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14. ABSTRACT A Wireless Vital Signs Monitor (WVSM) has been developed by the Office of Naval Research (ONR) and the United States Army Institute of Surgical Research (USAISR) in partnership with a Defense Contractor (Athena, http://www.athenagtx.com). This monitor incorporates several sensors from different manufacturers that can be implemented far out to the point of injury and adds complete trend analysis over four hours. Multicenter trials have been completed and the instrument is FDA approved. This WVSM is too bulky for field operations by US Special Forces (SOCOM), but functional prototypes of an alternative miniature wireless monitoring device with improved trend analysis even further out to the point of injury have now been delivered (SOCOM-Mini-medic™). There have been no field tests to date. The primary objective of this project is to perform the first field tests of the SOCOM Mini-medic. The main focus is to validate the mini-Medic for combat casualty care (including, but not limited to, brain injury) in prehospital and hospitalized patients. Lessons learned from our previous and ongoing trials in trauma patients with and without brain injury will be applied.					
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I. SUMMARY

A. GOAL

To evaluate for the US Special Operations Command (SOCOM) a miniature, portable wireless vital signs monitor (MWVSM, Mini-medix™, www.athenagtx.com) that could aid in the triage and diagnosis of trauma patients with and without traumatic brain injury (TBI). The MWVSM consists of two components, both of which are the approximate size and weight of a cell phone: one is a multi-parameter sensor that is placed either on the forehead or the fingertip of a casualty and the other is a monitor that receives a wireless signal transmitted up to 100 m carried by the medic.

B. HYPOTHESIS

This project has been totally driven by the technological needs of SOCOM, rather than by a classical hypothesis. Basically, the MWVSM was developed by www.athenagtx.com to capture whatever useful biological information is possible from small sensors placed on the forehead (or at a peripheral extremity site) of up to 5 casualties, then wirelessly transmit to miniature monitors carried by any first responder within range. The need was to triage, prioritize transport and to track changes in numerous casualties in an austere environment from a remote location. Within that context, to evaluate the MWVSM, we proposed the overall working hypothesis that: changes in multiple parameters or derived variables monitored from the forehead (or extremity) of a severely injured patient correlate favorably with conventional vital signs monitors either before or after definitive treatment at a level 1 trauma center.

C. EVALUATION OF MWVSM

1) PREHOSPITAL The purpose is to test whether spot measurements from miniature wireless vital signs monitor (MWVSM) can identify civilian trauma patients during prehospital transport who will require a lifesaving intervention (LSI) upon hospital admission.

METHODS From December 2011 to June 2013, a prospective trial was conducted in collaboration with prehospital providers. The MWVSM detects skin temperature, pulse oximetry (SpO₂), heart rate (HR), pulse wave transit time, and a derived Murphy Factor (MF) which is an overall status indicator . LSIs included: intubation, tube thoracostomy, central line insertion, blood product transfusion, and operative intervention.

Prehospital MWVSM data were compared with simultaneous vital signs (SaO₂, systolic blood pressure (SBP), and HR) from a conventional vital signs monitor. Sensitivity, specificity, negative predictive value, positive predictive value, and area under the receiving operating characteristic curves were calculated.

RESULTS Ninety-six trauma patients experienced predominantly blunt trauma ($n = 80, 84\%$), were mostly male ($n = 79, 82\%$), and had a mean \pm SD age of 48 ± 19 years and an Injury Severity Score (ISS) of 10 (17). Those who received an LSI ($n = 48$) had similar demographics but higher ISS (18 vs. 5) and mortality (23% vs. 0%) (all $p < 0.05$). The most common LSIs were intubation ($n = 24, 25\%$), blood product transfusion ($n = 19, 20\%$), and emergency surgery ($n = 19, 20\%$). Compared with HR > 100 beats/min, SBP < 90 mm Hg, SaO₂ $< 95\%$ alone or in combination, MF > 3 during the entire transport time had the largest area under the receiving operating characteristic curves (0.620, $p = 0.081$). MF greater than 3 had a specificity of 81%, sensitivity of 39%, positive predictive value of 68%, and negative predictive value of 57% for the need for LSI.

CONCLUSION A single numeric score has the potential to summarize overall patient status and identify prehospital trauma patients who need an LSI. Prehospital monitoring combined with algorithms that include trends over time could improve prehospital care for both civilian and military trauma.

2) **INHOSPITAL** The previous study demonstrated basic proof of principle of a numeric score derived from MWVSM vital signs for battlefield triage. However, there were unanswered questions related to sensor reliability and uncontrolled conditions in the prehospital environment. For example, there was variation in sensor placement between the forehead and thenar, the time of monitoring ranged from a few minutes to almost an hour, patient acuity varied from essentially no injury to near death, and conventional monitoring was intermittent for comparison. This study was conducted in a "more controlled" ICU environment to determine whether MWVSM sensors accurately track vital signs and allow for appropriate triage compared to a gold standard bedside monitor in trauma patients.

METHODS A prospective study was conducted in 59 trauma intensive care unit patients. Systolic blood pressure (SBP), temperature, heart rate (HR), skin temperature, and pulse oximetry (SpO₂) were displayed on a bedside monitor for 60 min. Shock index (SI) was calculated. A separate MWVSM monitor was attached to the forehead and finger of each patient. Data from each included pulse wave transit time (PWTT), temperature, HR, SpO₂, and a summary status termed "Murphy Factor" (MF), which ranges from 0-5. Patients are classified as "routine" if MF = 0-1 or SI = 0-0.7, "priority" if MF = 2-3 or SI = 0.7-0.9, and "critical" if MF = 4-5 or SI ≥ 0.9 .

RESULTS Forehead and finger MWVSM HRs both differed from the monitor (both $p < 0.001$), but the differences were no more than a few beats per min and were clinically insignificant. Differences in MWVSM SpO₂ (1-7%) and temperature (6-13°F) from the monitor were site specific (all $p < 0.001$). Forehead PWTT (271 ± 50 msec) was less ($p < 0.001$) than finger PWTT (315 ± 42 msec); both were dissociated from SBP ($r^2 < 0.05$). The SI distributed patients about equally as "routine," "priority," and "critical," whereas MF overtriaged to "routine" and undertriaged to "critical" for both sensors (all $p < 0.001$).

CONCLUSION MF does not accurately triage critically ill trauma patients, likely because erroneous PWTT values confound MF calculations. MF and the MWVSM are promising, but require fine-tuning prior to deployment.

D. ALTERNATIVE METHODS FOR TRIAGING TRAUMA PATIENTS

1) Heart rate variability In 216 hemodynamically stable adults undergoing computed axial tomography (CT) scan to rule out traumatic brain injury (TBI), we showed that heart rate variability predicted survival, severity of TBI, intensive care unit LOS, and hospital LOS. Beta-blockers or diabetes had no effect, whereas age, sedation, mechanical ventilation, spinal cord injury, and intoxication influenced one or more of the variables with age being the most powerful confounder. Except for the Glasgow Coma Scale, no other routine trauma or hemodynamic criteria correlated with any of these outcomes.

2) Hematocrit In a series of 4 studies in >2000 adult and pediatric patients during ongoing fluid resuscitation, we showed that change in hematocrit was a more powerful predictor of bleeding than blood pressure, heart rate, or base deficit alone or in combination.

