

Can Heart Rate Variability Analysis Predict Effective Acupuncture Treatment?

A Comparison of Profound Responders and Nonresponders

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Negative Values Indicate a Decrease in Stress Response and Increase in HRV During Treatment

Why This Study?

In the Acupuncture Clinic there is a wide variation in clinical outcomes from spectacular to dismal. Acupuncture is a subtle physiological input which can lead to outsized clinical results, i.e. it is nonlinear. Heart Rate Variability (HRV) can capture nonlinear phenomena and thus might be well suited to reflect some of the physiological changes that occur after needle placement, and may shed light on individual variation in response. Here we contrast the HRV profiles 6 patients who had dramatic, and rapid clinical results (“Profound Responders”) to 3 patients who had no results whatsoever. The Profound Responders show an increase of their HRV from the first to second half of treatment, where the Nonresponders do not.

Introduction

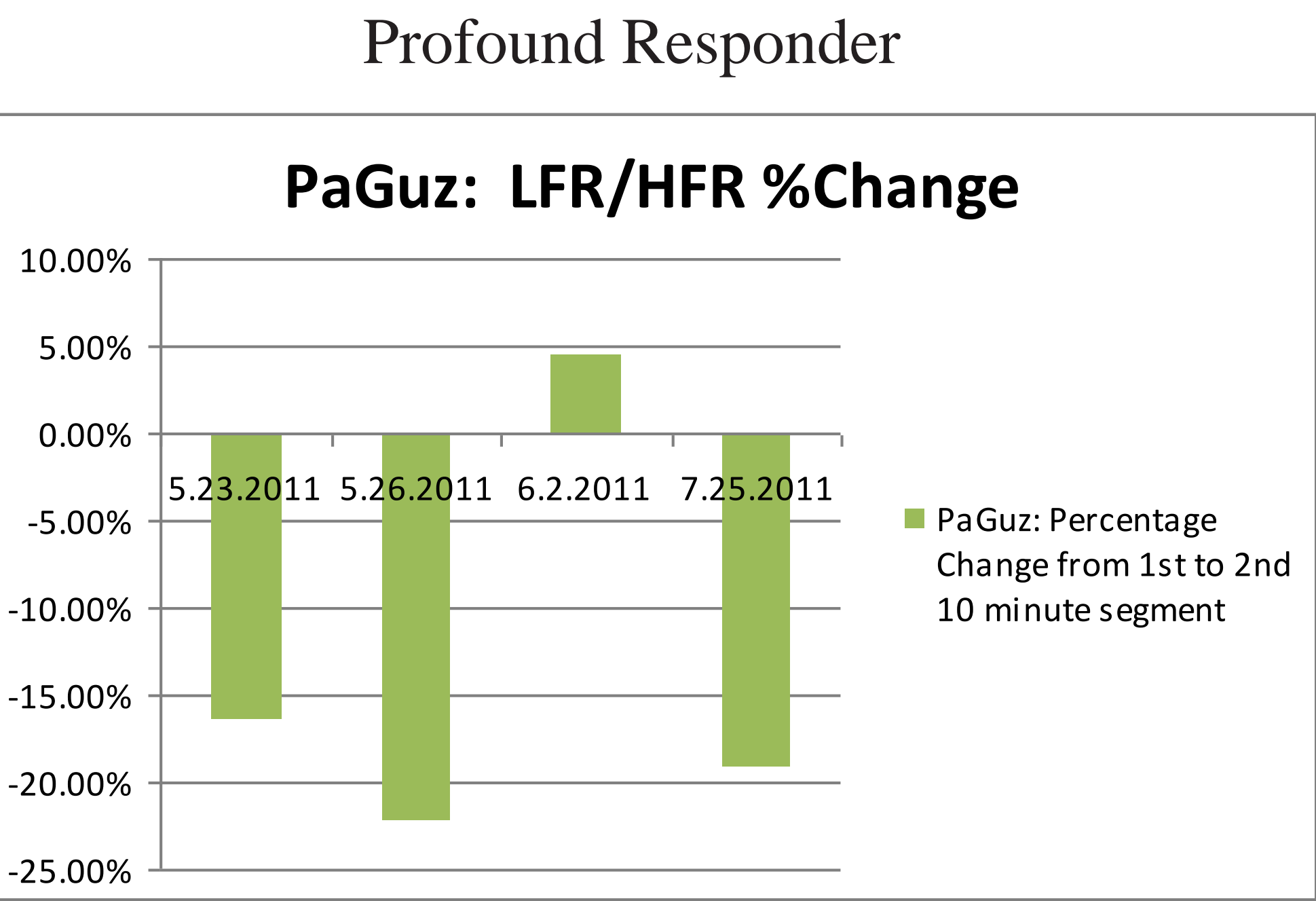
There have been many studies showing Acupuncture’s effectiveness in lowering the stress response. Because stress can have such a deleterious effect on pain, mood, immunity, longevity, and health in general, this effect alone is beneficial. Heart Rate Variability (HRV) is an exacting but potentially sophisticated measure of autonomic effects on heart rate. HRV data presented here is from a group of patients termed “Profound Responders.” They exhibited rapid and dramatic response to treatment in spite of their age or the duration of their condition. This study focused on HRV measurement during treatment to determine any correlation with their outsized clinical response. Goals of this approach are to establish parameters of clinical utility of HRV, to ultimately help correlate HRV with more expensive or invasive physiological measures, and to document the positive effects of Acupuncture on the Autonomic Nervous System.

