

Use of Heart Rate Variability to Measure Emergency Physician Stress

BACKGROUND
Heart rate variability (HRV) has been used to study measures of stress in several populations but to date has not been used to monitor emergency physicians on shift or to determine their specific stressors.

METHODS

- Emergency medicine interns (12) and attending (10) physicians wore an HRV device on a clinical shift.
- Participants completed a short survey to evaluate perseverance and resilience.
- Each clinical activity was documented in real time and time linked to HRV data.
- HRV data was analyzed in relationship to actions completed in order to identify stressors, as measured by LF/HF and SSDN, see Figure 1.
- Numerical score from resilience survey was compared to number of stressors that participants experienced.

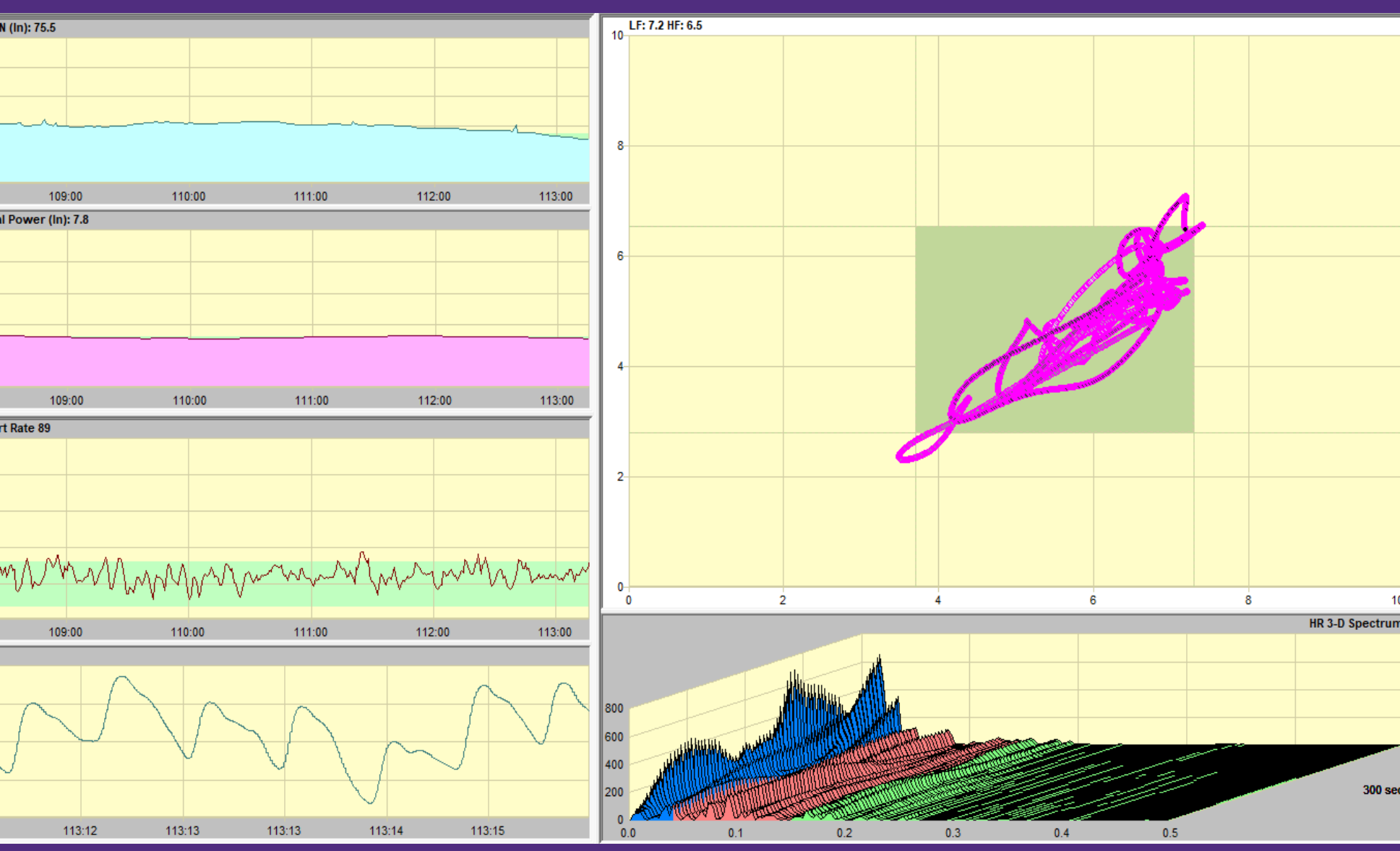


Figure 1. Sample of live HRV data

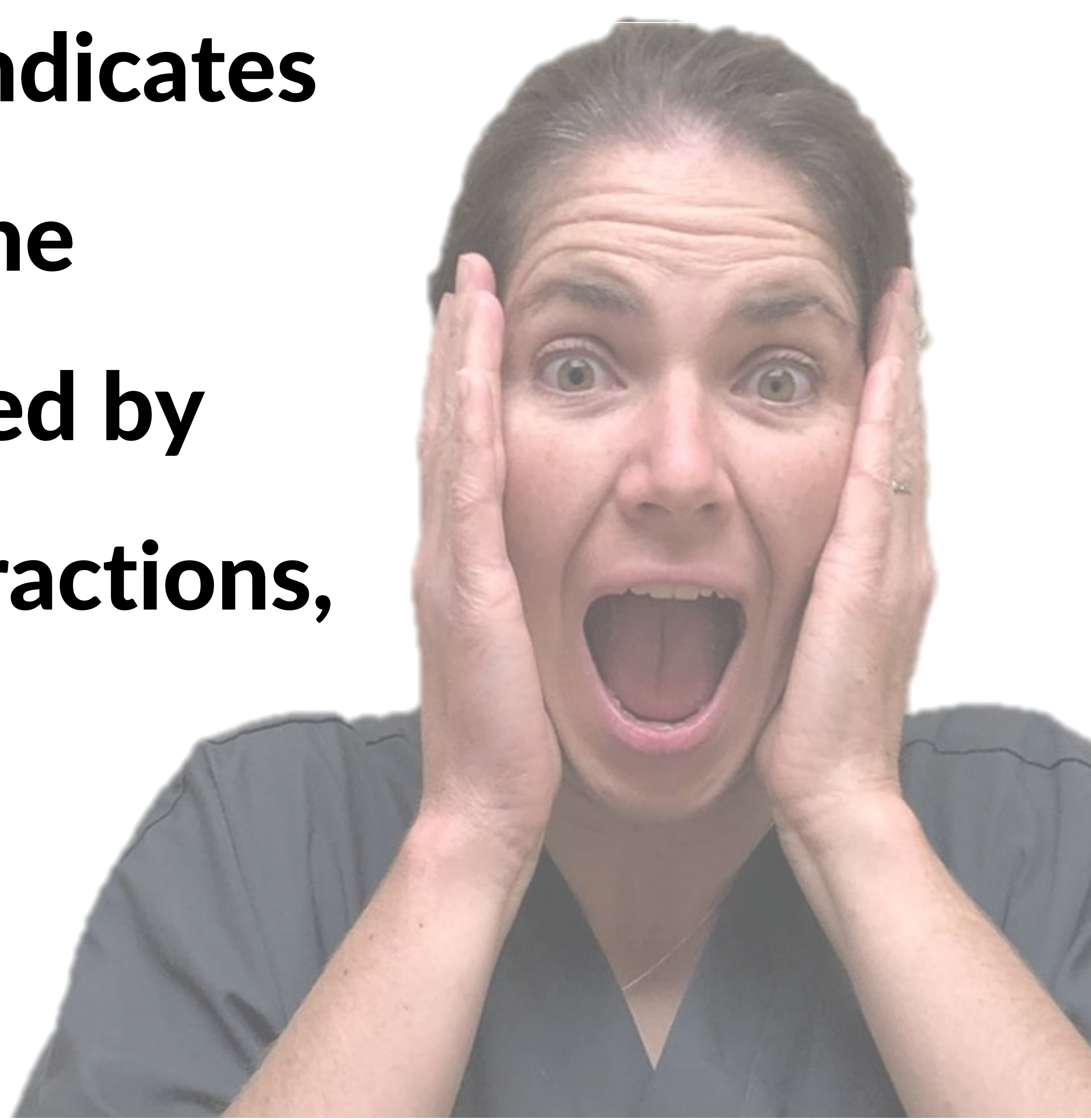
RESULTS

- Attending physicians were stressed less than 10% of the time when interacting with high acuity patients.
- Grit was not correlated with number of stressors (see Graph 1).