3) Near Infrared (NIRS) monitoring of tissue oxygen saturation (StO₂) . This prospective study consisted of 30 subjects: 20 trauma patients with extremity injury and 10 healthy volunteers. StO₂ reliably identified any vascular injury (P < 0.001), whereas pulse examination alone or in combination with Doppler exam could detect only arterial injury. A change in StO₂ of 6 had the greatest sensitivity and specificity (P < 0.001). These data show that continuous monitoring of bilateral limbs with NIRS detects changes in perfusion resulting from arterial or venous injury and may offer advantages over serial manual measurements of pulses or Doppler signals. This technique may be most relevant in military and disaster scenarios or during transport, in which the ability to monitor limb perfusion is difficult or experienced clinical judgment is unavailable.

4) Pre hospital interventions based on routine vital sign monitoring reduce mortality This study established the rationale for developing a MWVSM for use in pre hospital trauma triage. In two studies in >4000 pediatric and adult trauma patients, we show that pre-hospital interventions with any signs of life increased survival to the hospital.

5) Bispectral Index (BIS) in 94 mechanically ventilated trauma patients, we compared BIS, Richmond Agitation Sedation Scale (RASS), electromyography, and heart rate variability, as a test of autonomic function, were measured for 45 minutes during daily spontaneous awakening trials in the ICUs. In the first trial in trauma patients and largest trial in any surgical population, the BIS was reliable and has advantages over RASS of being continuous and objective, but interpretation remains somewhat subjective in patients receiving paralytic agents or with traumatic brain injury.

E. PEER REVIEWED PUBLICATIONS DIRECTLY RELATED TO APPROVED SOW DURING REPORT PERIOD

- 1) Ryan ML, Thorson CM, Otero CA, Vu T, Proctor KG: Clinical Applications of Heart rate variability in the triage and assessment of traumatically injured patients. **Anesthesiology Res Pract** 2011;2011:416590. Epub 2011 Feb 10.
- 2) Meizoso JP, Ray JJ, Karcutskie CA, Allen CJ, Namias N, Schulman CI, Proctor KG: Is trauma-evoked hyperglycemia influenced by blunt or penetrating mechanism of injury? Submitted 30 Nov 2015 to **J Am Coll Surg**
- 3) Meizoso JP, Allen CJ, Ray JJ, Van Haren RM, Teisch LF, Ruiz-Baez X, Livingstone AS, Namias N, Schulman CI, Proctor KG: Evaluation of wireless vital signs in a trauma intensive care unit. **Military Med** in press
- 4) Meizoso JP, Valle EJ, Allen CJ, Ray JJ, Jouria JM, Teisch LF, Shatz DV, Namias N, Schulman CI, Proctor KG: Decreased mortality after prehospital interventions in severely injured trauma patients. **J Trauma Acute Care Surg** 2015 Aug;79(2):227-231
- 5) Allen CJ, Teisch LF, Meizoso JP, Tashiro J, Ray JJ, Schulman CI, Sola JE, Proctor KG: Prehospital care and transportation of pediatric trauma patients **J Surg Res** 2015 Aug;197(2):240-6.
- 6) Allen CJ, Tashiro J, Valle EJ, Thorson CM, Shariatmadar S, Schulman CI, Neville HL, Proctor KG, Sola JE: Initial hematocrit predicts the use of blood transfusion in the pediatric trauma patient. **J Ped Surg** 2014 Nov; 49(11):1678-1682
- 7) Van Haren RM, Thorson CM, Valle EJ, Busko AM, Jouria JM, Livingstone AS, Namias N, Schulman CI, Proctor KG: Novel prehospital monitor with injury acuity alarm to identify trauma patients who require life saving intervention. **J Trauma Acute Care Surgery** 2014 Mar;76(3):743-9
- 8) Van Haren RM, Ryan ML, Thorson CM, Namias N, Livingstone AS, Proctor KG: Bilateral near infrared spectroscopy for detecting traumatic vascular injury. **J Surg Res.** 2013 Sep;184(1):526-32
- 9) Thorson CM, Ryan ML, Pereira R, Olloqui J, Otero CA, Schulman CI, Livingstone AS, Proctor KG: Change in hematocrit during trauma assessment predicts bleeding even with ongoing fluid resuscitation **Amer Surgeon** 2013 Apr;79(4):398-406.
- 10) Thorson CM, Van Haren RM, Ryan ML, Pereira R, Olloqui J, Guarch GA, Barrera JM, Busko AM, Livingstone

AS, Proctor KG: Admission hematocrit and transfusion requirements after trauma. *J Am Coll Surg* 2013 Jan;216(1):65-73. Epub 2012 Nov 21.

- 11) Ryan ML, Thorson CM, Otero CA, Vu T, Schulman CI, Livingstone AS, Proctor KG. Initial Hematocrit in Trauma: A Paradigm Shift? *J Trauma Acute Care Surg*. 2012 Jan;72(1):54-9; discussion 59-60.
- 12) Ogilvie MP, Pereira BMT, Ryan ML, Gomez-Rodriguez JC, Pierre EJ, Livingstone AS, Proctor KG: Bispectral Index (BIS) to monitor propofol sedation in trauma patients: *J Trauma*. 2011 Nov 71(5):1415-21.
- 13) Ryan ML, Ogilvie MP, Pereira BMT, Gomez-Rodriguez JC, Manning RJ, Vargas P, Duncan RC Proctor KG: Heart rate variability is an independent predictor of morbidity and mortality in hemodynamically stable trauma patients. *J Trauma*. 2011 Jun 70(6):1371-79 discussion 1379-80.

F. ABSTRACTS/PRESENTATIONS DIRECTLY RELATED TO APPROVED SOW DURING REPORT PERIOD

- 1) Karcutskie CA, Meizoso JP, Ray JJ, Horkan D, Ruiz XD, Namias N, Schulman CI, Proctor KG: Mechanism of injury may influence infection risk from early blood transfusion. Submitted Dec 1, 2015 to 36th Annual Meeting Surgical Infection Society Palm Beach, FL May 2016
- 2) Meizoso JP, Ray JJ, Allen CJ, Zakrison TL, Pust GD, Ginzburg E, Pizano LR, Schulman CI, Livingstone AS, Proctor KG, Namias N: Effect of time to operation for GSW: the golden 10 min.
 - a. Presented at 74th Annual Meeting of the American Association for the Surgery of Trauma & Clinical Congress of Acute Care Surgery Las Vegas, NV Sept 2015
 - b. Presented at 2015 American College of Surgeons Florida Committee on Trauma Paper Competition Delray Beach, FL Oct 2015
- 3) Meizoso JP, Teisch LF, Ray JJ, Allen CJ, Livingstone AS, Namias N, Schulman CI, Proctor KG: Admission hyperglycemia is not just a marker of injury severity after trauma
 - a. Presented at 101st Annual American College of Surgeons, Clinical Congress Chicago, IL Oct 2015
 - b. Presented at 2015 American College of Surgeons Florida Committee on Trauma Paper Competition Delray Beach, FL Oct 2015 (* **1st place Research Award**)
 - c. Presented at 2015 American College of Surgeons Region 4 Committee on Trauma Paper Competition Atlanta, GA (* **1st place Research Award**)
- 4) Allen CJ, Meizoso JP, Ciesla D, Tepas III JJ, Kerwin A, Moore FA, Flint L, Lee L, Proctor KG, Schulman CI, Pizano LR, Livingstone AS, Namias N. Assessing Field Triage Decisions And The International Classification Injury Severity Score (ICISS) At Predicting Outcomes Of Trauma Patients. Presented at 8th Annual Copeland resident/medical student Paper Competition Florida Chapter of the American College of Surgeons, Gainesville, FL May, 2015.
- 5) Valle EJ, Allen CJ, Meizoso JP, Livingstone AS, Namias N, Schulman CI, Proctor KG: Are prehospital interventions justified in polytrauma patients? Presented at 2014 American College of Surgeons Florida Committee on Trauma Paper Competition Jacksonville, FL Oct 2014
- 6) Meizoso JP, Allen CJ, Nissan JJ, Ruiz-Baez X, Schulman CI, Namias N, Proctor KG: Further evaluation of wireless vital signs in a trauma intensive care unit.
 - a. Presented at 2014 American College of Surgeons Committee on Trauma Region 4 Competition Orlando, FL Nov 2014
 - b. Presented at 2014 American College of Surgeons Florida Committee on Trauma Paper Competition Jacksonville, FL Oct 2014 (* **1st place Research Award**)
 - c. Presented at 6th Annual Postdoctoral Fellows Research Day, University of Miami Miller School of Medicine, Miami, FL Sep 2014
- 7) Allen CJ, Meizoso JP, Tashiro J, Nissan JJ, Schulman CI, Neville HL, Sola JE, Proctor KG: Pre-Hospital Care And Transportation Times Of Pediatric Trauma Patients. Presented at 10th Annual Academic Surgical Congress, Las Vegas, NV Feb 2015

