

An Emerging Heart Failure Strategy to Improve Outcomes and Reduce Readmissions



CardioSleeve helps monitor Right and Left Ventricle performance, ECG intervals and Arrhythmia on a daily basis.



Cardiac Function Report

SAMPLE REPORT



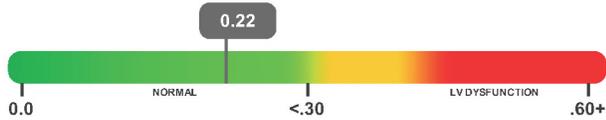
Brad Bard

Gender: Male
DOB: 12/23/1982

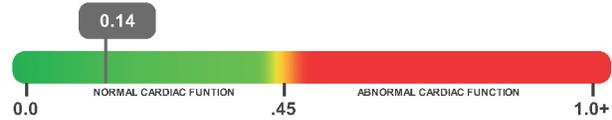
Patient ID: Eryuhhcf
Session Date: 02/20/2016

Clinician: Mr. Brads Staff
Clinician ID:

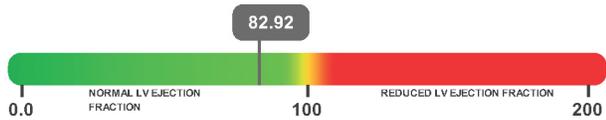
Systolic Performance Index (QS1/S1S2)



Myocardial Performance Index (IVCT+IVRT)/S1S2



Pre-Ejection Period (QS1)

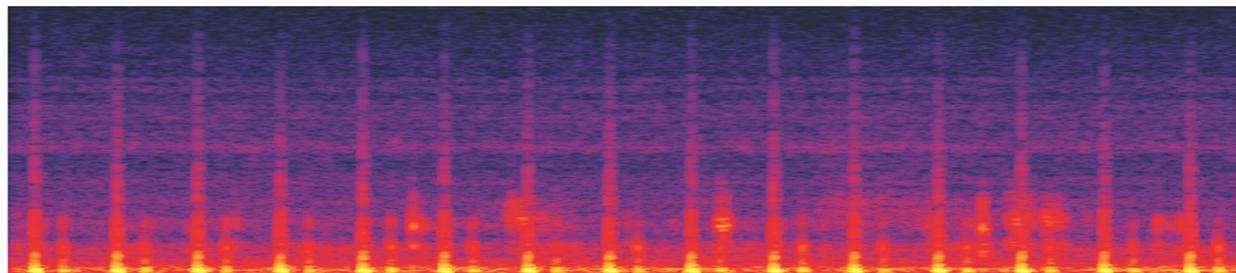
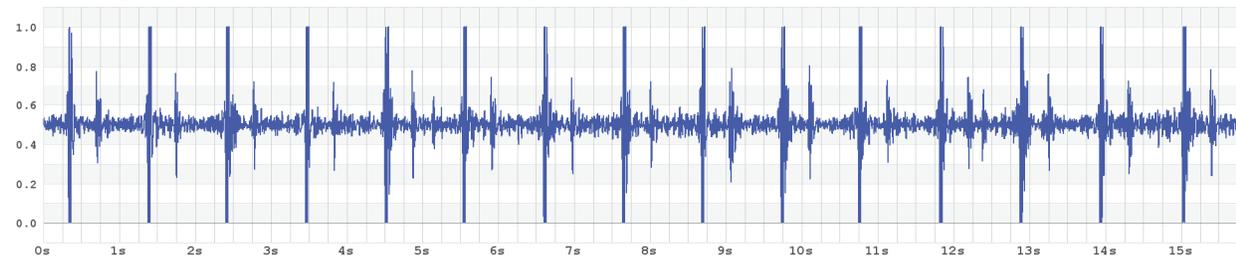
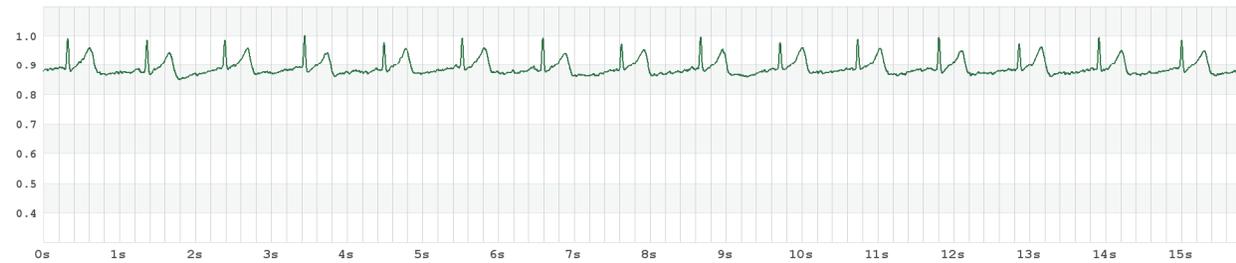