Materials and Methods

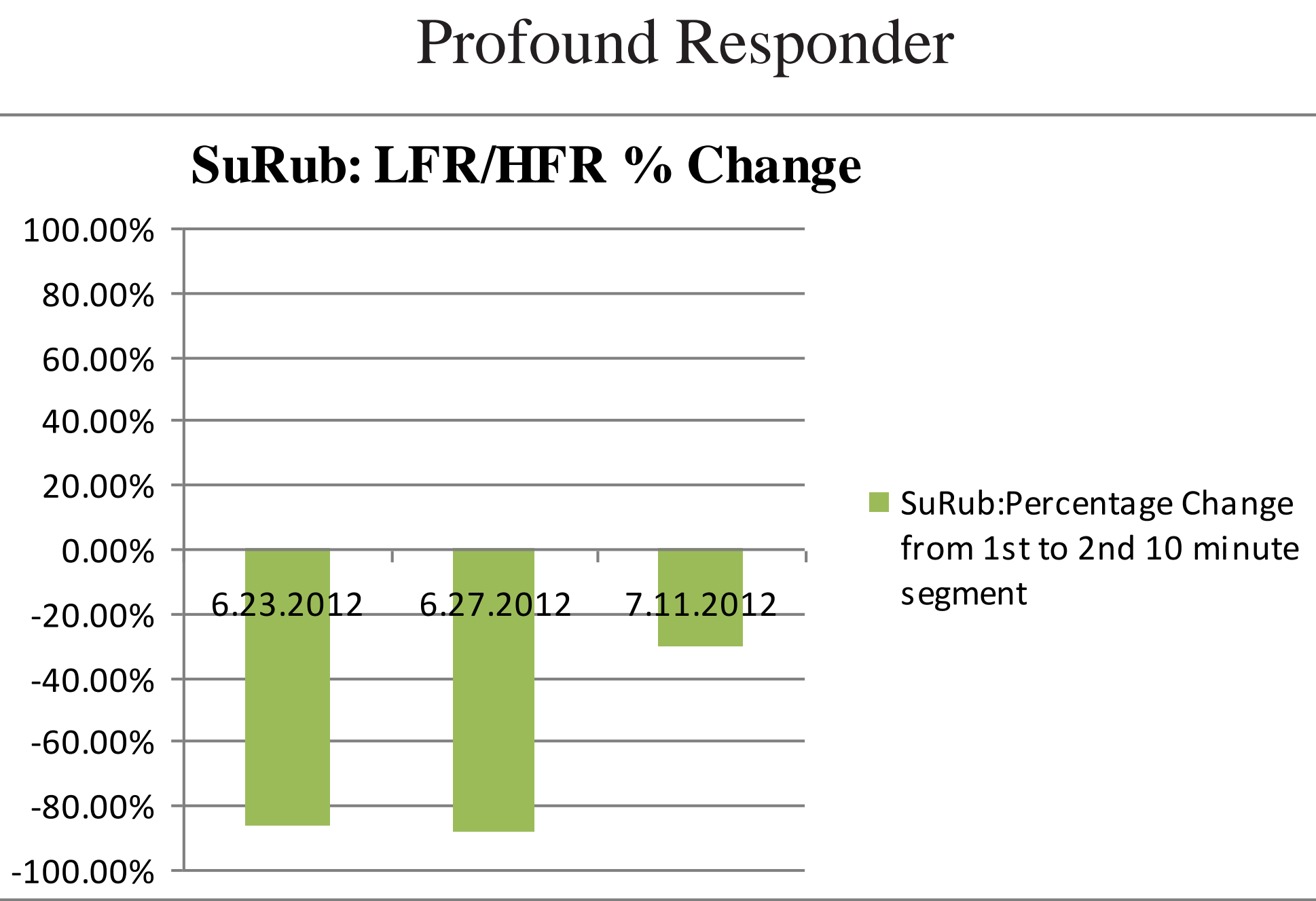
Over 50 clinic patients were monitored during their acupuncture treatments. All received Traditional Chinese Medicine body acupuncture according to their presenting pattern and diagnosis. The six patients reported on here had profound clinical response and in addition had adequate data (no artifact), enough data sessions in succession, and could be positioned suitably for HRV monitoring. Outcome measures were patients’ assessments of progress and/or blood pressure. Heart rate was measured during treatment after needle placement, then data analyzed using Vivosense software, comparing the first to second 10 minute segment. LFR/HFR (Low frequency/High frequency) trends were chosen for report though other parameters (Sample Entropy, pnn50, HF, Poincaré plots) were also measured. Their results are compared for illustration to three nonresponder patients.