- 8) Allen CJ, Tashiro J, Meizoso JP, Nissan JJ, Schulman CI, Perez EA, Lasko D, Neville HL, Proctor KG, Sola JE: Injury Patterns Associated with Pediatric Bicycle Accidents: Experience Of A Level 1 Trauma Center. Presented at 10th Annual Academic Surgical Congress, Las Vegas, NV Feb 2015
- 9) Allen CJ, Tashiro J, Valle EJ, Thorson C, Schulman C, Neville H, Proctor KG, Sola JE. Initial hematocrit guides the use of blood transfusion in the pediatric trauma patient.
 - a. Presented at 14th Annual John M. Templeton Jr. Pediatric Trauma Symposium, Philadelphia, PA Mar 2014
 - b. Presented at 6th Annual Postdoctoral Fellows Research Day, University of Miami Miller School of Medicine, Miami, FL Sep 2014
 - c. Presented at 6th Annual Southwest Trauma and Acute Care Symposium, Scottsdale, AZ Nov 2014
- 10) Van Haren RM, Thorson CM, Valle EJ, Busko AM, Guarch GA, Jouria JA, Blackburne LH, Livingstone AS, Namias N, Proctor KG: Novel prehospital monitor with injury acuity algorithm to identify patients who require life saving intervention. Presented at 72nd Annual Meeting of the American Association for the Surgery of Trauma and Clinical Congress of Acute Care Surgery, San Francisco, CA Sep 2013
- 11) Allen CJ, Valle EJ, Jouria J, Namias N, Proctor KG. Evaluation of Wireless Vital Signs Monitor in Trauma Patients. Smart Monitoring 2013, Pathways to Automated Critical Care. Fort Lauderdale, FL Aug 2013.
- 12) Van Haren RM, Thorson CM, Valle EJ, Guarch GA, Busko AM, Namias N, Livingstone AS, Proctor KG: Prehospital triage tool to predict life saving interventions. Presented at 2012 Annual Meeting, American College of Surgeons, Florida Committee on Trauma Resident Paper Competition, Gainesville, FL Oct 2012.
- 13) Van Haren RM, Ryan ML, Thorson CM, Curia E, Busko AM, Namias N, Livingstone AS, Proctor KG: Bilateral near infrared spectroscopy: a potential tool for detecting vascular injuries.
 - a. Presented at South Florida Society for Vascular Surgery 2012 Annual Scientific Sessions, Islamorada, Florida Keys. Oct 2012
 - b. ***J Surg Res***, 2013 Feb 179(2); 199 Presented at Academic Surgical Congress New Orleans, LA Feb 2013
- 14) Van Haren RM, Thorson CM, Ryan ML, Curia E, Barrera JM, Busko AM, Guarch GA, Namias N, Proctor KG: Non-invasive monitoring technologies from the frontline to the FST and beyond:
 - a. Presented at Florida Medical Association Poster Symposium Boca Raton, FL Jul 2012
 - b. Presented at Military Health System Research Symposium MHSRS/ATACCC 2012, Fort Lauderdale, FL, Aug 2012
 - c. Presented at University of Miami Annual Postdoctoral Fellows Research Day. Miami, FL, Sep 2012.
- 15) Thorson CM, Van Haren RM, Ryan ML, Guarch GA, Curia E, Busko AM, Namias N, Livingstone AS, Proctor KG: Hematocrit during initial trauma triage: Presented at Military Health System Research Symposium MHSRS/ATACCC 2012, Fort Lauderdale, FL, Aug 2012
- 16) Thorson CM, Van Haren RM, Ryan ML, Pereira R, Olloqui J, Guarch GA, Curia E, Barrera J, Busko AM, Livingstone AS, Proctor KG. Admission Hematocrit Predicts Transfusion Requirements in Trauma Patients
 - a. Presented at 2011 American College of Surgeons Florida Committee on Trauma Resident Paper Competition, Miami, FL, Nov 2011
 - b. Presented at 5th Annual Copeland Resident Paper Competition Florida Chapter American College of Surgeons, Sarasota, FL May 2012 (****1st place research Award***)
- 17) Ryan ML, Thorson CM, Otero CA, Vu T, Schulman CI, McKenney MG, Livingstone AS, Proctor KG. Initial Hematocrit in Trauma: A Paradigm Shift? Presented at 70th AAST Annual Meeting Chicago, IL, Sept 2011 (****Resident Travel Scholarship***) <http://www.aast.org>
- 18) Ryan ML, Thorson CM, Gomez-Rodriguez JC, Otero CA, Vu T, Pereira BMT, Garcia GD, Livingstone AS, Proctor KG. Bilateral near infrared spectroscopy (NIRS): a potential tool for monitoring limb perfusion after battlefield extremity vascular injuries. Presented at ATACCC2011, Advanced Technology Applications to Combat Casualty Care, Ft Lauderdale, FL Aug, 2011.
- 19) Thorson CM, Ryan ML, Otero CA, Vu T, Manning RJ, Schulman CI, Livingstone AS, Proctor KG. Early drop in hematocrit during initial trauma resuscitation is not just dilutional.

- a. Presented at 4th Annual Copeland Resident Paper Competition 58th annual meeting Florida Chapter, American College of Surgeons, Orlando, FL, March 2011.
- b. Presented at 6th Annual Florida Medical Association Poster Symposium Orlando, FL, July 2011.
- c. Presented at ATACCC2011, Advanced Technology Applications to Combat Casualty Care, Ft Lauderdale, FL Aug, 2011

