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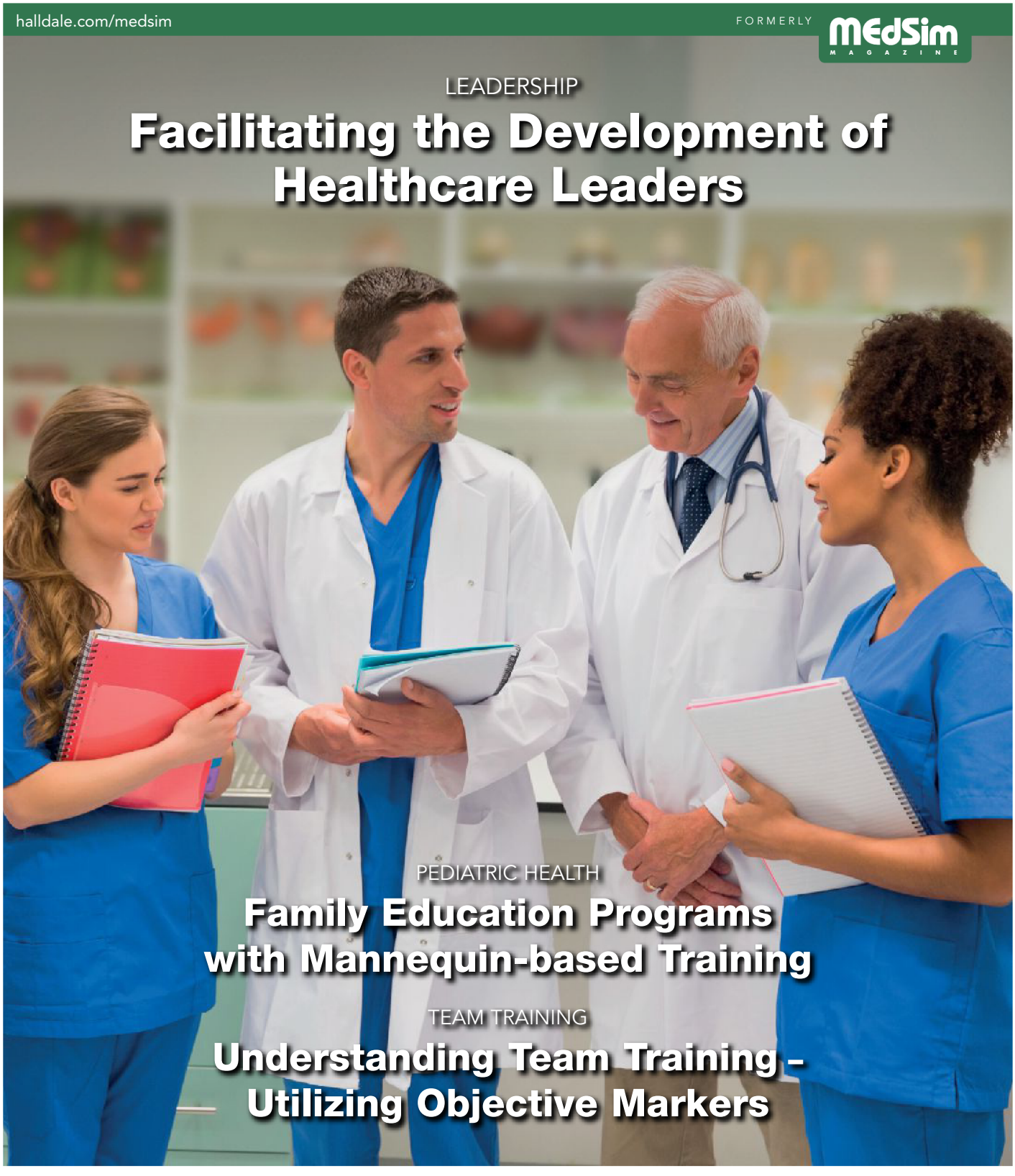

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Understanding Team Training – Utilizing Objective Markers

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Understanding Team Training – Utilizing Objective Markers

Dr. LaPorta, Captain Hoang and team discuss the US military unified healthcare training.

The need for unified healthcare training that encompasses true to life stressful situations with true to life casualty scenarios has become an urgent training requirement for the United States of America. Not only because of natural disasters but also the current prevalence of known terror threats to our citizens. The development of training tactics utilizing Hollywood techniques to dramatically enhance the realism has now been performed in highly realistic settings with the United States military and military medical students.