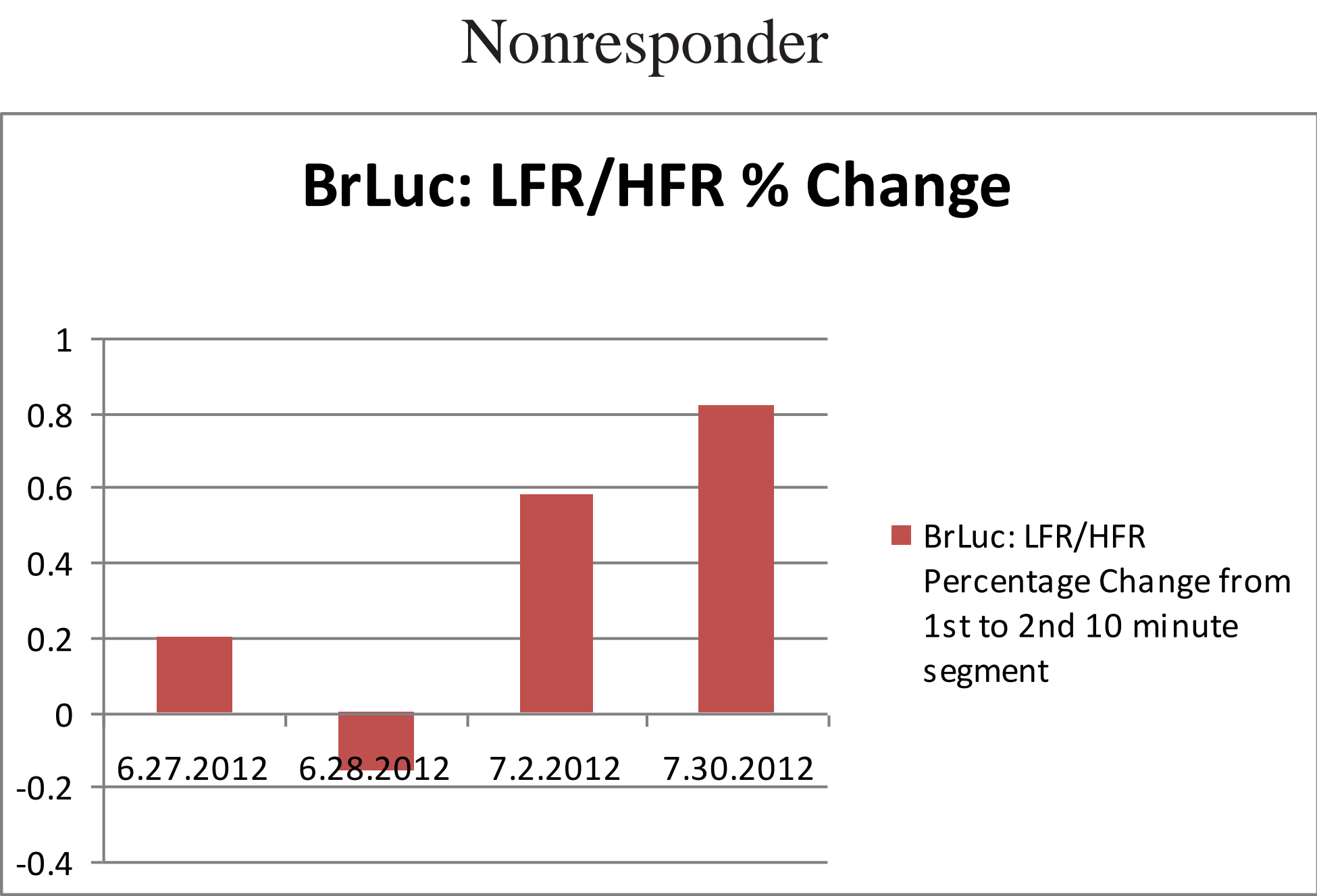
Ancient Medicine Made Modern



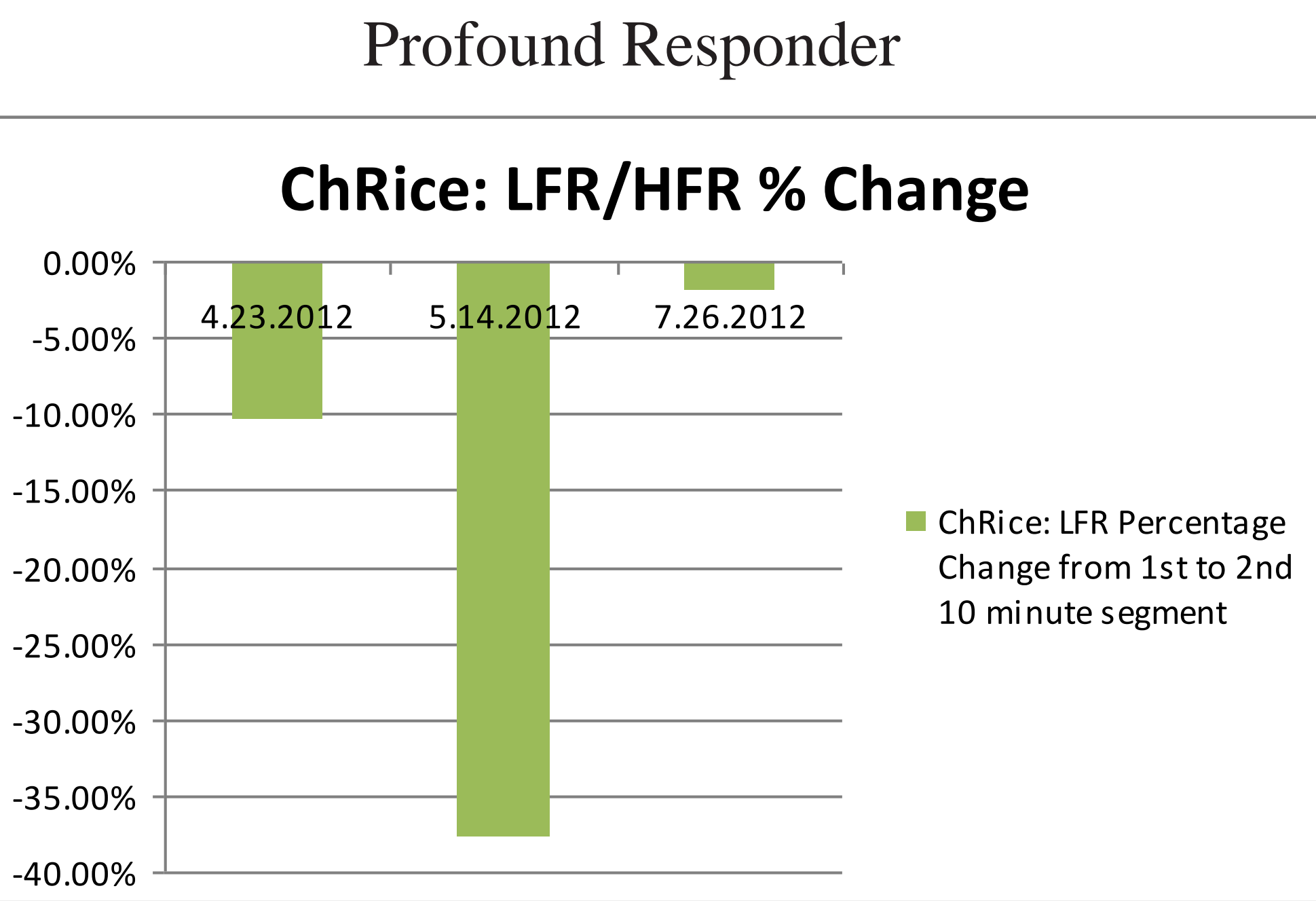
PaGuz: 38 year old Male with Severe Allergic Rhinitis
Symptoms disappeared from 5.23.2011 to 5.26.2011 and symptoms did not return
Treatment: 20GB, 13Bl, 11Bl, 12Bl, 3K, 36St, 4Li, 9Lu, 7Lu, yuyao, Bitong, 26DM