G. OTHER PEER REVIEWED PUBLICATIONS ON MILITARY MEDICINE RELEVANT TOPICS DURING REPORT PERIOD

- 1) Meizoso JP; Nissan JJ; Allen CJ; Van Haren RM; Ruiz G; Namias N; Schulman CI; Pizano LR; Proctor KG: Hypercoagulability and venous thromboembolism in burn patients. **Semin Thromb Hemost.** 2015 Feb;41(1):43-48. Epub 2015 Jan 15.
- 2) Van Haren RM, Thorson CM, Blackburne LH, Proctor KG: Prehospital Fluid Resuscitation in civilian and military populations. Chapter 7 in **Hemoglobin-based oxygen carriers as Red Cell Substitutes and Oxygen Therapeutics** by HW Kim and AG Greenburg,(eds) Springer-Verlag, Berlin/Heidelberg, Germany 2013 pp 127-138 ISBN 978-3-642-40716-1 ISBN 978-3-642-40717-8 (eBook)
- 3) Proctor KG: Invited editorial comment on "Differential Effects of Fresh Frozen Plasma and Normal Saline on Secondary Brain Damage in a Large Animal Model of Polytrauma, Hemorrhage and Traumatic Brain Injury" **J Trauma Acute Care Surg** 2013 Dec 75(6):974-975
- 4) Thorson CM, Dubose JJ, Rhee P, Knuth TE, Dorlac WC, Bailey JA, Garcia GD, Ryan ML, Van Haren RM, Proctor KG: Military trauma training at civilian centers: a decade of advancements. **J Trauma Acute Care Surg** 2012 Dec;73(6): S483-S489
- 5) Van Haren RM, Proctor KG: Invited editorial: Clinically Relevant Animal Models Needed to Advance State of the Art Fluid Resuscitation **Crit Care Med** 2012 Nov;40(11):3096-7.
- 6) Thorson CM, Namias N, Proctor KG. Letter to editor Re: Does hemopericardium after chest trauma mandate sternotomy? **J Trauma Acute Care Surg.** 2012 Jul;73(1):291-2
- 7) Ogilvie MP, Ryan ML, Proctor KG: Hestarch during initial resuscitation from trauma. **J Trauma** 2011 May;70(5):S19-21
- 8) McSwain NE, Champion HR, Fabian TC, Hoyt DB, Wade CE, Eastridge BJ, Proctor KG, Rasmussen TE, Roussel RR, Butler FK, Holcomb JB, Schreiber MA, Shackford SR, Blackburne LH. State of the Art of Fluid Resuscitation 2010: Prehospital and Immediate Transition to the Hospital **J Trauma** 2011 May; 70(5): S2-S10 Erratum **J Trauma** 2011Aug; 71(2):520
- 9) Meizoso JP, Karcutskie CA, Ray JJ, Seiden B, Horkan DB, Ruiz XD, Ginzburg E, Namias N, Schulman CI, Proctor KG: Revisiting the Greenfield Risk Assessment Profile in critically ill trauma patients Submitted 213 Dec 2015 to **J Trauma Acute Care Surg**
- 10) Meizoso JP, Subhawong TK, Allen CJ, Chelala L, Ray JJ, Karcutskie CA, Jagid JR, Bullock MR, Proctor KG: Does vasopressin exacerbate cerebral edema after traumatic brain injury? Submitted 21 Dec 2015 to **J Neurotrauma**
- 11) Meizoso JP, Ray JJ, Karcutskie CA, Allen CJ, Proctor LD, Zakrisson TL, Pust GD, Koru-Sengul T, Ginzburg E, Pizano LR, Schulman CI, Livingstone AS, Proctor KG, Namias N: Effect of time to operation on mortality for hypotensive patients with gunshot wounds Submitted 6 Dec 2015 to **J Trauma Acute Care Surg**
- 12) Allen CJ, Karcutskie CA, Zebib L, Guarch GA, Hanna MM, Meizoso JP, Ray JJ, Askari M, Thaller SR, Proctor KG: Coagulation profile changes following combined ablative and reconstructive breast surgery. **Plast Reconstr Surg** in press
- 13) Allen CJ, Straker RJ, Murray CR, Hannay WH, Hanna MM, Meizoso JP, Manning RJ, Schulman CI, Seery JM, Proctor KG: Recent advances in forward surgical team training at the United States Army Trauma Training Department. **Military Med** in press
- 14) Allen CJ, Ruiz XD, Meizoso JP, Ray JJ, Livingstone AS, Schulman CI, Namias N, Proctor KG: Is hydroxyethyl starch safe in penetrating trauma patients? **Military Med** in press
- 15) Allen CJ, Meizoso JP, Ray JJ, Teisch LF, Schulman CI, Namias N, Proctor KG: Does isolated

- hemoperitoneum cause peritonitis? A review of 400 trauma laparotomies. *Amer Surgeon* in press
- 16) Dandin O, Valle EJ, Pimentha G, Schulman CI, Teomete U, Proctor KG, Namias N. Pyogenic liver abscess after gunshot injury: 10 years' experience at a single level 1 trauma center. *Ir J Med Sci*. 2015 Sep 16. [Epub ahead of print]
 - 17) Allen CJ, Murray CR, Meizoso JP, Ray JJ, Neville HL, Schulman CI, Namias N, Sola JE, Proctor KG: Risk factors for venous thromboembolism after pediatric trauma. *J Ped Surg* 2015 Oct 23. pii: S0022-3468(15)00642-9. doi: 10.1016/j.jpedsurg.2015.10.033. [Epub ahead of print]
 - 18) Allen CJ, Murray CR, Meizoso JP, Ginzburg E, Schulman CI, Lineen EB, Namias N, Proctor KG: Surveillance and early management of deep vein thrombosis decreases rate of pulmonary embolism in high risk trauma patients. *J Am Coll Surg* 2016 Jan;222(1):65-72. doi: 10.1016/j.jamcollsurg.2015.10.014. Epub 2015 Nov 4.
 - 19) Allen CJ, Shariatmadar S, Meizoso JP, Hanna MM, Mora JL, Ray JJ, Namias N, Dudaryk R, Proctor KG. Liquid plasma use during "super" massive transfusion protocol. *J Surg Res* 2015 Dec 199(2): 622-628.
 - 20) Allen CJ, Hannay WM, Murray CR, Straker RJ, Meizoso JP, Ray JJ, Hanna MM, Teisch LF, Ruiz-Baez XD, Guarch GA, Schulman CI, Livingstone AS, Namias N, Proctor KG: Causes of death differ between elderly and adult falls. *J Trauma Acute Care Surg* 2015 Oct;79(4):617-621.
 - 21) Ray JJ, Satahoo SS, Meizoso JP, Allen CJ, Teisch LF, Proctor KG, Pizano LR, Namias N, Schulman CI: Does obesity affect outcomes in adult burn patients? *J Surg Res*. 2015 Oct;198(2):450-5.
 - 22) Allen CJ, Murray CR, Meizoso JP, Ray JJ, Ruiz XD, Hanna MM, Livingstone AS, Ginzburg E, Schulman CI, Namias N, Proctor KG: Coagulation profile changes due to thromboprophylaxis and platelets in trauma patients at high risk for venous thromboembolism. *Am Surg*. 2015 Jul;81(7):663-8.
 - 23) Allen CJ, Hsu A, Murray CR, Meizoso JP, Ray JJ, Schulman CI, Livingstone AS, Lineen EB, Ginzburg E, Namias N, Proctor KG: Risk of pulmonary embolism with repair or ligation of major venous injury following penetrating trauma *J Trauma Acute Care Surg* 2015 Mar;78(3):580-585
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 - 25) Valle EJ, Van Haren RM, Allen CJ, Jouria JM, Bullock MR, Schulman CI, Namias N, Livingstone AS, Proctor KG: Does traumatic brain injury increase the risk for venous thromboembolism in polytrauma patients? *J Trauma Acute Care Surg* 2014 Aug;77(2):243-50.
 - 26) Ryan ML, Van Haren RM, Thorson CM, Andrews DM, Perez EA, Neville HL, Sola JE, Proctor KG: Trauma-induced hypercoagulability in pediatric patients. *J Ped Surg* 2014 Aug; 49(8):1295-1299
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 - 28) Van Haren RM, Thorson CM, Valle EJ, Guarch GA, Jouria JA, Busko AM, Namias N, Livingstone AS, Proctor KG: Vasopressor use during emergency trauma surgery *Amer Surgeon* 2014 May; 80(5): 472-8
 - 29) Van Haren RM, Valle EJ, Thorson CM, Guarch GA, Jouria JM, Andrews DM, Sleeman D, Levy JU, Livingstone AS, Proctor KG: Long term coagulation changes after resection of thoracoabdominal malignancies. *J Am Coll Surg* 2014 Apr;218(4):846-54
 - 30) Van Haren RM, Valle EJ, Thorson CM, Jouria JA, Busko AM, Guarch GA, Namias N, Livingstone AS, Proctor KG: Hypercoagulability and other risk factors in trauma ICU patients with venous thromboembolism. *J Trauma Acute Care Surgery* 2014 Feb;76(2):443-9.
 - 31) Thorson CM, Van Haren RM, Ryan ML, Curia E, Sleeman D, Levi JU, Livingstone AS, Proctor KG: Pre-existing hypercoagulability in patients undergoing potentially curative cancer resection. *Surgery* 2014 Jan; 155(1):134-44.
 - 32) Van Haren RM, Thorson CM, Ogilvie MP, Valle EJ, Guarch GA, Jouria JA, Busko AM, Harris LT, Bullock MR, Jagid JR, Livingstone AS, Proctor KG: Vasopressin for cerebral perfusion pressure management in patients with severe traumatic brain injury: preliminary results of a randomized controlled trial. *J*