The formation of rapidly deployable surgical and resuscitative teams in the US military is frequently performed by having a core team of personnel that has multiple add-ons in the weeks leading up to the deployment of the unit. This requires a significant period of preparation and training exercises for the unit to deploy at the zenith of its functional ability. The generally accepted themes for training teams are: (1) emphasis on non-technical teamwork skills such as cooperation, coordination and effective communication; (2) utilizing many of the same strategies that have been proven to be highly successful in the aviation industry; (3) it is critical to provide feedback to the participants based on the actual behaviors and events observed during training; (4) you must have multilevel evaluations, not only of technical and cognitive skills and knowledge, but also objective measurement to truly determine the effectiveness of the training event, its cost, in terms of time, personnel and materials.

The dimensions of effective team performance include the concept of an organization's culture, the team's culture and structure, the expertise manifested in the team and the communication among the team members.

Naval Captain Tuan Hoang (Hoang et al) developed a trauma deployment team-training event that fits the above-mentioned ideas and concepts. His research on hyper-realistic immersive team training focuses on improving individual and team performance across the continuum of care; correlating team training efficacy and communication with long term unit cohesion, leadership, and resiliency. Rocky Vista University School of Medicine (RVU)[↗] has a significant portion of its students in partnership roles with the United States military, thus developing officers for the health professions scholarship program (Mueller et al.) RVU has developed a similar course with comparable objectives to Captain Hoang's navy course for training its students. Both courses have had significant input to a new team-training grant for fleet surgical and forward surgical teams.

In all, there will be 22 hours of classroom didactics with 28 hours of team-based simulations. The classroom curriculum

Above **Realistic field training improves skills and knowledge while reducing stress.** Image Source: Anthony J LaPorta.

emphasizes best practices drawn from civilian trauma, recent military combat trauma experiences and clinical practice guidelines (CPGs) currently used in theater, as well as examining common pitfalls encountered. Topics range from triage, basic trauma physiology, blood product utilization, pain management and different complex trauma injury patterns. Reduction in resuscitation time and critical errors was proven and sustained at the six-month interval. Likert scale data on relevance to deployment, preparation, and team cohesion was very strong.

RVU's course utilized similar total immersion training based didactics followed by multiple hours of practical experience and debriefing. The first two years of the course had only subjective evidence of stress and effectiveness of the overall training and cooperation. The third and fourth year of the course used objective measurements of stress and habituation. This was in addition to the standard measures of cognitive knowledge and technical skills on life-saving procedures to include surgical airway, surgical first assistant, suturing, knot tying and decompression of tension pneumothorax. The third and the fourth year courses incorporated the objective measurement of salivary cortisol and salivary amylase as measures of the course stress and habituation. In the fourth year of the course an additional function was added. 1 / 1000 of a second cardiac micro variability was used to identify the occurrence of stress and it's effectiveness.

Salivary hormone measurements were performed by the method described by Granger et al. Measurements were performed at pre, mid and post event times plus 20 and 40 minutes post event. Heart rate variability was monitored long term with BodyGuard-2™ devices from FirstBeat™. Analysis was retrospective, as the subjects were monitored continuously starting the night before the classroom portion of the course. Data was then calculated utilizing the root mean square of successive differences in heartbeat intervals (RMSSD), measured in milliseconds. (Kettunen et al; and Kinnunen et al)

Results

Utilizing a five point Likert Scale to gather data, three questions were asked at the conclusion of each day "What was your overall stress on a scale from 1 to 5? What was your overall confidence on a scale from 1 to 5? And did the stress help you learn? Data indicated the overall stress of the operating room participants declined in those years and they reported

Chart 1

	Yes	No
Day 1	52.4%	47.6%
Day 2	85.0%	15.0%
Day 3	95.0%	5.0%
Day 4	95.0%	5.0%
Day 5	100.0%	0.0%

Chart 2

	Confident	Not Confident
Day 1	55%	45%
Day 2	45%	55%
Day 3	65%	35%
Day 4	85%	15%
Day 5	90%	10%