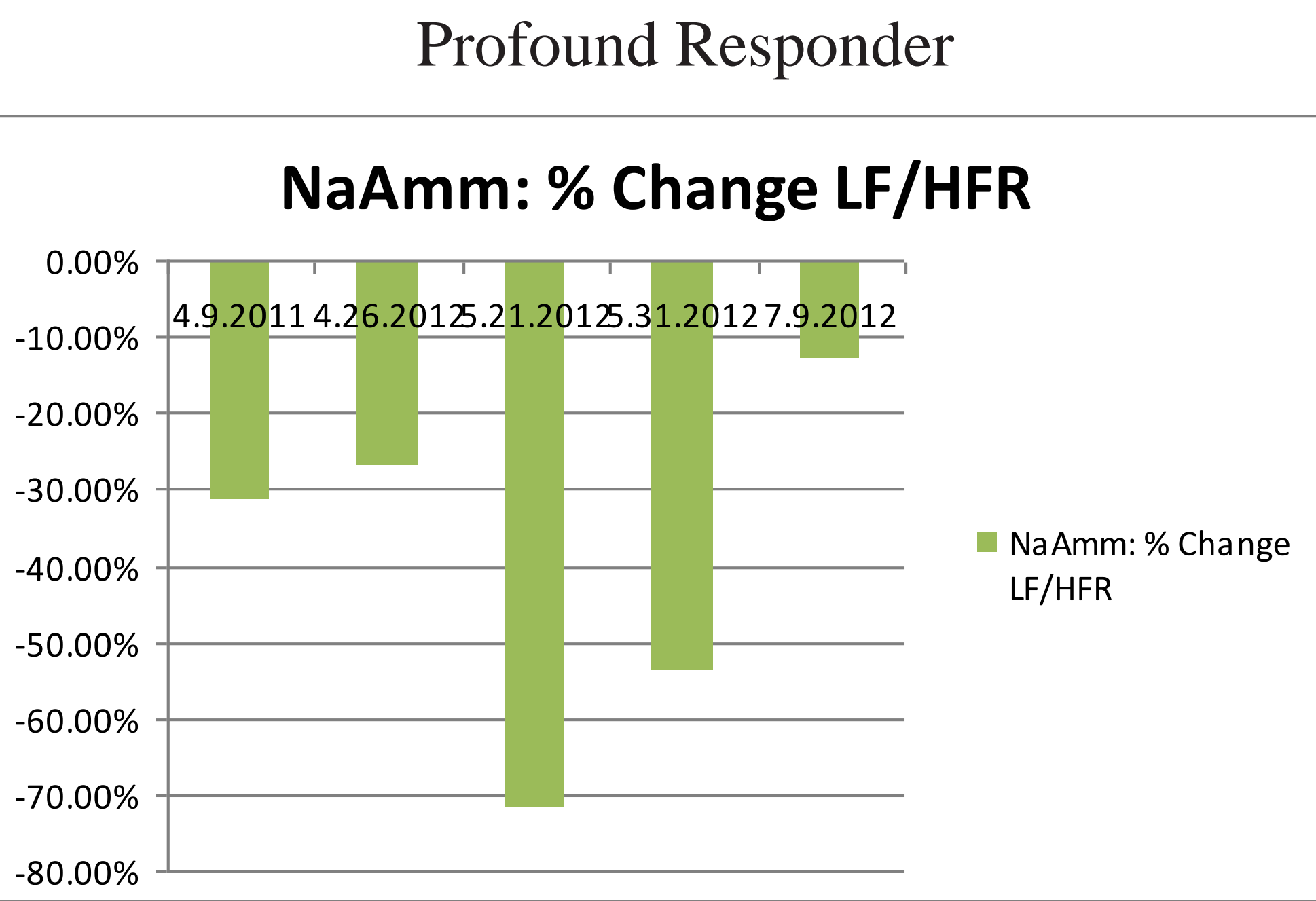
SuRub: 70 Year Old Female with Hypertension and Severe Peripheral Neuropathy
Blood pressure on 6.23.2012 170/100 Pain 8 out of 10
Blood Pressure on 6.27.2012 130/70 Pain 2 out of 10
Blood Pressure on 7.11.2012 125/70 Pain 1 out of 10
Treatment: 11Li, 10Li, 36St, 37St, 3K, 60Bl, 3Li, 4Li



