

Depression, HRV, and CAD Pilot Study

the Emory Cardiovascular Biobank

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Overview

Disclosures and Funding

- ▶ Emory University
- ▶ Emory Clinical Cardiovascular Research Institute
- ▶ Emory Program in Cardiovascular Outcomes Research and Epidemiology
- ▶ Georgia Clinical & Translational Science Alliance
- ▶ NIH/NCATS UL1TR002378, TL1 TL1TR002382

Emory Cardiovascular Biobank

- ▶ Ongoing prospective cohort of patients undergoing cardiac catheterization
- ▶ Includes clinical history and biomarkers
- ▶ Includes psychological questionnaires (including depression by PHQ9)
- ▶ Over 7000 patients enrolled thus far

Background

This is a pilot study examining the relationship between depression and CAD. We have shown using the non-linear HRV metric, Dyx , is a powerful predictor of CAD, and can also be a useful marker for Depression.

Aims

1. Quantify how depression affects ANS function
2. Examine how HRV can predict obstructive (versus microvascular) CAD

Descriptive analysis

Population

Demographic description

Table 1: Depression

	Inpatient N=11	Outpatient N=19
gend: Male	10 (90.9%)	18 (94.7%)
race:		
African American Black	2 (18.2%)	3 (15.8%)
Asian	0 (0.00%)	2 (10.5%)
Caucasian White	9 (81.8%)	14 (73.7%)
blbmi	33.2 (9.62)	28.7 (4.33)
adm_reason:		
Heart Failure	2 (18.2%)	0 (0.00%)
Heart Transplant	0 (0.00%)	3 (15.8%)
Non-ST Elevation Myocardial	2 (18.2%)	0 (0.00%)
Non-ST Elevation Myocardial,Unstable Angina	2 (18.2%)	1 (5.26%)
Other	0 (0.00%)	2 (10.5%)
Positive Stress Test	2 (18.2%)	3 (15.8%)
Positive Stress Test,Unstable Angina	3 (27.3%)	4 (21.1%)
PreOp Cardiac Clearance	0 (0.00%)	4 (21.1%)
Unstable Angina	0 (0.00%)	2 (10.5%)

Depression

Depression scoring

- ▶ Each patient is given a questionnaire, the PHQ9
- ▶ The scores are validated and suggest severity/category of depression
- ▶ Scores ≥ 10 are considered moderate to severe depression, and accepted cut-off

Depression table

Table 2: Depression scoring

	Low Depression N=21	High Depression N=7
gend: Male	20 (95.2%)	6 (100%)
race:		
African American Black	2 (9.52%)	2 (33.3%)
Asian	2 (9.52%)	0 (0.00%)
Caucasian White	17 (81.0%)	4 (66.7%)
adm_reason:		
Heart Failure	1 (5.00%)	0 (0.00%)
Heart Transplant	2 (10.0%)	1 (14.3%)
Non-ST Elevation Myocardial	2 (10.0%)	0 (0.00%)
Non-ST Elevation Myocardial,Unstable Angina	2 (10.0%)	1 (14.3%)
Other	1 (5.00%)	1 (14.3%)
Positive Stress Test	4 (20.0%)	1 (14.3%)
Positive Stress Test,Unstable Angina	3 (15.0%)	2 (28.6%)
PreOp Cardiac Clearance	4 (20.0%)	0 (0.00%)
Unstable Angina	1 (5.00%)	1 (14.3%)

Coronary artery disease

Cardiac catheterization

- ▶ Every patient presents for cardiac catheterization to be enrolled
- ▶ Are either inpatient or outpatient
- ▶ Etiology: pre-op, heart transplant, UA, NSTEMI, STEMI, positive stress test
- ▶ scored by angiographic severity indices - CASS and Gensini scores

CAD Severity

Table 3: CAD Severity Scores

	[ALL] N=27	N
cass50	1.15 (1.06)	27
cass70	1.00 (1.00)	27
gensini	52.6 (52.6)	27
stenosis:		27
0	7 (25.9%)	
1	20 (74.1%)	

Heart rate variability

Overview of HRV

- ▶ ECG data was collected using the VivaLNK patch
- ▶ this records data for up to 72 hours
- ▶ ECG was started the AM of LHC, and continued for several hours after event
- ▶ HRV is generated through the Emory HRV Toolbox
- ▶ Frequency domain was log-transformed
- ▶ HRV was blocked into averaged 1-hour segments for analysis

Quality of HRV data

Table 4: HRV quality

	[ALL] N=28	N
Duration	12.9 (9.35)	28
PercentNotAnalyzed	26.8 (31.2)	28
PercentLowQualityWind	26.8 (31.2)	28