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- 34) Thorson CM, Van Haren RM, Otero CA, Guarch GA, Curia E, Barrera JM, Busko AM, Namias N, Bullock MR, Livingstone AS, Proctor KG: Repeat head computed tomography after minimal brain injury identifies the need for craniotomy in the absence of neurologic change. **J Trauma Acute Care Surg** 2013 Apr;74(4):967-75.
- 35) Thorson CM, Van Haren RM, Ryan ML, Curia E, Sleeman D, Levi JU, Livingstone AS, Proctor KG: Persistence of hypercoagulable state after resection of intrabdominal malignancies. **J Am Coll Surg** 2013 Apr;216(4):580-9
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- 37) Thorson CM, Ryan ML, Van Haren RM, Curia E, Barrera JM, Guarch GA, Busko AM, Namias N, Livingstone AS, Proctor KG: Venous thromboembolism after trauma: A Never event? **Crit Care Med** 2012 Nov;40(11):2967-73.
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- 39) Ryan ML, Thorson CM, King DR, Van Haren RM, Manning RJ, Andrews DM, Livingstone AS, Proctor KG: Insertion of central venous catheters induces a hypercoagulable state. **J Trauma Acute Care Surg.** 2012 Aug;73(2):385-90.
- 40) Thorson CM, Namias N, Van Haren RM, Guarch GA, Ginzburg E, Salerno TA, Schulman CI, Livingstone AS, Proctor KG: Does hemopericardium after chest trauma mandate sternotomy? **J Trauma Acute Care Surg.** 2012 Jun;72(6):1518-25
- 41) Thorson CM, Ryan ML, Otero CA, Vu T, Schulman CI, Borja MJ, Jose J, Livingstone AS, Proctor KG: Operating room or angiography suite for hemodynamically unstable pelvic fractures? **J Trauma Acute Care Surg.** 2012 Feb;72(2):364-70; discussion 371-2.
- 42) Raveh Y, Lubarsky DA, Pretto Jr. EA, Proctor KG Nicardipine reverses vasoactivity associated with University of Wisconsin solution in the peripheral circulation. **Transplant Proc.** 2011 Sep;43(7):2540-9.

H. OTHER ABSTRACTS/PRESENTATIONS ON MILITARY MEDICINE RELEVANT TOPICS DURING REPORT PERIOD

- 1) Karcutskie CA, Meizoso JP, Ray JJ, Horkan D, Ruiz XD, Schulman CI, Namias N, Proctor KG: Validation of greenfield risk assessment profile score in both blunt and penetrating trauma. Submitted Dec 4, 2015 to Annual Meeting of Association of VA Surgeons, Committee on Trauma, Virginia Beach, VA Apr 2016
- 2) Karcutskie CA, Meizoso JP, Ray JJ, Horkan D, Ruiz XD, Livingstone AS, Schulman CI, Ginzburg E, Namias N, Proctor KG: Transfusion of Packed Red Blood Cells and Fresh Frozen Plasma are Synergistic Risk Factors for Venous Thromboembolism in Trauma Patients Submitted Nov 22, 2015 to 136th Annual Meeting American Surgical Association Chicago, IL Apr 2016
- 3) Meizoso JP, Karcutskie CA, Ray JJ, Seiden B, Horkan D, Ruiz XD, Namias N, Schulman, CI, Proctor KG: Revisiting the Greenfield Risk Assessment profile in critically ill trauma patients. Accepted for presentation at 46th Annual Meeting of Western Trauma Assoc Lake Tahoe, CA Mar 2016
- 4) Karcutskie CA, Ray JJ, Meizoso JP, Bullock MR, Namias N, Schulman CI, Proctor KG Initial presentation severity and mortality of traumatic brain injury in elderly patients Presented at 2015 American College of Surgeons Florida Committee on Trauma Paper Competition Delray Beach, FL Oct 2015
- 5) Meizoso JP, Subhawong TK, Allen CJ, Chehala L, Ray JJ, Jagid JR, Bullock MR, Namias N Schulman CI, Proctor KG: Does arginine vasopressin exacerbate cerebral edema after traumatic brain injury?

Accepted for presentation at 29th Eastern Assoc for Surgery of Trauma Annual Scientific Assembly at the JW Marriott San Antonio in San Antonio, TX Jan 12-16, 2016

