

Emergency Medicine Research Times

The New Roaring Twenties (of Research)

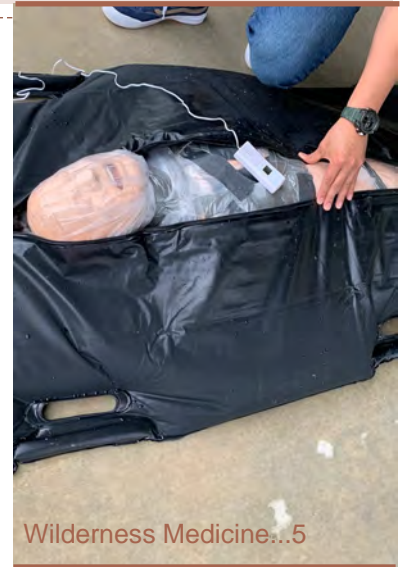
As we emerge from COVID-19 and the “snowmageddon” of 2021, we have many accomplishments to celebrate. The members of the Department of Emergency Medicine (DEM) have worked diligently to both provide uncompromising excellence in emergency care as well as in academic scholarship.

While 2020 was a challenging year overall, the DEM has reason to celebrate: over 35 articles were published since our last issue of the EM Research Times! These include full-length articles, chapters and other academic papers. This is nearly double the number published in the previous year and is further evidence of the accelerating growth of DEM research and scholarship. A quick review of the articles highlight the strength of our DEM team: over half of the articles originate with our PRN and adjunct faculty members. The

rich and diverse talents of all the faculty is evident in the many subjects covered: COVID-19, ECMO, IO access, airway, and EMD are just a few of the topics covered.

Congratulations to the authors and coauthors! While we welcome the re-opening of our classrooms, restaurants, and churches, there is still much work that remains. In the area of *scholarship*, we have our hands full! In subsequent issues, we hope for even more scholarly publications. In the meantime, if you have a citation that was missed in the Spring 2021 tally, please email Linda Pavlas (pavlasL@uthscsa.edu) so we may update the list.

- William G. Fernandez, MD, MPH
Assistant Research Director



Wilderness Medicine...5

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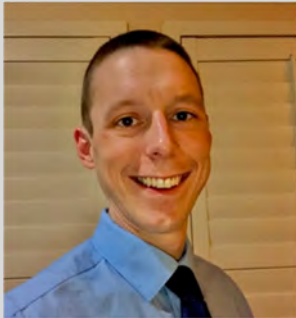


The EMPIRE Course

(Emergency Medicine Principal Investigator's Research Education)

The EMPIRE Program is an innovative program of learning which includes a research skills boot camp along with a series of research milestones organized according to PGY level. The course is scheduled for **Dec 13,14,17 2021 and Jan. 3, 4, 7 2022.**

COLLEAGUE SPOTLIGHT



Brit J. Long, MD, FACEP

Dr. Long is the Assistant Program Director of Research at the San Antonio Uniformed Services Health Education Consortium (SAUSHEC) and Adjunct Professor at the UTHSCA. Additionally, he is currently Core Clinical Faculty as well as Military Staff Physician in the Department of Emergency Medicine at SAUSHEC. Dr. Long's teaching and educational activities are extensive and includes lectures, workshops and podcasts. Most notably, he serves as Associate Editor-in-Chief to emDocs.net and Emergency Physicians Monthly. Dr. Long has most recently received the EMRA 25 under 45 – Awarded for Impact in Emergency Medicine 2020 and the Lt. General PK Carlton Award.

Joseph K. Maddry, MD, FACEP, FACMT

Lt. Col Joseph Maddry presently serves as the Deputy Commander of the US Army Institute of Surgical Research. Concurrently, Dr. Maddry is Board-Certified Core Faculty Emergency Medicine Physician, the Director of Medical Toxicology at Brooke Army Medical Center, the Director of the Clinical Resuscitation, Emergency Sciences, Toxicology, and Triage (CREST) Research Program and is the Director of the Clinician Scientist Investigator Opportunity Network (CSION). He is an Associate Professor of Emergency Medicine with the Uniformed Services University of the Health Sciences and Associate Professor/Clinical at the UTHSCSA.