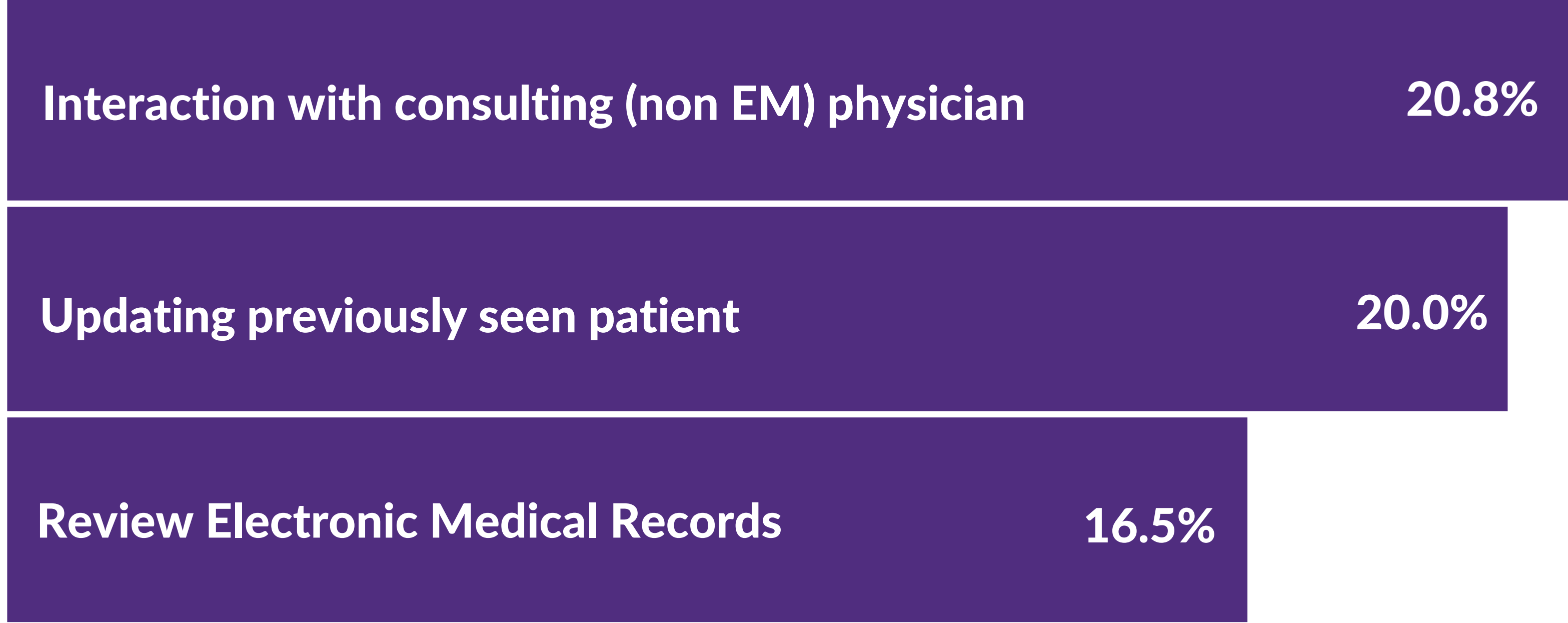


Graph 1. Grit Score vs. Number of Stressors

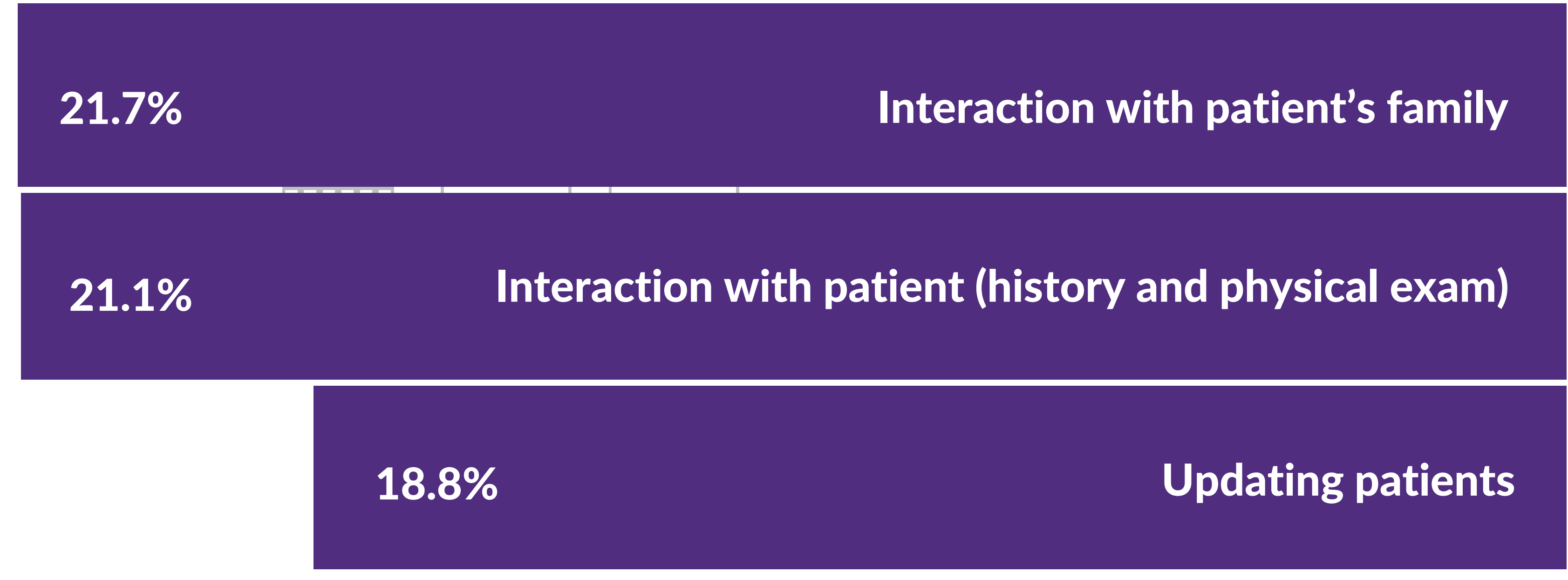
Heart Rate Variability Indicates that Emergency Medicine Interns are Most Stressed by Patient and Family Interactions, while Attendings are Most Stressed by Consultant Interactions



Most Common Stressors (Attendings)



Most Common Stressors (Interns)



Grit Survey
Created by Angela Duckworth. A high Grit score is associated with individuals being less prone to stress

HRV Metrics
HF: High frequency interval changes during rest controlled by parasympathetic nervous system
LF: Low frequency interval changes during stress/action controlled by sympathetic nervous system
LF/HF: Shows balance between sympathetic and parasympathetic nervous systems