- 6) Allen CJ, Meizoso JP, Guarch GA, Hanna MM, Ray JJ, Askari M, Thaller SR, Proctor KG: Prospective evaluation of coagulation changes after combined ablative and reconstructive breast surgery. ***Plast Reconstr Surg*** 2015 Oct 136(4S Suppl):65 Presented at Plastic Surgery The Meeting Boston, MA Oct 2015
- 7) Van Haren RM, Valle EJ, Allen CJ, Guarch GA, Livingstone AS, Nguyen DM, Proctor KG: Prospective Evaluation of Coagulation Parameters After Resection of Thoracic Malignancies. ***J Am Coll Surg*** 2015 Oct Suppl 1; 221(4): S152 Presented at 101st Annual American College of Surgeons, Clinical Congress Chicago, IL Oct 2015
- 8) Allen CJ, Griswold AJ, Schulman CI, Meizoso JP, Ruiz XD, Sleeman D, Levi JU, Livingstone AS, Proctor KG. Global gene expression change induced by major thoracoabdominal surgery. ***J Am Coll Surg***. 2015 Oct Suppl 1; 221(4): S70 Presented at 101st Annual American College of Surgeons, Clinical Congress Chicago, IL Oct 2015
- 9) Allen CJ, Meizoso JP, Kaufman J, Teisch LF, Ruiz XD, Van Haren RM, Schulman CI, Lineen EB, Namias N, Proctor KG. Surveillance and early management of deep vein thrombosis decreases rate of pulmonary embolism in high risk trauma patients.
- 10) ***J Am Coll Surg***. 2015 Oct Suppl 1; 221(4): S167 Presented at 101st Annual American College of Surgeons Clinical Congress, Chicago, IL Oct 2015
- 11) Presented at 26th Annual Fellow, Resident Medical Student Surgical Research Forum Miami Beach, FL Apr 2015
- 12) Allen CJ, Meizoso JP, Ray JJ, Hanna MM, Manning RJ, Schulman CI, Namias N, Bullock MR, Jagid JR, Proctor KG. Craniectomy following urgent evacuation of intracranial hemorrhage improves intracranial and cerebral perfusion pressures in severe traumatic brain injured patients. Presented at 74th Annual Meeting of the American Association for the Surgery of Trauma & Clinical Congress of Acute Care Surgery Las Vegas, NV Sept 2015
- 13) Ray JJ, Sznol JA, Teisch LF, Meizoso JP, Allen CJ, Pizano LR, Namias N, Sleeman D, Proctor KG, Schulman CI, Spector SA. Is it time for a standardized evaluation of resident performance? Presented at 39th Annual Meeting of Association of VA Surgeons, Miami Beach, FL May 2015
- 14) Meizoso JP, Teisch LF, Ruiz X, Guarch GA, Hanna M, Allen CJ, Ray JJ, Schulman CI, Proctor KG, Sleeman D, Namias N: Need for percutaneous drainage after cholecystectomy is higher in patients with gallstone disease versus malignancy. Presented at 35th Annual Meeting Surgical Infection Society, Los Angeles, CA Apr 2015
- 15) Hsu A, Allen CJ, Meizoso JP, Ray JJ, Schulman CI, Proctor KG, Namias N: Bacteroides fragilis bacteremia in the Surgical Population: A 7 Year Review at a Large Tertiary Care Center. Presented at 35th Annual Meeting Surgical Infection Society, Los Angeles, CA Apr 2015
- 16) Ray JJ, Satahoo SS, Spalding PB, Julien K, Meizoso JP, Allen CJ, Bramlett HM, Proctor KG, Pizano LR, Namias N, Schulman CI: Does Therapeutic Hypothermia Attenuate the Hyper-Inflammatory Response After Burns?
 - a. Presented at 47th Annual Meeting of American Burn Assoc, Chicago, IL Apr 2015
 - b. Presented at 26th Annual Fellow, Resident Medical Student Surgical Research Forum Miami Beach, FL Apr 2015
- 17) Allen CJ, Meizoso JP, Hannay WM, Ray JJ, Schulman CI, Livingstone AS, Sola JE, Namias N, Proctor KG: Predictors of survival in pediatric trauma: A comparison of the international classification injury severity score (ICISS) to existing injury scoring tools. Presented at 15th annual John M. Templeton Jr Pediatric Trauma Symposium, Pittsburgh, PA Mar 2015
- 18) Allen CJ, Meizoso J, Nissan J, Tiesch L, Sola J, Neville H, Schulman C, Namias N, Proctor K: Venous thrombosis in pediatric trauma patients. Presented at 46th annual American Pediatric Surgical Association Fort Lauderdale, FL May 2014

- 19) Teisch LF, Nissan JJ, Satahoo SS, Allen CJ, Meizoso JP, Guarch GA, Proctor KG, Pizano LR, Namias N, Schulman CI: Fluid resuscitation and independent contributors to death during hospitalization in burn patients.
- 20) Presented at 26th Annual Fellow, Resident Medical Student Surgical Research Forum Miami Beach, FL Apr 2015
- 21) Presented at 41st annual Eastern Atlantic Student Research Forum Miami, FL Feb 2015
- 22) Presented at 12th Annual AMA Research Symposium Dallas, TX Nov 2014
- 23) Meizoso JP, Allen CJ, Nissan JJ, Thorson CM, Pizano LR, Namias N, Proctor KG, Sola JE, Schulman CI: Predictors of mortality following pediatric burns: a 20 yr review of an ABA burn center. Presented at 10th Annual Academic Surgical Congress, Las Vegas, NV Feb 2015
- 24) Nissan JJ, Satahoo SS, Allen CJ, Meizoso JP, Thorson CM, Teisch LF, Sola JE, Proctor KG, Pizano LR, Namias N, Schulman CI: Does obesity affect outcomes in adult burn patients?
 - a. Presented at 10th Annual Academic Surgical Congress, Las Vegas, NV Feb 2015
 - b. Presented at 27th Annual Southern Region Burn Conference Southern Medical Assoc Houston, TX Nov 2014
- 25) Allen CJ, Hannay WM, Murray CR, Straker RJ, Meizoso JP, Ray JJ, Hana M, Teisch LF, Ruiz-Baez XD, Guarch GD, Schulman CI, Livingstone AS, Namias N, Proctor KG: Falls in the elderly: A cause of death at a level 1 trauma center. Presented at 10th Annual Academic Surgical Congress, Las Vegas, NV Feb 2015
- 26) Allen CJ, Meizoso JP, Nissan JJ, Teisch LF, Zebib L, Moore GM, Namias N, Schulman CI, Dudaryk R, Proctor KG: Administration of Target Blood Component Ratio During Super Massive Transfusion Protocol. Presented at 10th Annual Academic Surgical Congress, Las Vegas, NV Feb 2015
- 27) Allen CJ, Straker RJ, Tashiro J, Meizoso JP, Nissan JJ, Hanna M, Schulman CI, Namias N, Proctor KG, Rey J, Sola JE: Pediatric Vascular Injury: Experience of a High Volume Level 1 Trauma Center. Presented at 10th Annual Academic Surgical Congress, Las Vegas, NV Feb 2015
- 28) Allen CJ, Meizoso JP, Ray JJ, Ruiz XD, Hanna MM, Schulman CI, Namias N, Livingstone AS, Proctor KG: Coagulation Profile Changes Due To Thromboprophylaxis And Platelets In Trauma Patients At High-Risk For Venous Thromboembolism.
 - a. Presented at 8th Annual Copeland resident/medical student Paper Competition Florida Chapter of the American College of Surgeons, Gainesville, FL May, 2015
 - b. Presented at the 26th Annual Fellow, Resident & Medical Student Surgical Research Forum South Florida Chapter, American College of Surgeons, Miami, FL, Apr 2015 (* **2nd place Research Award**)
- 29) Presented at 2015 Annual Scientific Meeting Southeastern Surgical Congress, Chattanooga, TN, Feb 2015
- 30) Presented at the 7th Annual Southwest Trauma & Acute Care Symposium, Scottsdale, AZ, Nov, 2014.
- 31) Valle EJ, Allen CJ, Van Haren RM, Jouria JM, Li H, Livingstone AS, Proctor KG: Tranexamic acid may have undesirable actions in some trauma patients. Presented at 2014 MHSRS (Military Health Science Research Symposium), Fort Lauderdale, FL, Aug 2014
- 32) Allen CJ, Valle EJ, Bullock MR, Schulman CI, Namias N, Livingstone AS, Proctor KG: Diagnosis and treatment of traumatic brain injury. Presented at 2014 MHSRS (Military Health Science Research Symposium), Fort Lauderdale, FL, Aug 2014
- 33) Allen CJ, Valle EJ, Schulman CI, Namias N, Livingstone AS, Proctor KG: Is the use of hydroxyethyl starch solutions safe in trauma patients? Presented at 2014 MHSRS (Military Health Science Research Symposium), Fort Lauderdale, FL, Aug 2014
- 34) Allen CJ, Hsu A, Valle EJ, Namias N, Livingstone AS, Lineen E, Proctor KG. Repair vs ligation of major venous injury after penetrating trauma: is there a difference in the development of pulmonary embolism? Presented at 73rd Annual Meeting of the American Association for the Surgery of Trauma and Clinical Congress of Acute Care Surgery Philadelphia, P
- 35) Allen CJ, Valle EJ, Jouria JM, Schulman CI, Namias N, Proctor KG: Does isolated hemoperitoneum cause peritonitis? A review of 400 trauma laparotomies Presented at South Florida Chapter of the American