Pre-Ejection Period % (QS1/RR)



Location	Mitral	Ejection Period	370.79
Heart Rate	57	RR	1046
Isovolumic Contraction (ms)	15.54	QT	489.54
Isovolumic Relaxation (ms)	36.15	QRS	109.69
Rhythm Analysis	SINUS BRADYCARDIA + IVCD		
Notes	No value		

Cardiac Function - Mitral Waveform (2501)



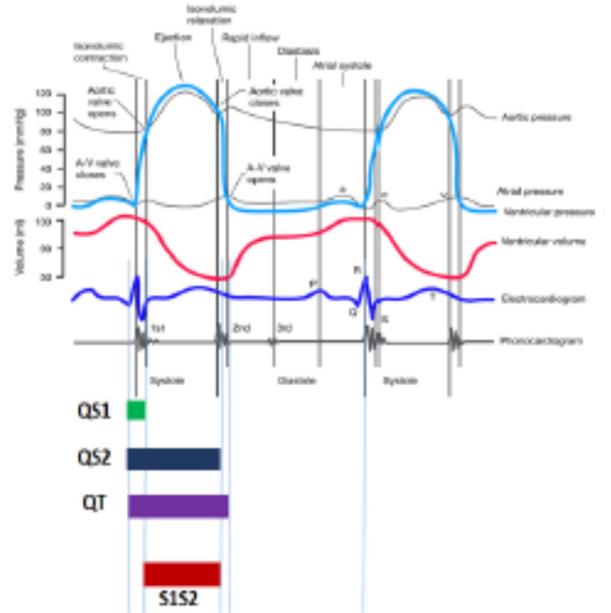
Signature

Printed on: 4/2/2016 8:35 am EST

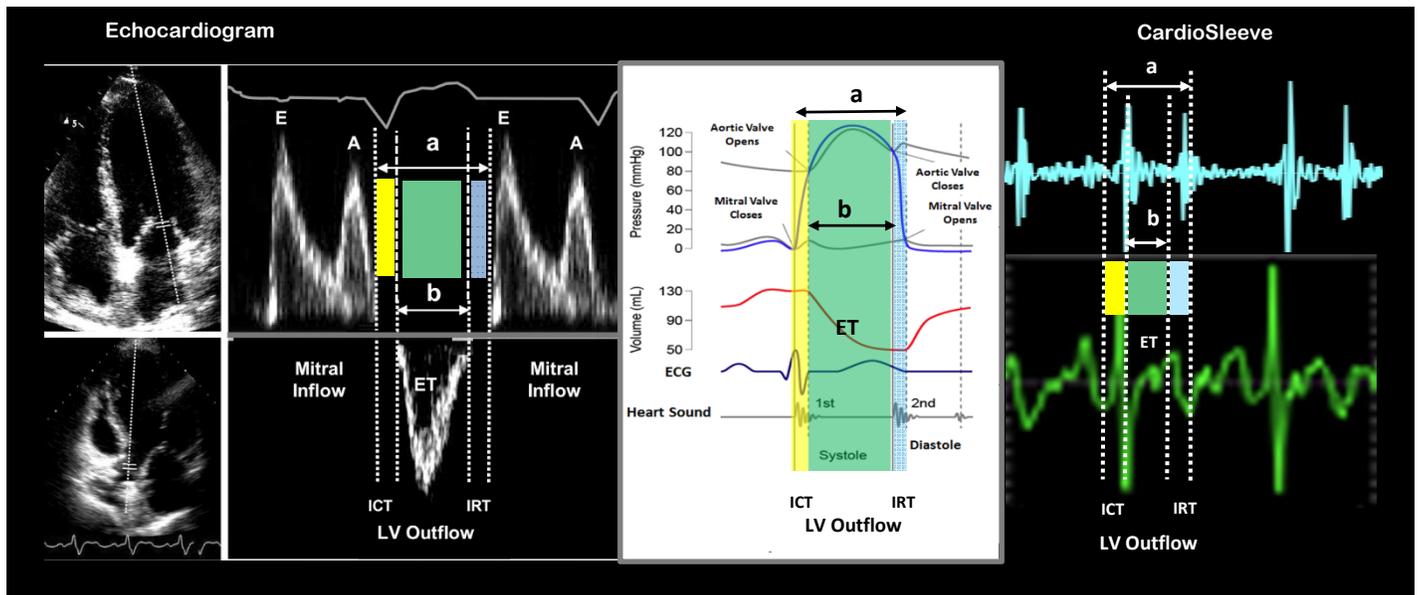
Systolic Time Intervals - Parameter Overview