Steven G Schauer, DO, MSCR, RDMS MAJ USA MC

Major Schauer is the Clinical Research Fellowship Program Director at the San Antonio Uniformed Services Health Education Consortium (SAUSHEC). He also serves as the Capability Area Manager at the US Army Institute of Surgical Research Emergency Medicine as well as core faculty in the Department of Emergency Medicine, Brooke Army Medical Center (BAMC). In addition to his other duties, Dr. Schauer is Associate Professor Department of Military and Emergency Medicine Uniformed Services University of the Health Sciences and Associate Professor/Clinical at UTHSCSA.

R. Lyle Hood, Ph.D.

Dr. Hood is the Assistant Professor in the Department of Mechanical Engineering at the University of Texas at San Antonio. He is also Adjunct Professor in the Department of Electrical and Computer Engineering at UTSA and Adjunct Assistant Professor at UTHSCSA. Dr. Hood is a founding member of BEXAS Biomedical, LLC which led the design and development of an innovative drug delivery port for intrathecal chronic pain management. As a member of Scientific Advisory Board of Galaxy CCRO, Inc., Dr. Hood aided in networking and recruiting medical doctors for prospective clinical trials and advised on technical development planning.



RESEARCH SUPPORT TEAM

New Members



Linda Pavlas

Linda Pavlas is an administrative assistant-associate with the team. Born in St. Croix, USVI and raised in Antigua, W.I., Linda comes to San Antonio from UTHealth-Houston. She earned her BFA at the University of Houston and has been with UT Health Science for over 16 years. Linda enjoys foreign films, architecture, learning languages, experiencing different cultures, food and music. She hopes to continue collecting passport stamps as soon as the travel restrictions are completely lifted.



Juan Laporta

Juan is responsible for patient recruitment in numerous studies and a member of the Diversity, Equity, and Inclusion (DEI) Committee. He was born in Argentina and lived in South Florida before moving to San Antonio. Juan attended the University of Florida, majoring in Applied Physiology and later received a Graduate Certificate in Medical Physiology from the University of Florida College of Medicine. He enjoys cooking, camping, vehicle restoration and biking.

Juan hopes to continue to apply his skills and research experience in medical school.



Alex Hood

Alex is responsible for patient recruitment, obtaining informed consent at both University Hospital and BAMC EDs and Trauma clinics. He performs all study-related tasks, including monitoring and recording patient outcomes, ensuring ongoing IRB compliance, managing subject data and patient specimen processing. Alex received his BA in Psychology and Liberal Arts Honors with high honors from the University of Texas at Austin. Alex creates artworks (predominantly

landscapes) in oils and in digital media, is a singer/songwriter and is an avid outdoorsman, hiker and biker.



Patricia Sanchez

An administrative professional with over 20+ years in the healthcare industry, Patricia is grateful to be back at the UTHSCSA. She worked previously as a contractor in November 2019-February 2020, supporting the DEM and enjoyed working with the team. Patricia's hobbies are crocheting, sewing and watching movies at home. She has three children, four grandchildren, a puppy and she

enjoys spending time with all of them.

RESEARCH TEAM

Robert De Lorenzo, MD
Vice Chair, Research

William Fernandez, MD
Asst. Research Director
Newsletter Editor-in-Chief

Linda Pavlas
Admin. Asst. Assoc.
Publisher

Patricia Sanchez
Admin. Asst. Assoc.

Research Area Specialists

Genny Krackau
Elizabeth Costilla
Juan Laporta
Alex Hood

GOT RESEARCH IDEAS?

Let us help you take those grant ideas and put them into motion. We are here to assist with everything from technical assistance, protocol development, navigating the IRB, and assisting with subject enrollment.

IRB ISSUES:

A Closer Look at Exempt Research

The OCR Research Concierge offers support and institutional guidance on scope of practice, IRB rules and regulations, OCR policies, institutional procedures and requirements and much more. Representation from the Clinical Trials Office, Office of Clinical Research, Office of Sponsored Programs, Office of Commercialization and Technology, and IRB will be present.