Chart 3

	ER		OR	
	Stressed	Not Stressed	Stressed	Not Stressed
Day 1	N/A	N/A	N/A	N/A
Day 2	71.5%	28.5%	83.4%	16.6%
Day 3	94.1%	5.9%	38.9%	61.2%
Day 4	82.4%	17.6%	31.6%	68.5%
Day 5	76.8%	26.1%	28.5%	71.5%

Chart 4

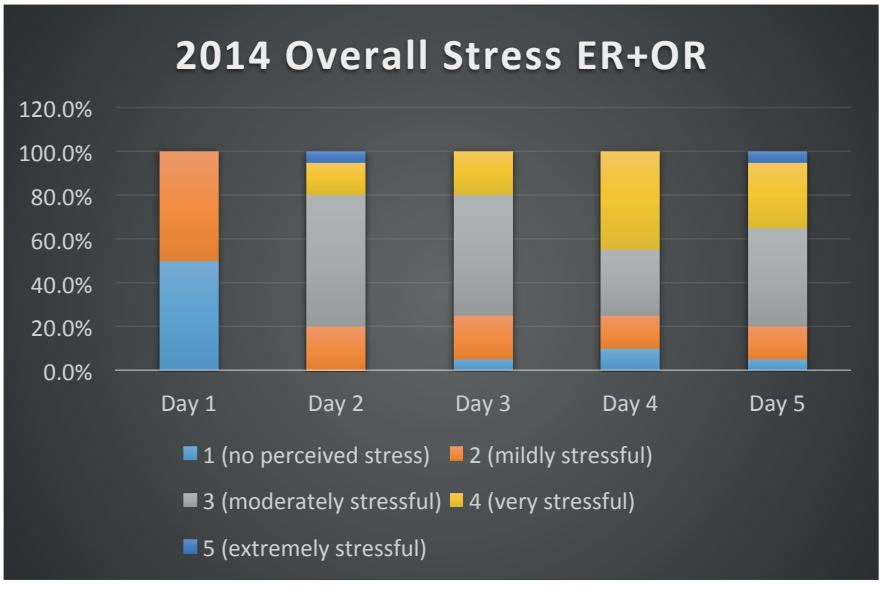
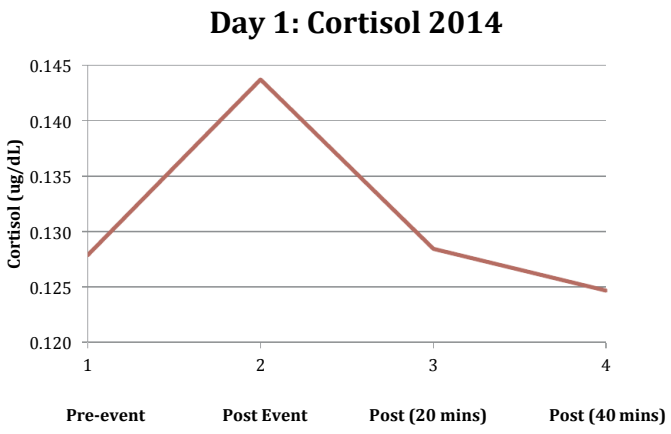


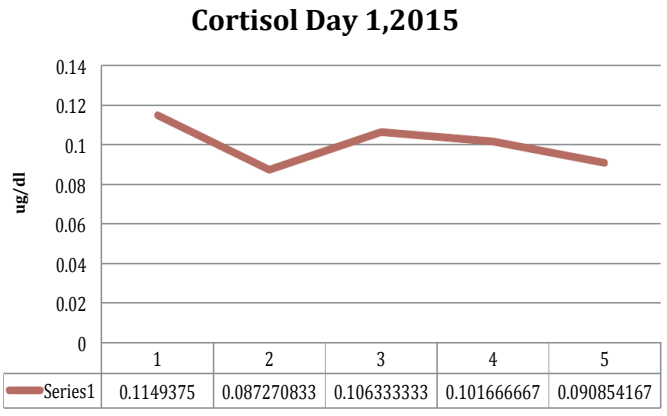
Chart 5

Day 1	123.0
Day 2	126.5
Day 3	133.0
Day 4	170.4

Graph 1, 2014 Startle Stress.



Graph 2, 2015 Anticipatory Stress.



