ABSTRACT
The Cost Effectiveness of Research: Are these Objective Measurements the Tools of the Future

Background:
The objective marker for the quality of simulation training especially expensive high acuity
high-risk training needs to be established. The hypothesis that hyper realistic simulation allows us to evaluate objective hormone and cardiac human factor data is the basis of the current research. To accomplish this goal we produced an artificial environment that duplicates, as close as possible real environments.

Objective: Determine objective markers for trauma training.

Design/Methods: Salivary hormones and noninvasive micro variability cardiac electro-physiologic activity to the 1/1000 of a second were utilized to evaluate 44 students in hyper realistic training. Salivary hormones were evaluated by the methods described by Granger. Heart micro variability was measured continuously to the 1/1000th of a second utilizing Firstbeat BG continuous technology for the entire 4 1/2 days. This data is now enhanced with the addition of 35 new students from the 2016 intensive surgical skills course.

Results:
Researchers did not anticipate response differences in the initial stress event. The initial course given to the first group showed the typical expected dramatic rise in cortisol because of a stressful event. The second year unexpectedly showed the initial response was not startle but relief with a drop in initial cortisol levels. Importantly, however peak combined amylase data shows habituation on every day of the training when compared to pre-training levels. P value for each day was between $P>0.002$ and 0.004 for both 2014 and 2015.The 2016 year data will add 35 new students to the data pool enhancing this research

Conclusion:
.Salivary data became confusing as we compared the differences between those students in the operating room and those in emergency room. This data was then compared to heart rate micro-variablity which clarified events.

Impact:
Multiple previous publications and presentations have documented effective learning through our high intensity hyper-realistic training courses. We have performed in all terrains from a medical school in a city, to jungles and mountains , onboard ships, and on a large movie studio lot with Hollywood effects. We now turned our attention to finding totally objective physiologic measurements that will allow us to measure the effects of the training and when to change it. We believe we are getting closer with these measurements. The first day differences in Cortisol was a complete surprise to the authors until we realized that the first year group of students leaked the first day surprise event to the second group. Thus the realization that the first group had startle stress ,while the second had anticipatory stress. The addition of 35 data points will further clarify this issue.