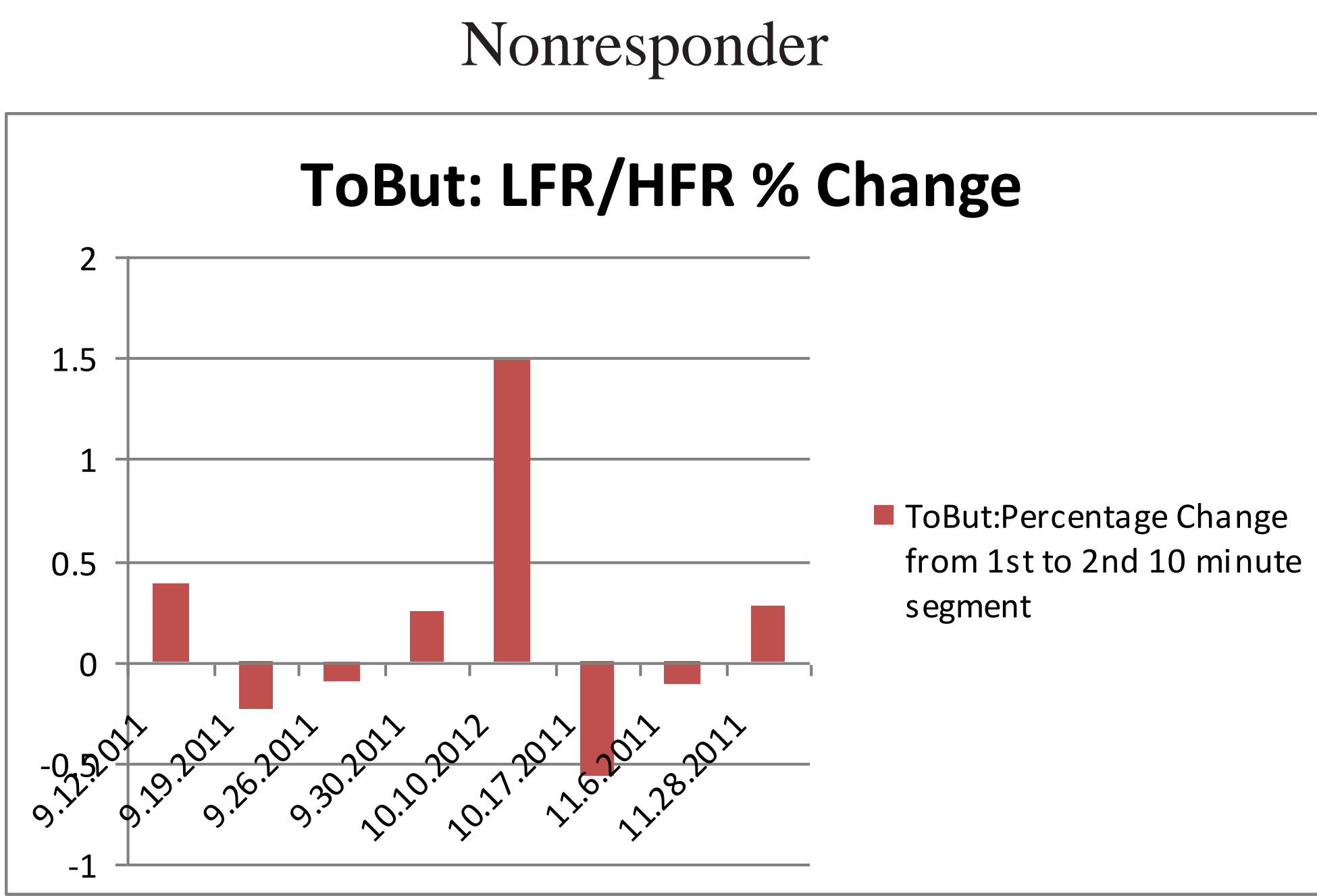
BrLuc: Sinusitis and Knee Pain and Anxiety
Acupuncture Ineffective
Treatment: 3Li, 44St, 4Li, 36St, 37St, 11Li, 10Li, 7He, 6PC, yin tang