Research Administration
Bldg., Room 2.302

Phone: 210-567-8555

What is Exempt Human Subjects Research? For starters, *human subject* refers to “a living individual that an investigator is interacting with to conduct research”, and *research* is defined as a “systematic investigation designed to develop or contribute to generalizable knowledge”. Putting it all together, *exempt human subjects research* is defined as “research that meets the regulatory definition of human subjects research and qualifies for exemption”. However, this doesn’t mean that you can just decide that your project is *exempt* and avoid submitting anything to the IRB altogether. Your project still requires an IRB review. However, as long as the project represents no more than *minimal risk* (i.e., “the probability and magnitude of harm that is normally encountered in daily life, or in the routine examination of healthy persons”) and fits one of the exempt review categories as defined by federal regulation 45 CFR 46, it may be deemed exempt. The categories of potentially exempt research in-

clude: education research; public observations, surveys, interviews, or educational tests; benign behavioral interventions; analysis of previously collected data from identifiable individuals; federal studies on public benefit or service programs; or taste and food evaluation studies. Exempted research cannot include projects that study the safety or effectiveness of a drug or medical device, or involve children or prisoners. The IRB forms required for Exempt Research include: 1) Institutional Research Application for Non-Clinical Trials; 2) Form M (Personnel form); 3) Form B-3 (Exempt Research Request Form); and 4) Form A (Signature Assurance Sheet). The exempt application forms can be found on this link. <https://www.uthscsa.edu/vpr/services/approval/human-exempt-research>. You may submit the application forms directly to IRBMail@UTHSCSA.EDU.

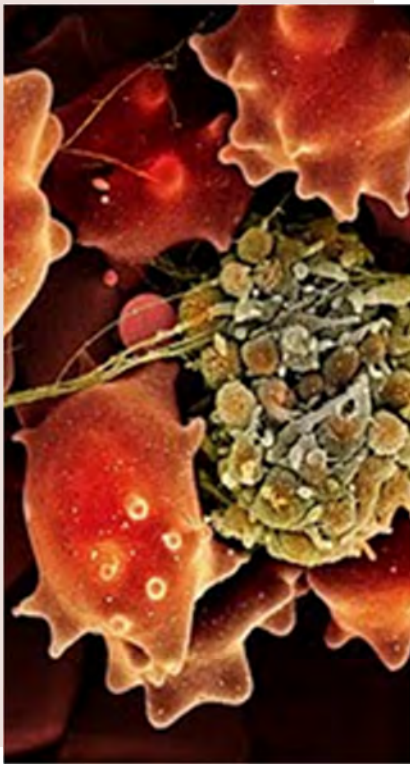
--William G. Fernandez, MD, MPH

EMS UPDATE

AntiSEPTIC (Alamo area SEPs Treatment Improvement Collaborative) is a quality improvement initiative aimed at improving the recognition and treatment of septic patients in the prehospital setting. Early identification is challenging as with any septic patient, especially when you lack education and diagnostic tools. To improve this, we obtained a grant from the San Antonio Medical Foundation (SAMF) that would support the teaching, data collection, publication, and collaboration to improve the early identification of sepsis and initial prehospital treatment of sepsis. Currently, there are several projects in the works, including prehospital education, emergency department education, deployment of prehospital antibiotics, development of a system of data sharing, and prevention campaigns. This

project has been a hurdle but appears to be improving recognition and is gaining buy-in from multiple stakeholders as we move forward. If you like to help improve the data collection process, please let one of the EMS faculty or Fellows know. We will be presenting the project at the upcoming STRAC Conference (29-30 June, 2021), which we encourage all to attend.

—Bryan Everitt, MD, NRP



WILDERNESS MEDICINE

Medical Care Outside of Traditional Clinical Setting

The Wilderness Medicine section at the DEM strives to empower those who are called to render medical care outside of traditional clinical settings and in challenging environments with the knowledge and tools needed to provide the highest level of patient care possible, while continuing to optimize safety. Research is fundamental to this mission, and we are working to add to the growing body of evidence specific to wilderness medicine, as well as create treatment solutions that are simple, low-cost, easily transported, and durable.

For the past 18 months, we have focused on building an infrastructure for the section, creating purposeful projects that have impact, are enjoyable, and are inherently self-sustaining. Now, settling in to a new phase for the section, we are seeing our research endeavors grow. Here are a few of the current projects:

Hot and cold

Improvised IV Fluid Warming Using MRE Chemical Heat Packs – Husby, Chechani, Everitt, Benzing and Scotty's team in Bulverde are at it again, figuring out a way to warm people up, with the simplest of methods. These days MRE's are more than just Chicken a la King and dehydrated pork patties.