Overview of all HRV measures I

Table 5: Time Domain

	[ALL] N=115933	N
BPM	73.6 (14.5)	115933
SDNN	42.3 (35.0)	115933
RMSSD	41.7 (42.8)	115933
PNN50	12.8 (21.2)	115933

Table 6: Frequency Domain

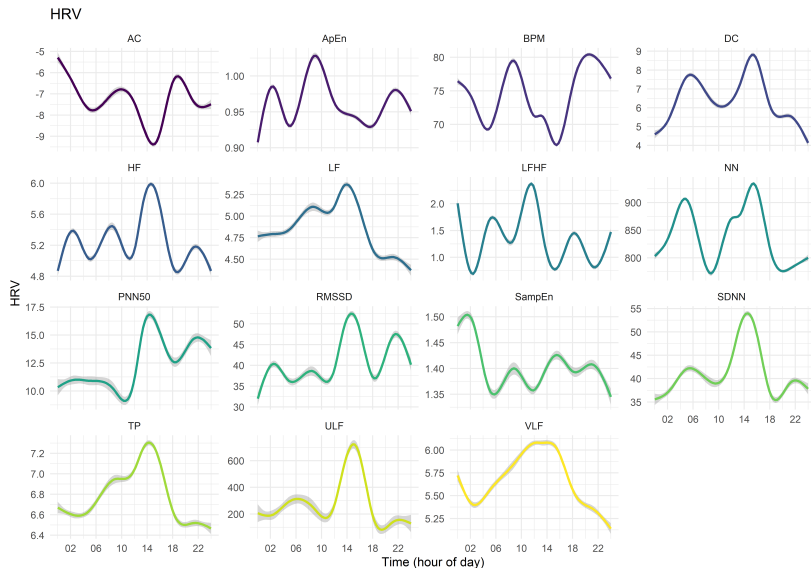
	[ALL] N=115933	N
HF	5.29 (1.85)	115933
LF	4.90 (1.91)	115933
VLF	5.70 (1.78)	115933
ULF	304 (1958)	115933
TP	6.82 (1.66)	115933
LFHF	1.35 (2.08)	115933

Overview of all HRV measures II

Table 7: Additional Measures

	[ALL] N=115933	N
AC	-7.40 (6.60)	115933
DC	6.57 (6.25)	115933
SampEn	1.41 (0.46)	115933
ApEn	0.96 (0.17)	115933

Overview of all HRV measures III



Aim 1: Relationship between Depression and ANS Dysfunction

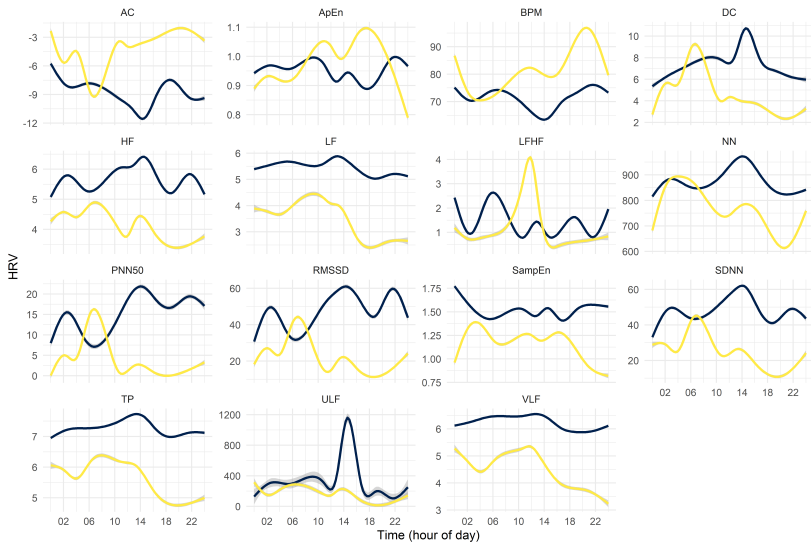
Differences in population

hrv	ks.pvalue	t.pvalue
HF	0	0
LF	0	0
VLF	0	0
ULF	0	0
TP	0	0
LFHF	0	0
AC	0	0
DC	0	0
SampEn	0	0
ApEn	0	0
BPM	0	0

Hourly differences

Visualizing Differences in HRV by Depression

HRV by Depression (sad = yellow)



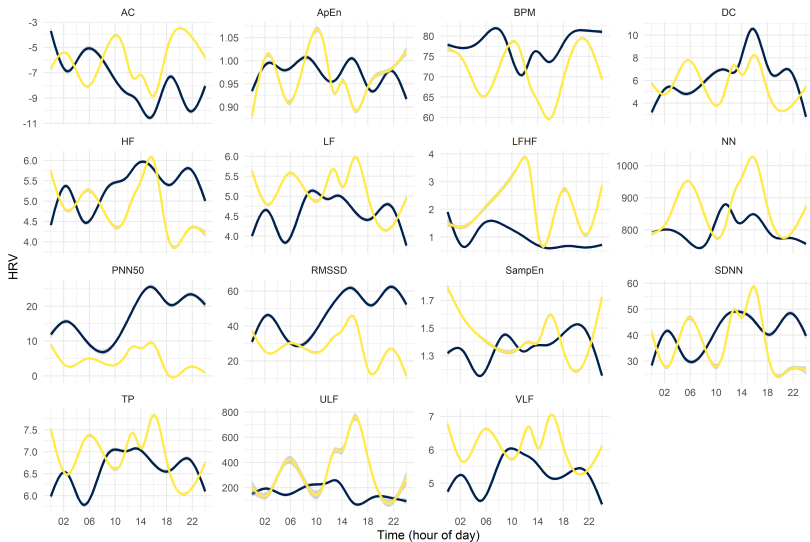
Aim 2: Relationship between CAD and ANS Dysfunction

Differences in population

hrv	ks.pvalue	t.pvalue
HF	0	0
LF	0	0
VLF	0	0
ULF	0	0
TP	0	0
LFHF	0	0
AC	0	0
DC	0	0
SampEn	0	0
ApEn	0	0
BPM	0	0

Visualizing Differences in HRV by CAD

HRV by CASS50 (if >1 = yellow)



Hourly differences I