College of Surgeon's 25th Annual Fellow, Resident & Medical Student Surgical Research Forum Paper Presentations Miami Beach, FL May 2014 (***3rd place Research Award**)

- 36) Allen CJ, Valle EJ, Schulman CI, Zakrison T, Namias N, Livingstone AS, Proctor KG: The hypercoagulability of blunt trauma. Presented at 61st annual meeting Florida Chapter, American College of Surgeons, Weston, FL May 2014
- 37) Allen CJ, Tashiro J, Valle EJ, Thorson C, Schulman C, Neville H, Proctor KG, Sola JE. Survival factors following pediatric trauma: a 13 year review of a high volume level 1 trauma center. Presented at 14th Annual John M. Templeton Jr. Pediatric Trauma Symposium, Philadelphia, PA, Mar 2014
- 38) Allen CJ, Valle EJ, Jouria JM, Namias N, Livingstone AS, Schulman CI, Proctor KG: Differences in acute kidney injury and death between blunt and penetrating trauma after resuscitation with hydroxyethyl starch
- Presented at 44th Annual Meeting, Western Trauma Association, Steamboat Springs, CO Mar 2014
 - Presented at South Florida Chapter of the American College of Surgeon's 25th Annual Fellow, Resident & Medical Student Surgical Research Forum Paper Presentations Miami Beach, FL May 2014 (*** 1st place Research Award**).
- 39) Gushka J, Parikh P, Proctor K, Namias N, Zakrison T: The equivocal FAST in penetrating thoracic trauma, beware the occult cardiac injury with left-sided hemothorax: Presented at 26th PanAmerican Trauma Congress Santiago, Chile Nov 2013; <http://www.panamtrauma.org/> (***2nd place Research Award**)
- 40) Allen CJ, Valle EJ, Jouria JM, Namias N, Livingstone AS, Schulman CI, Proctor KG: Is initial trauma resuscitation low volume starch solution associated with renal injury or mortality? Presented at 2013 Annual Meeting, American College of Surgeons, Florida Committee on Trauma Resident Paper Competition, Tampa, FL Nov 2013.
- 41) Valle EJ, Van Haren RM, Guarch GA, Jouria JM, Bullock MR, Namias N, Schulman CI, Livingstone AS, Proctor KG: Risk factors and venous thromboembolism in patients with polytrauma± traumatic brain injury. *J Surg Res* 2014 Feb 186(2); 518 Presented at 9th Annual Academic Surgical Congress San Diego, CA Feb 2014 (*** Resident Research Award and Best Trauma/Critical Care Abstract**)
- 42) Van Haren RM, Valle EJ, Thorson CM, Guarch GA, Jouria JM, Sleeman D, Levi JU, Livingstone AS, Proctor KG: Long-Term Coagulation Changes After Resection of Thoracoabdominal Malignancies. Presented at 125th Annual Meeting Southern Surgical Assoc, Homestead, VA Dec 2013
- 43) Valle EJ, Van Haren RM, Bullock MR, Guarch GA, Jouria JM, Livingstone AS, Blackbourne LH, Namias N, Proctor KG. Effects of mannitol on fluid and blood product requirement during CPP management in polytrauma patients. Presented at 60th Annual meeting of the Florida Chapter of American College of Surgeons. Orlando, FL May 2013.
- 44) Van Haren RM, Valle EJ, Thorson CM, Guarch GA, Jouria JM, Busko AM, Sleeman D, Levi JU, Livingstone AS, Proctor KG. Coagulation changes one year after resection of intra-abdominal malignancy. Presented at the 6th Annual Copeland Resident Paper Competition at the 60th Annual meeting of the Florida Chapter of American College of Surgeons. Orlando, FL May 2013 (***2nd place Research Award**).
- 45) Valle EJ, Van Haren RM, Guarch GA, Duncan RC, Schulman CI, Jouria JA, Blackbourne LH, Namias N, Livingstone AS, Proctor KG: Do all patients benefit from tranexamic acid? The experience of an urban level 1 trauma center. Presented at 72nd Annual Meeting of the American Association for the Surgery of Trauma and Clinical Congress of Acute Care Surgery, San Francisco, CA Sep, 2013
- 46) Valle EJ, Allen CJ, Jouria J, Namias N, Proctor KG. Automated Critical Care: Pressors in Trauma Care. Smart Monitoring 2013, Pathways to Automated Critical Care. Fort Lauderdale, FL Aug 2013
- 47) Van Haren RM, Valle EJ, Busko AM, Guarch GA, Jouria JA, Namias N, Livingstone AS, Proctor KG: Safety and Efficacy of Tranexamic Acid in Trauma Patients at High Risk for Venous Thromboembolism.
- J Am Coll Surg*, 2013 Sept; 217(3);S49 Presented at American College of Surgeons' 99th Clinical Congress Washington, DC Oct 2013

- b. Presented at the 6th Annual Copeland Resident Paper Competition at the 60th Annual meeting of the Florida Chapter of American College of Surgeons. Orlando, FL May 2013 (***1st place Research Award**).
- 48) Zakrison T, Parikh P, Murtha M, Schulman C, Namias N, Proctor KG: The Risk of cardiac injury after penetrating thoracic trauma: Which is the better predictor--hemodynamic status or pericardial window? Presented at Trauma Association of Canada, Whistler, BC Apr 2013
 - 49) Van Haren RM, Thorson CM, Ogilvie MP, Valle EJ, Bullock MR, Jagid JR, Livingstone AS, Proctor KG: Vasopressin for cerebral perfusion pressure management in patients with severe traumatic brain injury: preliminary results of a randomized controlled trial. Presented at 43rd Annual Western Trauma Association, Snowmass, CO Mar 2013.
 - 50) Van Haren RM, Thorson CM, Ryan ML, Curia E, Barrera JM, Guarch GA, Busko AM, Namias N, Livingstone AS, Proctor KG: Vasopressor use during emergency surgery in patients with refractory shock. Presented at 2013 Southeastern Surgical Congress Jacksonville, FL Feb 2013.
 - 51) Van Haren RM, Thorson CM, Valle EJ, Guarch GA, Busko AM, Namias N, Livingstone AS, Proctor KG: Thromboelastography and venous thromboembolism in trauma patients.
 - a. Presented at 2012 Annual Meeting, American College of Surgeons, Florida Committee on Trauma Resident Paper Competition, Gainesville, FL Oct 2012 (***1st place Research Award**)
 - b. Presented at 2012 Region IV American College of Surgeons Committee on Trauma Resident Paper Competition, Memphis TN, Nov 2012 (***2nd place Research Award**)
 - c. Presented at 42nd Critical Care Congress, Society of Critical Care Medicine, San Juan, Puerto Rico, Jan, 2013.
 - 52) Van Haren RM, Thorson CM, Curia E, Busko AM, Guarch GA, Barrera JM, Andrews DM, Pizano LR, Schulman CI, Namias N, Proctor KG: Hypercoagulability after thermal injury. Presented at 26th EAST Annual Scientific Assembly Raymond H. Alexander Competition, Scottsdale, AZ Jan 2013 (***Resident Travel Scholarship *2nd place Research Award**)
 - 53) Thorson, CM, Van Haren RM, Ryan ML, Curia E, Sleeman D, Levi JU, Livingstone AS, Proctor KG: Hypercoagulability after resection of intrabdominal malignancy. Presented at 124th Annual Meeting Southern Surgical Assoc, Palm Beach, FL Dec 2013
 - 54) Van Haren RM, Thorson CM, Ryan ML, Ogilvie MP, Bullock MR, Jagid JR, Livingstone AS, Proctor KG: Vasopressor use in trauma patients with refractory hypotension: from benchtop to bedside: Presented at Military Health System Research Symposium MHSRS/ATACCC 2012, Fort Lauderdale, FL, Aug 2012.
 - 55) Thorson CM, Van Haren RM, Ryan ML, Pizano LR, Schulman CI, Andrews DM, Namias N, Livingstone AS, Proctor KG: Trauma-induced hypercoagulability: Presented at Military Health System Research Symposium MHSRS/ATACCC 2012, Fort Lauderdale, FL, Aug 2012
 - 56) Thorson, CM, Van Haren RM, Ryan ML, Curia E, Sleeman D, Levi JU, Livingstone AS, Proctor KG: Hypercoagulability in cancer.
 - a. Presented at 5th Annual Copeland Resident Paper Competition Florida Chapter American College of Surgeons, Sarasota, FL May 2012 (***1st place research Award**)
 - b. Presented at Sylvester Cancer Center Research Poster Session, Univ of Miami Miller School of Medicine, Miami, FL May 2012
 - 57) Thorson, CM, Van Haren RM, Ryan ML, Curia E, Sleeman D, Levi JU, Livingstone AS, Proctor KG: Pre-operative hypercoagulability is associated with advanced disease in cancer patients. *J Am Coll Surg* 2012 Sept; 215(3) Supplement; S128-S129 Presented at 98th Annual Clinical Congress of the American College of Surgeons, 67th Annual Surgical Forum, Chicago, IL Oct 2012
 - 58) Thorson CM, Van Haren RM, Namias N, Otero C, Curia E, Busko A, Barrera J, Guarch GA, Bullock MR, Livingstone AS, Proctor KG: Repeat head CT after minimal brain injury predicts need for craniotomy in absence of neurologic change.
 - a. Presented at 71st Annual Meeting of the American Association for the Surgery of Trauma and