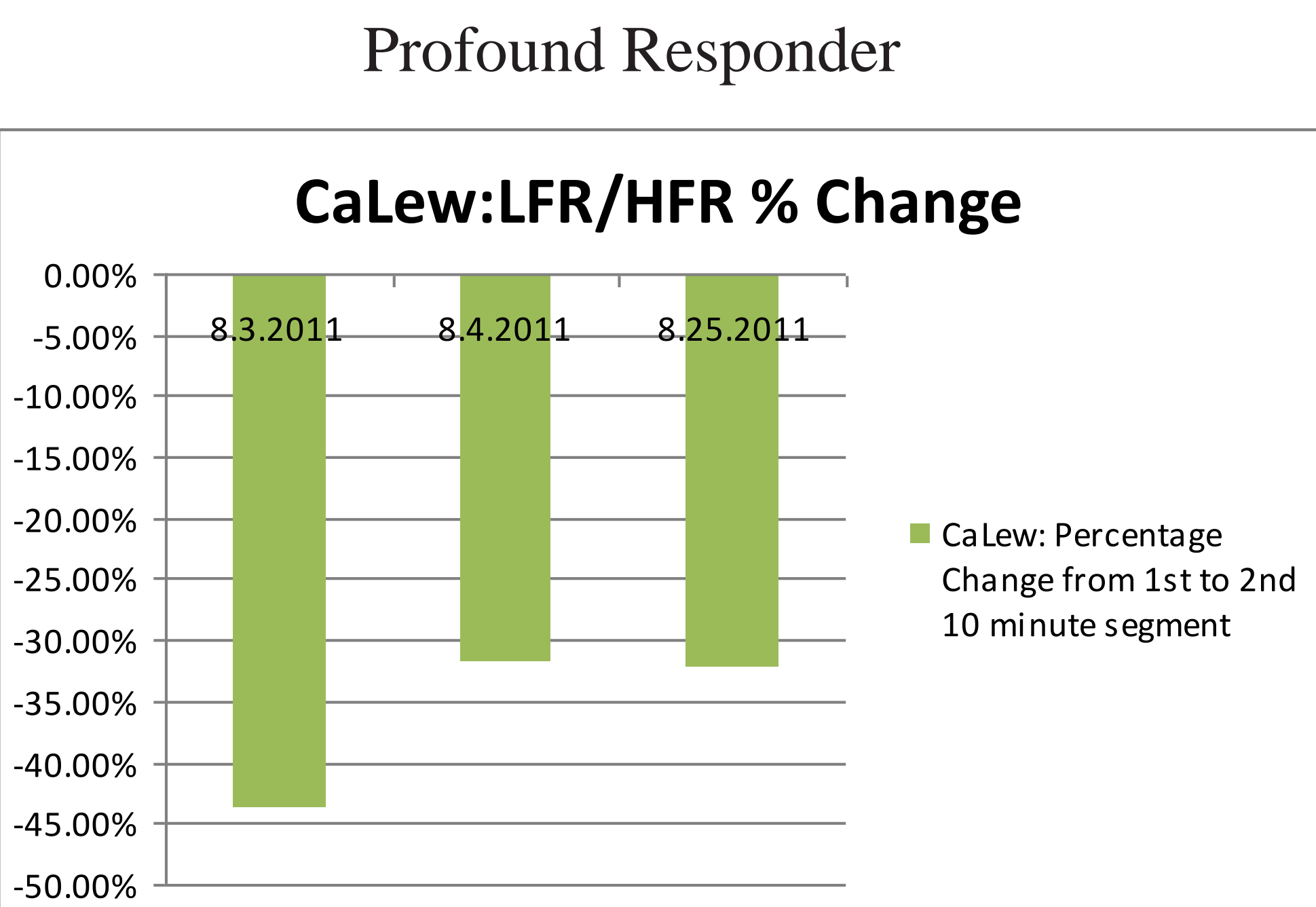
ChRic: 35 Year Old Female with Hypertension.
Blood Pressure 4.23.2012 164/95
Blood Pressure 5.14.2012 127/77
Blood Pressure 7.26.2012 107/68
Treatment: Sishengcong, 4Sp, 36St, 37St, 3K, 6PC, 7He, 11Li, 10Li,