An optimized pre-hospital core rewarming technique developed from a cadaver model, Everitt, Moore, Bierle. The un-



derappreciated geniuses of Bryan Everitt and Scotty unite to create a medic-friendly version of core rewarming that might be just as good as what we have in the hospital.

Inhaled iloprost and its effects on digital skin temperature and circulation, Faulker, Moore, Bierle. Yes, IV iloprost is proving to be an excellent treatment for severe frostbite. The problem is, it's not FDA approved in the US. But do you know what is? Inhaled iloprost. Low-tech and field ready, we're looking to see if it's a viable option for severe frostbite treatment.

Comparison of cold-water immersion methods in the emergency department, Jalkonnen, Moore, Bierle, DeLorenzo. Did you know that your average body



bag can hold 20 gallons of water, 48 pounds of ice, AND a body, and still not spill when unzipped? Body bags are the perfect portable, pre-hospital cold-water immersion method for exertional heat stroke. We are working out the details so you don't have to when the stakes are high

Other cool stuff

Hunting Injuries in Texas: A Retrospective Observational Report, Husby and the Wilderness Medicine Student Interest Group. The thinking is that "Buck Fever" may not cause hyperthermia, but it can cause some other physiologic changes that aren't so good for your health. The investigation begins here.

Improvised Survival Water Filter Efficacy Filtering Coliform Bacteria, Husby and Rodrigues. Not everyone has access to a fancy pump filter or portable UV light. These guys are figuring out other ways to produce clean drinking water

- Steven Moore, MD

Toxoplasma Encephalitis in Altered Patient with HIV

We present a case report on an HIV+ patient with an unknown CD4 count who was not currently taking highly active antiretroviral therapy (HAART) to our emergency department with altered mental status. After a workup that included blood tests, CSF, and CT imaging, a preliminary diagnosis of Toxoplasmosis was made.

With the rise of HAART, incidence of Toxoplasma encephalitis has dropped, and is not seen as often. It is important to keep this and other CNS infections in mind when encountering patients that present with altered mental status, especially in those that are immune compromised.



Figure 1: Axial cut of CT head with numerous bilateral supratentorial rounded hyperdensities (red arrows) with varying degrees of surrounding edema.

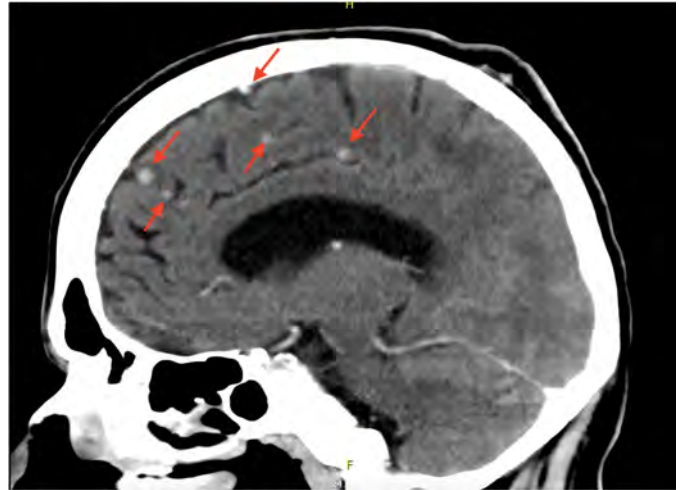


Figure 2: Sagittal cut of CT head with numerous bilateral supratentorial rounded hyperdensities (red arrows) with varying degrees of surrounding edema.