Rijuvan's CardioSleeve technology captures, synchronizes and algorithmically interprets simultaneous digital Heart Sound and ECG. Rijuvan provides a non-invasive and easy way to evaluate heart function to give a complete electrical and hemodynamic view of the heart. Rijuvan's technology is based on well-known Systolic Time Interval (STI) fundamentals. Rijuvan identifies and quantifies normal and abnormal heart sounds related to the left ventricle, and determines the timing of those heart sounds in every cardiac cycle in relation to the onset of the P wave and QRS complex from the simultaneously recorded ECG.

Rijuvan's STI technology produces a variety of measurements, including the duration of systolic time intervals that have been shown to correlate with established measures of cardiac function, and have proven to provide prognostic information relevant for the optimization of cardiac treatment.



Head to head comparison of Systolic Time Intervals between Echocardiogram and CardioSleeve



Key:

ICT= Isovolumic Contraction Time
 IRT= Isovolumic Relaxation Time
 ET (or EP) = Ejection Time (or Period)

$$SPI = ICT/ET$$

$$MPI = ICT+IRT/ET$$

Diastolic Heart Failure

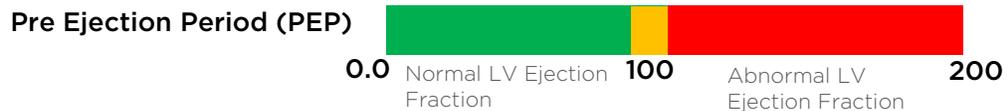
Myocardial Performance Index (MPI) or (Tei Index) is a measure of combined systolic and diastolic myocardial performance of both the left and right ventricles ii. MPI is a simple reproducible index which can reasonably separate normal controls (low and narrow MPI) from patients with HF (high and wide MPI). It shows significant difference with HF severity and an inverse relationship with Ejection Fraction (EF) iii.

- **MPI: $(IVCT + IVRT) / LEP$**
- Isovolumetric Contraction time in msec (IVCT): R-S1
- Isovolumetric Relaxation time in msec (IVRT): $|(Q-T) - (Q-S2)|$
- Left Ejection Period in msec (LEP): S1S2

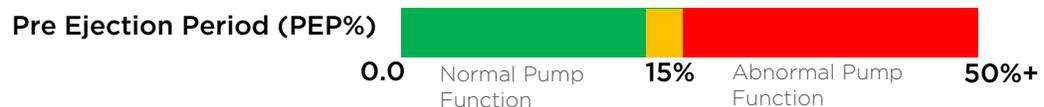


Systolic Heart Failure

Pre Ejection Period (PEP) = in msec (QS1): The PEP interval is the time from the onset of the Q wave on the ECG to the closure of the mitral valve within the S1 heart sound. The value of PEP in ms reflects the time required for the left ventricle to generate sufficient force to close the mitral valve, and is therefore related to the acceleration of the pressure in the left ventricle. Prolonged PEP has been associated with reduced LV EF and abnormally low LV dP/dt (often used as a measure of LV contractility). Shortened PEP correlates with increased contractility and short electromechanical delays iv.



Pre Ejection Period Percent (PEP%) = $(QS1/RR)$: PEP% is computed as QS1 divided by the RR interval, and it relates to the efficiency of the pump function. PEP% >15% predicts re-hospitalization for heart failure at and post discharge v.



