Background

Psychological stress is bad. Likely due to changes in sympathovagal balance Vagal withdrawal increases risk High sympathetic tone increases risk ANS function can be quantified in several ways Invasive/extensive MSNA Reactive hyperemia Venous adrenergic Non-invasive ECG morphology (T wave area, Time-independent HRV (e.g. geometric, PSA) Time-dependent HRV (e.g. HRT, Dyx) Quantification of ANS tone Identifying ANS tone can identify at-risk individuals Can also test if treatment/interventions are successful Importance Few studies look at MSNA and ECG findings in real-time?

#### Hypothesis

* disturbances of neurocardiac axis lead to ANS dysfunction
* quantified measures of ANS tone will reflect brain and heart metrics
* ECG measures reflect this (PEP, T wave repolarization, HRV)

#### Aims

Determine relationship between MSNA and ECG findings during mental stress. P-wave morphology GEH TWA Measure correlation of MSNA with other non-invasive measures of autonomic tone SKNA VOP ML to detect ECG features that associate with MSNA

ECG data and cardiac catherization Have already enrolled ~ 200 patients Will have up to 2 years of data follow-up and outcomes Refine feature analysis and algorithm to detect CAD Add retrospective data on prior stress test (heavy chart review) Add machine learning or digital signal processing coursework MSNA and ECG clinical outcomes MSNA data has been collected with Jeanie Park