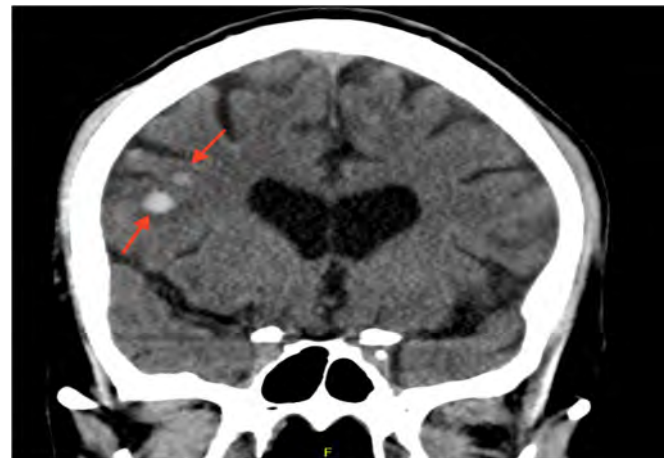


Figure 3: Coronal cut of CT head with numerous bilateral supratentorial rounded hyperdensities (red arrows) with varying degrees of surrounding edema.

tered mental status and confusion is a fairly common complaint in the emergency department and has a multitude of causes. However, the immunocompromised population has an increased risk of having an opportunistic infection as the cause of the change in mental status. Reactivation of latent toxoplasma gondii leading to toxoplasma encephalitis is more common in patients with human immunodeficiency-virus (HIV) and a CD4 counts less than 100/mcL and not on prophylactic trimethoprim-sulfamethoxazole (TMP-SMX).

--Joshua R Radparvar, MD, Karen Green, PA-C,
William G. Fernandez, MD

FACULTY ANNOUNCEMENTS



Tatiana Emanuel, DMSc., PA-C is this year's recipient of the Society of Emergency Medicine Physician Assistants (SEMPA) of the Year Award. SEMPA recognizes those who have demonstrated exceptional service and/or leadership in emergency medicine, the emergency medicine physician assistant profession and/or the

community with its annual EMPA of the Year Award.



Ryan Bierle, PA-C, DMSc, achieved the rank of Assistant Professor, Clinical. Thank you Ryan for all of your hard work and dedication to the department and especially for your work with our Wilderness Medicine team.



Bradley Goettl, DNP was appointed to a Technical Expert Panel looking at "Refining a Measure of Missed Stroke in the Emergency Department." Dr. Goettl will work with the American College of Emergency Physicians and faculty from John Hopkins University on this grant funded project. The goal is to optimize measures for the diagnostic accuracy of dizziness and stroke in

the Emergency Department. Measures will be submitted to the National Quality Form for approval. The project is funded through the National Institute of Health.

The Department of Emergency Medicine will be initiating a Critical Care Track for residents. Dr. Mark Foster and Dr. Christopher Dayton have been selected to serve as founding faculty member facilitators for this track. The track will include didactic teaching, as well as monthly case reviews and journal club sessions. Opportunities for additional mentored experiences in the ICU, as well as plans for exposure to ECMO care are anticipated. Opportunities for research collaborations with critical care



partners are currently being explored. The next Society of Critical Care Medicine annual conference will be held in Puerto Rico (February 6-9, 2022). Opportunities to present original research or case reports are available for highly motivated residents and students.



EMS/DISASTER

Everitt B, Raczek KK. Emergency Medical Dispatch: The True First Responder. EM Resident. Aug 17, 2020.

Schauer SG, Naylor JF, April MD, Tanaka K, Baldwin D, Maddry JK, Beaumont DM, Becker TE, De Lorenzo RA: Airway management in the prehospital, combat environment – Analysis of after-action reviews and lessons learned. Journal of Special Operations Medicine 2020; 20(3): 44-48.

Schauer SG, April MD, Fairley R, Uhaa N, Hudson IL, Johnson MD, Keen DE, De Lorenzo RA: A comparison of the iGel versus cricothyrotomy by combat medics using a synthetic cadaver model. Journal of Special Operations Medicine 2020; 20(4): 62-66.

Berard D, Navarro JD, Bascos G, Harb A, Feng Y, De Lorenzo RA, Hood RL, Restrepo D: Novel Expandable Architected Breathing Tube for Improving Airway Securement in Emergency Care. Journal of the Mechanical Behavior of Biomedical Materials 2021;14:104211.