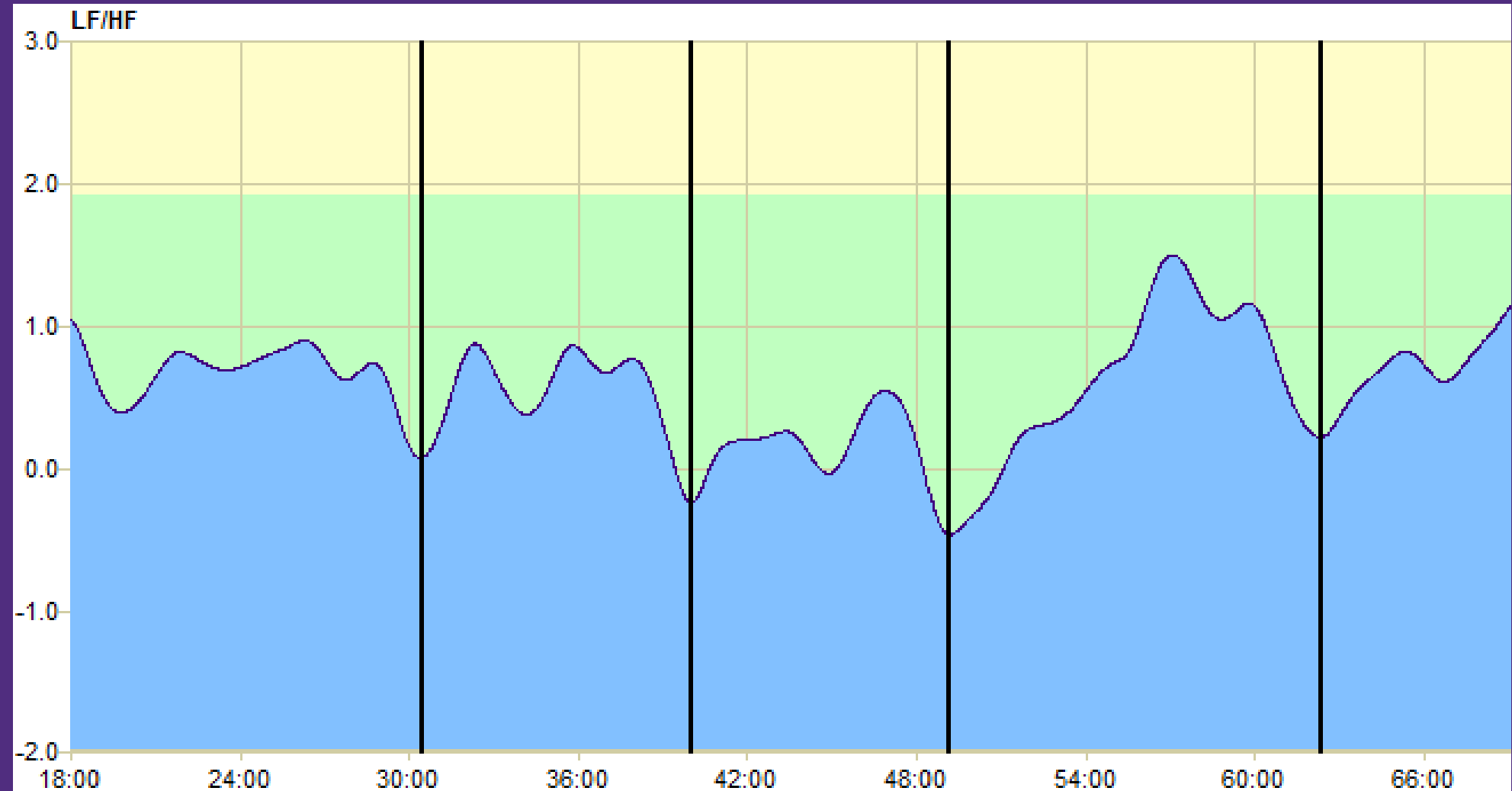


Figure 2. Sample of HRV report

Interactions with high acuity patients
9.10% were stressful
95.01% were not stressful

Weighted averages were determined by multiplying number of interactions by percent and dividing sum by total number of interactions in order to get a more accurate number.

High acuity is defined as a patient who is considered a medical yellow, trauma red, or trauma yellow, or otherwise concerning as indicated by the physician.

	Attending	Intern
Minimum	7.0	2.0
Maximum	47.0	31.0
Average	21.5	16.4
Median	16.5	18.0

Table 1. Number of Stressors

Stressful Interaction	Frequency (%)	
	Attending	Intern
Non EM Provider	20.83	18.42
Update Patient	20.00	18.81
Review Records	16.53	14.09
Patient's Family	16.00	21.74
Documentation	14.46	15.00
EMS	14.29	-
History & Physical Exam	13.61	17.96
EKG Review	12.66	-
Supervise Procedure	12.50	-
EM Resident Physician	11.84	11.98
Nurse	11.61	10.20
EM Attending Physician	11.11	7.96
Order Entry	10.20	12.50

Table 2. Most Frequent Stressors

Acknowledgements
We would like to thank Dr. Carmen Russoniello for his assistance in our understanding of the relationship between HRV and stress.

Jennifer McMains Evans
Juan March, MD, FAEMS, FACEP
Stephen Taylor, MHS, NC-P, FAEMS
Andrew Bouland, MD
Bryan Kitch, MD, FAEMS
Robert Portela, MD
Department of Emergency Medicine
Brody School of Medicine, East Carolina University