Graph 3

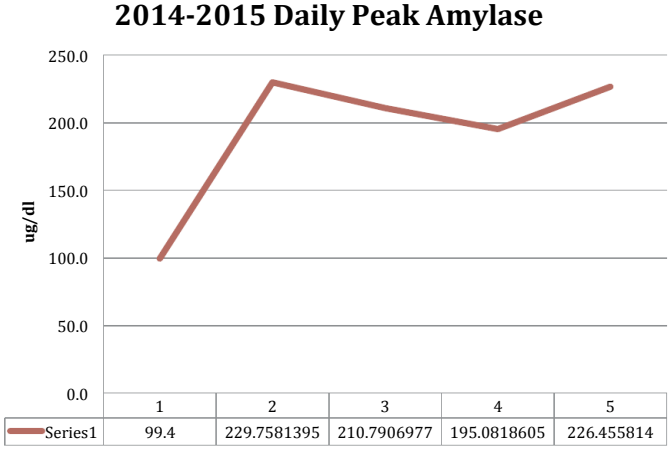


Table 1

-Reduction in Resuscitation Time	24.4 to13.9 minutes	Improvement of 10.5 Minutes P<0.001	Prior to Deployment
Reduction in Critical Error	5.2(+/- 1.13	Improvement of 4 errors P<0.01	Prior to Deployment
Sustainment at 6 Months	YES	YES	5-6 months into deployment

less stress by the end of the training. However, the emergency room students felt more stress by the end of the week. The stress by all students was recognized as beneficial to the educational process. Confidence as measured by the Likert Scale increased from 55% to 90%. (See Charts 1, 2 and 3.)

The cortisol never correlated with these events as the variables were too divergent, but average salivary alpha amylase did dramatically correlate once again exhibiting habituation. (See Chart 4 and 5.)

By the 2015 RVU course, we were excited to see that whether we put the stress at the beginning, middle or end of the course, we continued to see a rise in salivary amylase. Whether the course produced startle stress or anticipatory stress did not make a difference. In 2014, cortisol spiked dramatically with startle stress. In 2015, salivary cortisol fell dramatically because anticipatory stress was so high. Importantly, amylase data showed habituation every day of training when compared to pre-training levels regardless of the type of stress (see Graphs 1, 2, and 3.)

Utilizing the above stated similar course with Naval surgical teams, 25 teams were measured and graded in triage-to-disposition time and number of critical errors. We found the time to resuscitation decreased from 24.4 to 13.9 minutes ($p<0.001$.) Each team improved by an upgrade of four critical errors per event. Course feedback showed enhanced confidence, 7.25 to 8.65 in complex traumas. The course was advantageous to team focus (9.36), function (9.50) and cohesion (9.31.) We demonstrated that immersive, team-based simulation showed improvement in trauma-team performance. This plus the additional benefit of recreating an environment-specific familiarization plan, produces a training program as real as possible. (See Table 1.)

The 2015 addition of 1/1000 of a second micro-variability added an entirely new dimension to these evaluations. This data is expected to show a strong correlation between stress and recovery in training. However, finality of the data is pending.

Conclusion

Total immersion training utilizing the special effects of Hollywood and the reality of being able to utilize your equipment and perform procedures on live human beings wearing the exoskeleton known as the human worn partial task trainer or the cut suit has been extremely effective. The re-creation of consistent quality training and personnel specific training environment, in addition to objective hormone and cardiac evaluation accords significant promise for the possibility of utilizing objective markers for the effectiveness of training and cost benefits.

The Joint Program Committee-1 of the United States Military has now given us the opportunity to utilize all of the above-mentioned modalities in a study of surgical teams over the next two years. The finalization of this data will hopefully continue our march toward finding the proper objective training markers. MTM

About the Authors

Col. (R) Dr. Anthony J. LaPorta has served in every aspect of medical education and is currently the Professor of Surgery and Director of Rocky Vista University's Military Medicine Honors Program.

Captain Tuan N. Hoang was born in Saigon, Vietnam and immigrated to the U.S. He is dual designated as Surface Warfare Medical Department Officer and Fleet Marine Force Warfare Officer. Under his leadership, the first Shock Trauma Platoon (STP) and Forward Resuscitative Surgical System (FRSS) simulation labs in the USMC were created.

Col (Ret) Alan Moloff D.O., MPH is Board Certified in Aerospace, Undersea and Disaster Medicine, Fellow of the Aerospace Medical Association and American College of Preventive Medicine.

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