SENIOR SCHOLAR PRESENTATIONS

3rd Year Residents' Scholarly Projects Presentations



SOPHIA AHMED, MD

Pilot Study to Assess Urban, Fire-based Paramedic Accuracy in Identification of Anatomic Landmarks Necessary for Cricothyrotomy and Needle Decompression Using Live Patient Models



MELODIE BLACKMON, DO

Lost to Follow Up: Complications of an Invasive Giant Prolactinoma



J. MCCURDY CARDWELL, MD

Surgical Airway Education Research and ED Syncope Pathway Quality Improvement



ARTHUR DAIGH, MD

NMS and Dantrolene



OWAIS DURRANI, DO

Interfacility Transfers: Pearls & Pitfalls for the Emergency Physician



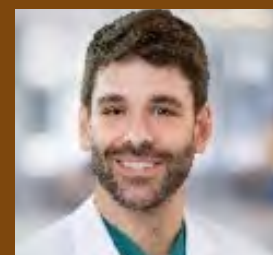
BLAKE GILLILAND, MD

Comparison of Body Bag and Polar Life-Pod Cold-Water Immersion Methods in the Treatment of Heat Stroke



JALKENNEN JOSEPH, MD

Comparison of Body Bag and Polar Life-Pod Cold-Water Immersion Methods in the Treatment of Heat Stroke



SAMUEL NESEMANN, MD

Eight-point Lung Ultrasound as a Risk Stratification Tool in Covid-19 Patients



ADRIANA POVLOW, MD

Surgical Airway Models for Low Resource Settings



MARSHALL SHEIDE, DO

Seizures



ALEXANDER SMITH, MD

CT Yield in Breakthrough Seizures



JESSICA WILSON, MD

Extremity Trauma and the Utility of Bedside Peripheral Nerve Blocks

Toxicology Corner:

Fatal Crotaline Envenomation Resulting in Coagulopathy, Renal Failure, ARDS, and Cardiovascular Collapse Resistant to Fab and F(ab')₂ Antivenom

HT Gao, AE Lock, SM Varney, CE Crane, LD Rippee, MT Muir, LF Liao

Background: Fatal North American Crotaline envenomations are rare and 2-12 fatalities occur annually in North America due to pit viper envenomation¹ and are usually attributed to intravascular envenomation and anaphylaxis². We describe a case of envenomation resulting in cardiovascular collapse and coagulopathy refractory to Fab antivenom (FabAV) and F(ab')₂ antivenom (F(ab')₂AV).

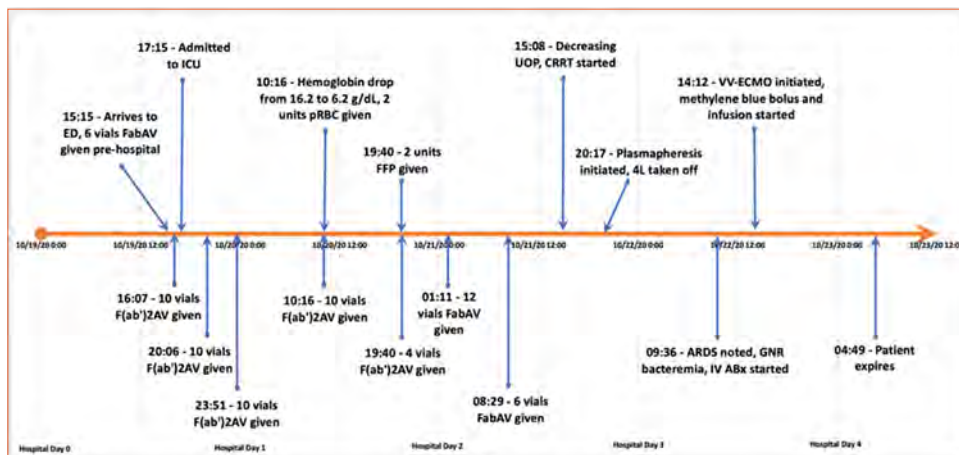
Case Report: A 67-yr-old male with hypertension and hyperlipidemia presented to the emergency department with leg pain, edema, confusion, hypotension, and tachycardia 45 minutes after rattlesnake envenomation to the right calf. Family denied prior exposure to Crotalids. He was intubated, given epinephrine, methylprednisolone, and six vials of Crotaline Fab antivenom (FabAV) without response and transported to our institution. On arrival he received antihistamines, dexamethasone, norepinephrine, 10 vials of F(ab')₂AV, and over the next hospital day (HD), 34 more vials of F(ab')₂AV. Initial laboratory results were platelets 285,000/mL, fibrinogen 113 mg/dL, INR 1.8, hemoglobin 16.2 g/dL, creatinine 1.42 mg/dL, and lactate 4.3 mmol/L. After the initial resuscitation and first 10 vials of F(ab')₂AV, he briefly trended towards recovery with fibrinogen 211 mg/dL, INR 1.3, creatinine 1.06 mg/dL, and lactate 2.2 mmol/L, though platelets decreased to 210,000/mL.