Systolic Performance Index (SPI) = $(QS1/S1S2)$: SPI is a validated measurement of left ventricular (LV) systolic performance. This ratio increased significantly in the heart failure with depressed LV systolic function through increase in the QS1 and decrease in S1S2vi. This parameter is helpful in distinguishing systolic from diastolic dysfunction.



i Lewis et al., **A Critical Review of the Systolic Time Intervals**, <http://circ.ahajournals.org/>

ii Karazis et al., **Myocardial Performance Index (Tei Index): Evaluating its Application to Myocardial Infarction**, Department of Echocardiography, Hellenic Red Cross Hospital, Athens, Greece

iii Ogunmola et al., **Relationship between clinically assessed heart failure severity and the Tei index in Nigerian patients**, <http://www.biomedcentral.com/1756-0500/6/488>

2-Schmermund et al., **Tei-Index in patients with mild-to-moderate congestive heart failure**, European Heart Journal (2000) 21, 1888–1895

3- Lakoumentas et al., **The Tei Index of Myocardial Performance: Applications in Cardiology**, Hellenic Journal of Cardiology

iv Efstratiadis S et al., **Computerized Acoustic Cardiographic Electromechanical Activation Time Correlates with Invasive and Echocardiographic Parameters of LV Contractility**, J of Card. Failure. 2008, 14(7):577-582.

v Chao T et al., **EMAT in the Prediction of Discharge Outcomes in Patients Hospitalized with AHFS**. Internal Med. 2010, 49: 2031-2037

vi Zuber et al., **Systolic Dysfunction: Correlation of Acoustic Cardiography With Doppler Echocardiography**, Congestive Heart Failure 2006

Lives

- 6 Million Patients Effected
- 1.1 Million Hospitalizations
- 550,000 New Cases/year

Costs

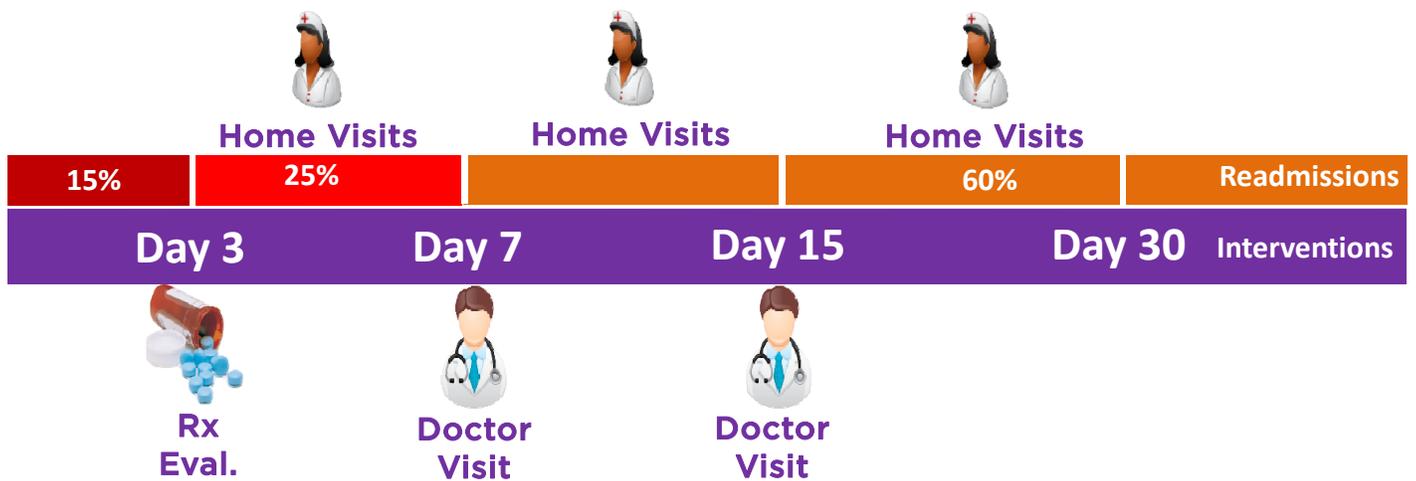
- \$38 Billion/year
- Hospital Cost 60%
- Outpatient Cost 40%

FROM HOSPITAL 2 HOME

There are many approaches to an affective heart failure discharge and readmission reduction program in the home.

A comprehensive and proactive program includes remote monitoring, medication management, diet and activity tracking, patient engagement and interventions.

However, the timeline matters most to success.



For a reactive care team and unengaged patient, proper **ALERTS** make interventions proactive and therapy optimized.

- S**ymptoms: Shortness of Breath, Chest Pain, Palpitation, Syncope, Fever, Stroke
- U**rgent: SPI, QRS, Meds
- R**isk Index: for Vitals BP, HR, BR, SpO2
- G**ain Weight: Feet, Abdominal Swelling
- E**KG: QTc, Arrhythmia