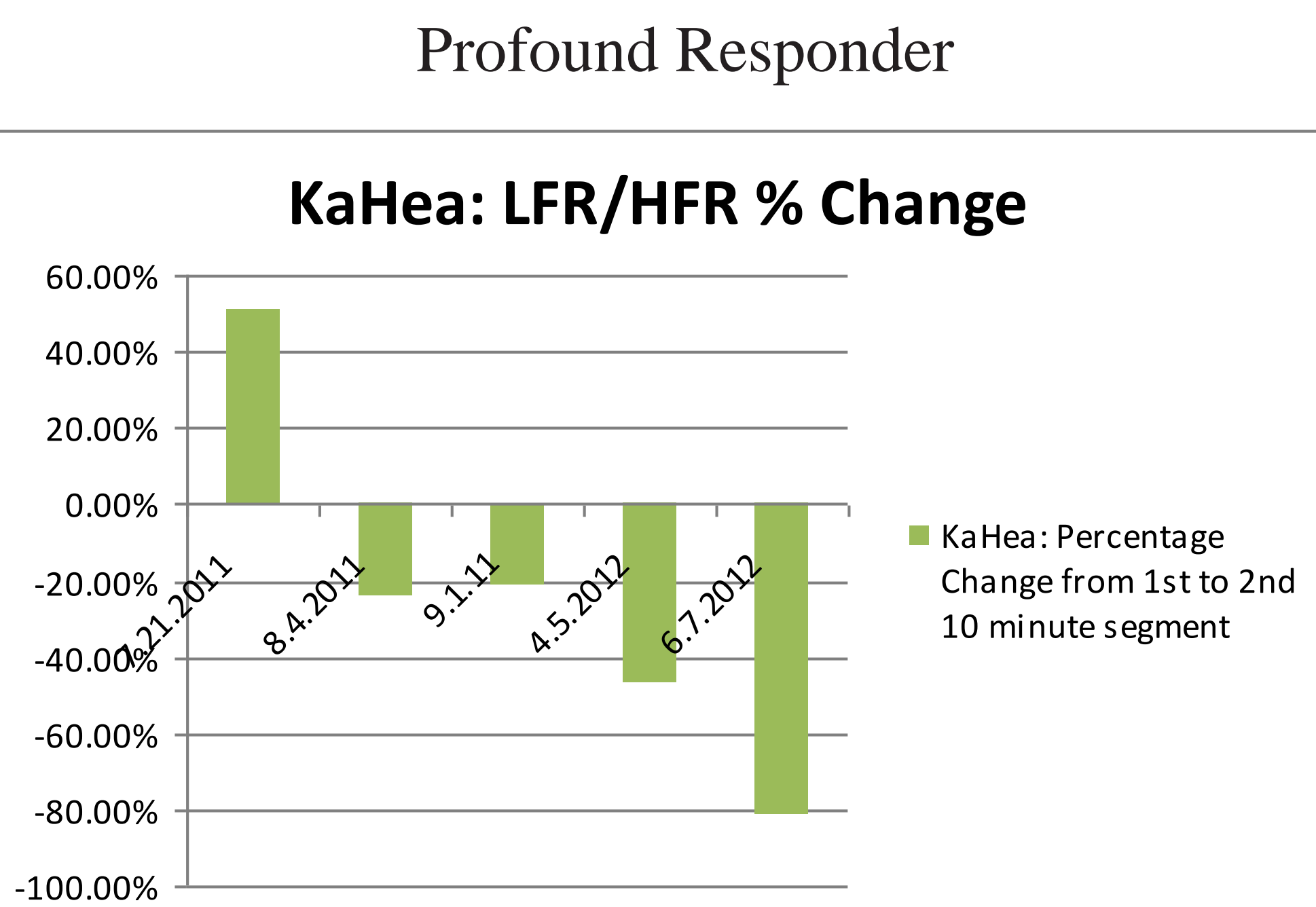
NaAmm: 40 Year Old Female with Intractable Panic Attacks
Panic and Anxiety Disappeared after 3 visits
Treatment: 4Sp, 3K, 3Li, 6PC, 7C, 20DM, 4Li



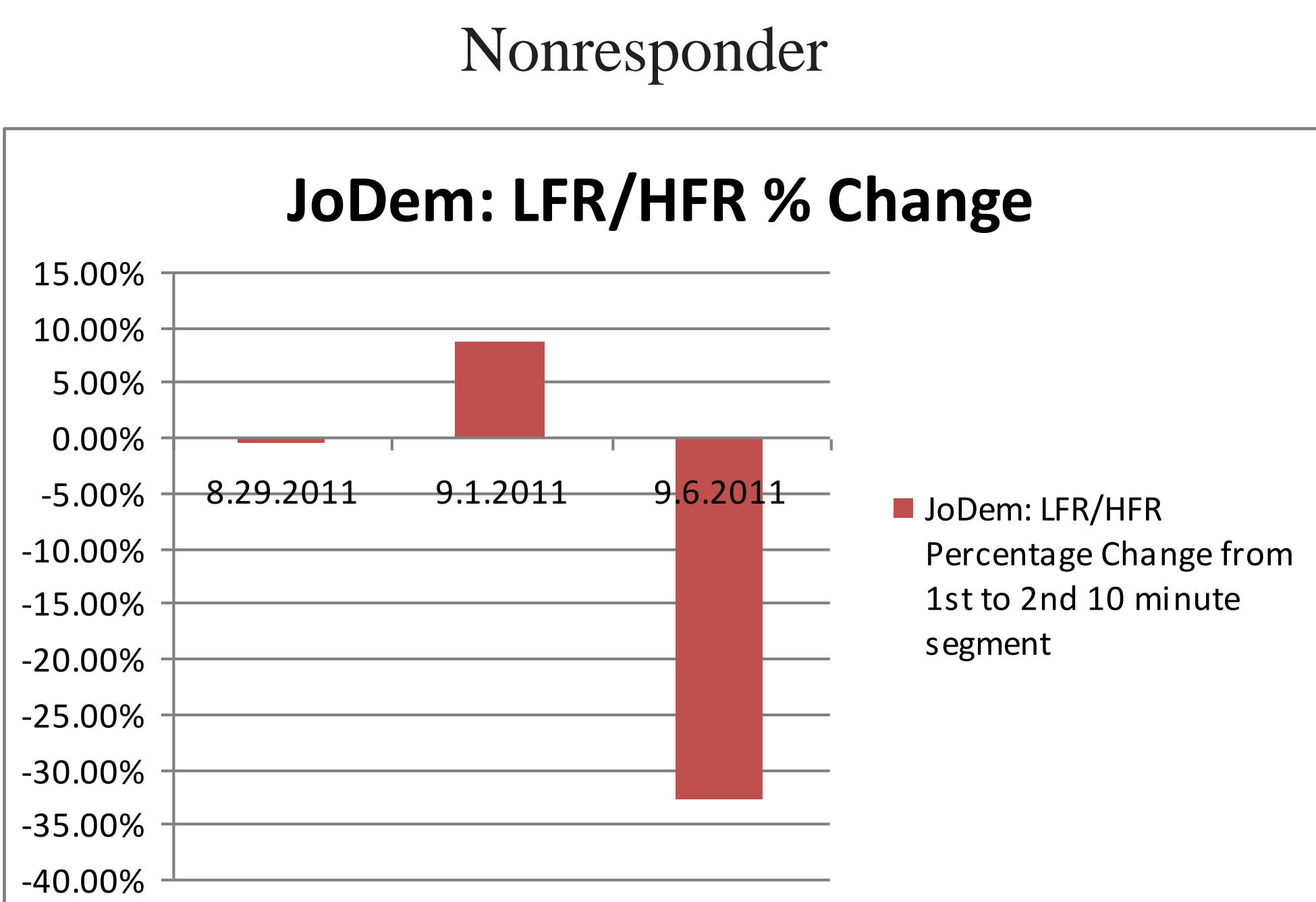
ToBut: 41 Year Old Male with Intractable Migraines
Acupuncture Ineffective
Treatment: 3Liv, 4Li, 7C, He, 6PC, 36St, 20GB,
Then 8Liv, 7He, 6PC, 4IG, sishengcong, 20GB, 11b, 15TH, 12B, 13B
Then: 3Liv, 7He, 6PC, 4IG, sishengcong, 20GB, 11b, 15TH, 12B, 36St~, 37St~