However, by the end of HD1, it was clear initial control was not yet achieved. Repeat testing showed platelets 73,000/mL, fibrinogen 141 mg/dL, INR 2.0, and hemoglobin 6.2 g/dL requiring blood transfusion. With the acute blood loss, worsening liver failure, and coagulopathy, 18 vials of FabAV were administered with no response and multiple blood products including whole blood were administered without meaningful recovery. Finally, a round of plasmapheresis with 4L of replacement plasma was attempted to halt progression without success. Localized swelling progressed to the abdomen, renal failure developed requiring dialysis,

VV-ECMO was initiated due to ARDS, and plasmapheresis was attempted. Despite this, he developed worsening hyperkalemia and acidosis refractory to CRRT, and he began to show signs of abdominal compartment syndrome. Family declined decompressive laparotomy and elected for comfort measures. Patient expired on HD4 and the family declines autopsy.

Discussion: Cases of fatal crotalid envenomations are uncommon and rarely reported in the medical literature. Despite maximum resuscitative efforts and the administration of antivenom pre-hospital at an outside facility one-hour post-envenomation, the patient expired due to cardiovascular collapse and multisystem organ failure. Neither the FabAV nor F(ab')₂AV were able to achieve initial control of this patient's local tissue swelling or his coagulopathy, even with large doses. Anaphylaxis from the venom appears unlikely in this patient due to lack of prior exposure and lack of response to treatment for anaphylaxis and/or anaphylactoid reactions. Prior reports of rapid deterioration following Crotalid envenomation are thought to be due to direct intravascular injection². It is unclear if that is the etiology of this patient's fatal outcome without autopsy.

Conclusion: Crotaline envenomation resulting in cardiovascular collapse led to refractory coagulopathy and multisystem organ failure despite treatment for anaphylaxis and 24 vials of FabAV and 44 vials of F(ab')₂AV.



ULTRASOUND:

Does non-invasive positive pressure ventilation affect the Caval Index, a commonly used measure of clinical volume status?

Investigators at the Center for Clinical Ultrasound Education at the UT Health San Antonio sought to determine the impact of non-invasive positive pressure ventilation (NIPPV) on measurements of the caval index (CI), a marker of clinical volume status, using bedside ultrasound. In this prospective observational trial, investigators enrolled 165 healthy adult participants > 18 years of age between 2015 and 2018. Measurements of the inferior vena cava (IVC) were obtained during normal tidal respirations from the subxiphoid area in the long and short axis and from the right mid-axillary line in the long axis. Measurements were obtained in each of these locations at rest with no NIPPV and with CPAP at 5, 10, and 15 cmH₂O.

The CI was then calculated for each of the three locations at each level of pressure. The investigators found that as NIPPV pressures increased from 0 to 15cmH₂O, the CI measurements obtained at the lateral mid-axillary line did not show any statistically significant variation. There was a statistically significant difference ($p < 0.001$) when comparing measurements of the CI from the lateral mid-axillary line location to both anterior location measurements. As NIPPV pressures increased, the CI calculated from the subxiphoid area in both the anterior-short and anterior-long axis orientations initially

trended upwards at 5 cmH₂O, then began to downtrend as the pressures increased to 10 and 15 cmH₂O. Comparing the CI measurements from the anterior-long and anterior-short axis at 0, 5, 10 and 15 cmH₂O there was no statistically significant difference at any pressure ($p > 0.05$). Measurements of the CI from the subxiphoid long and subxiphoid short axis IVC orientations were not statistically different at externally applied pressures of 0, 5, 10, and 15cmH₂O. Measurements of the CI from the lateral mid axillary line IVC orientation were significantly different from both anterior IVC orientations at externally applied pressures of 0, 5, 10 and 15cmH₂O.