Clinical Congress of Acute Care Surgery Kauai, Hawaii Sep 2012 (***Resident Travel Scholarship**)

<http://www.aast.org>

- b. Presented at 2011 American College of Surgeons Florida Committee on Trauma Resident Paper Competition, Miami, FL, Nov 2011 (***1st place Research Award**)
 - c. Presented at American College of Surgeons Region IV Committee on Trauma Resident Paper Competition, Kiawah Island SC, Nov 2011
- 59) Van Haren RM, Thorson CM, Curia E, Busko AM, Andrews DM, Pizano LR, Schulman CI, Namias N, Proctor KG: Burn-induced hypercoagulability.
- a. Presented at 5th Annual Copeland Resident Paper Competition Florida Chapter of American College of Surgeons, Sarasota, FL May 2012 (***2nd place research Award**)
 - b. Presented at 23rd Annual Fellow, Resident, and Medical Student Surgical Research Forum, South Florida Chapter of the American College of Surgeons, Miami, FL Apr 2012 (***2nd place Research Award**)
- 60) Thorson CM, Ryan ML, Van Haren RM, Curia E, Barrera JM, Guarch G, Busko AM, Namias N, Livingstone AS, Proctor KG. Risk assessment profile to screen for venous thromboembolism in trauma patients.
- a. Presented at 23rd Annual Fellow, Resident, and Medical Student Surgical Research Forum, South Florida Chapter of the American College of Surgeons, Miami, FL Apr 2012 (***3rd place Research Award**)
 - b. Presented at 41st Critical Care Congress, Society of Critical Care Medicine, Houston, TX, Feb 2012 Crit Care Med 2011 Dec 39:12 (Suppl) A106 (***Burns/Trauma Specialty Award**)
- 61) Van Haren RM, Thorson CM, Curia E, Schulman CI, Namias N, Livingstone AS, Proctor KG. Mortality is not a reliable quality metric in trauma. Presented at 42nd Annual Meeting of Western Trauma Assoc, Vail, CO Mar 2012 www.westerntrauma.org/documents/meeting/2012/WTAProgramBook2012.pdf
- 62) Ryan ML, Thorson CM, King DR, Otero CA, Vu T, Manning RJ, Livingstone AS, Proctor KG. Insertion of Central Venous Catheters Induces a Hypercoagulable State. Presented at 25th Annual Meeting of the Eastern Assoc. for the Surgery of Trauma, Lake Buena Vista, FL Jan 2012; http://www.east.org/content/documents/2012_oral_abstracts.pdf
- 63) Raveh Y, Pena AM, Proctor KG: Temperature Independence Of University Of Wisconsin Solution-Induced Vasoconstriction In The Rat Visceral Circulation. Presented at American Society of Anesthesiology 2011 Annual Meeting, Chicago, IL Oct 2011;A1632 <http://www.asaabstracts.com/strands/asaabstracts/search.htm;jsessionid=E43C85DBB271C4B370B1698A7A180EA0>
- 64) Raveh Y, Proctor KG: Direct Vasoconstrictive Effect By University Of Wisconsin Solution In the Splanchnic Circulation. Presented at American Society of Anesthesiology 2011 Annual Meeting, Chicago, IL Oct 2011;A1631 <http://www.asaabstracts.com/strands/asaabstracts/search.htm;jsessionid=E43C85DBB271C4B370B1698A7A180EA0>
- 65) Raveh Y, Proctor KG: Nicardipine Reverses Vasoactivity Associated With University Of Wisconsin Solution In The Rat Peripheral Circulation. Presented at American Society of Anesthesiology 2011 Annual Meeting, Chicago, IL Oct 2011;A1219 <http://www.asaabstracts.com/strands/asaabstracts/search.htm;jsessionid=E43C85DBB271C4B370B1698A7A180EA0>
- 66) Thorson CM, Ryan ML, Otero CA, Vu T, Schulman CI, Livingstone AS, Proctor KG. Can angioembolization be safely delayed for operative interventions in patients with pelvic fractures? Presented at 70th AAST Annual Meeting Chicago, IL, Sept 2011 <http://www.aast.org>
- 67) Vu T, Otero CA, Thorson CM, Ryan ML, Schulman CI, Ginzburg E, Salerno TA, McKenney MG, Livingstone AS, Proctor KG. Does hemopericardium after chest trauma mandate sternotomy? Presented at 70th AAST Annual Meeting Chicago, IL, Sept 2011 <http://www.aast.org>

- 68) Ryan ML, Thorson CM, Otero CA, Pierre EJ, Andrews DM, Neville HL, Sola JE, Proctor KG: Coagulation changes in pediatric trauma patients. Presented at 42nd Annual Meeting of the Surgery Assoc, Palm Desert, CA May 2011
- 69) Ryan ML, Ogilvie MP, Gomez-Rodriguez JC, Pereira BMT, Pierre EJ, Livingstone AS, McKenney MG, Proctor KG: Volume Expansion with Hetastarch in Trauma Patients Requiring Emergency Surgery. Presented at 41st Annual Meeting of the Western Trauma Assoc, Big Sky, Montana Feb 2011
http://www.westerntraumaassociation.org/meetings/2011Meeting/WTA2011ProgramBook_NoMEMBERSHIP.pdf

I. SUMMARY

The MWVSM monitor manufactured by www.athenagtx.com according to SOCOM specifications cannot reliably triage trauma patients and therefore should not be deployed. Alternative methods for triaging trauma patients include, 1) heart rate variability which can reliably triage severity of brain injury in hemodynamically stable patients, 2) hematocrit which is more accurate than conventional vital signs for detecting bleeding, and 3) near infrared spectroscopy which can distinguish limb threatening vascular injury as well as, or better, than conventional physical or Doppler exams, especially in field situations.