CaLew: 48 year old female with Intractable Migraines
Migraines disappeared from 8.3.2011 to 8.4.2011
Treatment: 4Sp, 6PC, 7He, 6K, 3K, 20GB, 4Li, 3Li



KaHea: 68 Year Old Female with Hypertension
7.21.2011 168/90 74
8.4.2011 137/75 72
9.1.2011 128/79 72
4.5.2011 134/78 70
6.7.2011 131/74 74
Treatment: 36St~, 37St~, 7He, 6PC, 3Li, sishengcong, yin tang, 11Li, 10Li



JoDem: Knee Pain
No effect with Acupuncture
Treatment: 3K, knee “eyes”, 36St, Hedging, 9Sp, 4Li, 3Li
Infrared therapy
10 Hz Electroacupuncture to “eyes”, Hedging, 36E

Results

In Profound Responders, data analysis showed an almost uniform increase in HRV from the first to the second 10 minute segment, best demonstrated by a decrease in their LFR/HFR. Nonresponders show no discernible pattern, or an increase in their LFR/HFR over the same segments.

Discussion

Variable heartbeat has been considered a sign of good health since the third century. Oriental physician and the scientist Wang-Shu Ho stated, “If the pattern of the heartbeat becomes regular as the tapping of woodpecker or the dripping of rain from the roof, the patient will be dead in four days”.

HRV analysis can be an exacting and painstaking undertaking. Aberrant beats, “outliers”, must be handled since HRV values are exquisitely sensitive to artifact. The Vivosense system of artifact management decidedly improves the artifact problem, but many impediments to accuracy and reliability remain (see Tips: HRV Analysis in the Acupuncture Clinic). The autonomic state of the patient is of interest scientifically and clinically. This study is exploring the “real time” autonomic response of actual patients to needling. Instead of looking at HRV before and after treatment, or between treatments, the patients’ reactions were captured immediately after needle placement. The model is to look at the response to the subtle “insult” of acupuncture and correlate this reaction to ultimate clinical outcomes. This response can be interpreted as a sort of “righting reflex” that may indicate an “adaptability” of the patient, and may be an indicator of effective treatment.

Stress reduction has become a key outcome goal in health and prevention. Measuring Autonomic Balance through biofeedback and HRV are now mainstream. Indeed, there now are handheld devices to measure HRV on smart phones and freestanding devices. Acupuncture has as its foundation the concept of prevention, longevity, and sturdiness of spirit, by invoking “balance” in the system. Acupuncture should be rightfully positioned as a key element in helping to optimize autonomic balance and health. There have been correlations with HRV and other more expensive, and invasive physiological measures such as fMRI, EEG, and immune profiles. Since HRV is noninvasive and more accessible, it could be a proxy for these other modalities if parameters were defined.

This is a clinical case study and not a controlled scientific one, presented in hopes of provoking further inquiry.

Tips: HRV Analysis in the Acupuncture Clinic

- ◆ Though reasonably reliable data can be achieved from 5 minute windows (even 2 or 3 minute windows are possible), the best results were with 10 minute windows.
- ◆ If a patient has two sided treatment, it is best to do HRV monitoring during the supine portion of the treatment first, then do the prone portion of the treatment afterwards
- ◆ If the patient requires prone or lateral treatment, their data will be less reliable.
- ◆ If the patient has persistent PAC’s (premature atrial contractions), or other artifact, their data is useless.
- ◆ Often the LFR/HFR will increase towards the end of the treatment, after 17 to 20 minutes or so. The significance of this is open to speculation.
- ◆ Sensitivity of the Patient to needling (low pain threshold) has no bearing on their resultant stress response.

Conclusion

Profound responders show an increase in their HRV during an acupuncture session, best represented by the LFR/HFR ratio. This “relaxation response” is not exhibited by Nonresponders. HRV may reflect these differences because HRV captures subtle physiologic changes.

Contact Information

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http://www.ksparrowmd.com/category/kristen-sparrow-md-blog/heart_rate_variability/