The investigators concluded that the results from this study together with prior research conducted on the IVC builds an argument that when evaluating the IVC in a spontaneously breathing patient, measurements from an anterior orientation are preferred as the lateral mid-axillary view can underestimate CI calculations. This work is currently under review for publication in a peer-reviewed journal.

--Jessica Solis-McCarthy, MD

GRANT SPOTLIGHT

SARS-CoV-2 Infection (COVID-19) and the Development of Cardiac Dysfunction

The American Heart Association awarded \$100,000 grant to Dr. Anand Prasad (Cardiology) as well as faculty co-investigators in the Department of Emergency Medicine, Drs. Mark Foster, Craig Sisson, Christopher Gelabert MD, Jessica Solis-McCarthy, and Ryan Joseph, to document the cardiac effects of COVID-19 via echocardiography.

Clinical Question: What is the incidence and degree of new onset cardiac dysfunction in patients infected with the SARS-CoV-2 Virus defined by elevation in cardiac biomarkers and ventricular systolic dysfunction on echocardiography? What are identifiable risk factors, patient characteristics or associated laboratory findings in this group compared to SARS-Cov-2 infected patients who do not develop cardiac dysfunction?

Actionable Outcomes: The goal would be to identify potential risk factors to determine the probability of individual patients developing cardiac ventricular systolic dysfunction or unstable cardiac arrhythmias including cardiac arrest or death as a result of COVID-19. This would allow clinicians to provide guidance to those vulnerable patients. In addition, this study will aid in understanding the timing and progression of disease in affected patients, as well as the extent to which biomarkers correlate with the degree of cardiac dysfunction.

--Mark Foster, MD, MS

A Journey of Improvement:

Increasing SEP-1 Bundle Compliance and Reducing Sepsis Mortality

Sepsis is the leading killer of hospitalized patients in the US. Most cases of early sepsis will first present themselves in the emergency department (ED) setting. We describe our hospital's ongoing journey to improve sepsis care by improving our compliance with the multicomponent severe sepsis and septic shock (SEP-1) bundle, a key Center for Medicare/Medicaid Services (CMS) quality metric. Learning what the data was telling us was critical to understanding where we stood and where we needed to go. Thus, "You can't improve what you don't measure" was our key mantra. To improve our SEP-1 bundle compliance we used several Quality Improvement tools.

First, we created a process map to outline the process. Next, we created an Ishikawa (i.e., fishbone) diagram to identify barriers that led up to SEP-1 fallouts. We then identified the most important causes that resulted in SEP-1 fallouts (Pareto Chart). Additionally, we created a driver diagram to link the drivers of failure with specific interventions. We were able to track our weekly, monthly, and annual SEP-1 compliance, as well as met regular to adjudicate recent SEP-1 fallouts. We provided regular audit-and-feedback to nursing/medical providers on opportunities for improvement (OFIs). Additionally, we compiled regular monthly and annual trend reports.

"You can't improve what you don't measure"

Our implementation strategy centered on four key SEP-1 bundle goals: 1) Identifying sepsis early; 2) Limit delays in initiating SEP-1 bundle; 3) Improving nursing-physician communication; 4) Limit documentation challenges. Our interventions centered on: EDUCATION - Frequent multi-platform coaching on SEP-1 bundle compliance; ENGINEERING - Establishing best-practice-advisories (BPAs) and listing "Sepsis risk score" on the electronic health record; ENFORCEMENT - Regular audit & feedback to providers with SEP-1 fallouts.



In terms of our results, our year-over-year SEP-1 compliance increased >10% annually, from 15% in 2016 to 51% in 2020; preliminary 2021 results are > 60%. Our severe-sepsis/septic-shock mortality dropped from 29% in 2017 to 19.5% in 2019. Non-COVID severe-sepsis/septic-shock mortality in 2020 was 22%. Frequent multidisciplinary communication/collaboration & senior leadership support were keys to successful sustainment. The three E's (Education, Engineering, Enforcement) were critical to our change efforts. Additionally, hosting regular multidisciplinary meetings, and enabling active engagement throughout the hospital, along with strong senior leadership, helped to move the needle on our SEP-1 bundle compliance. Once we learned the rules of how the SEP-1 game was played, our team could focus on winning nearly every day of the week. This quality improvement project will be presented at the National Association for Healthcare Quality **NAHQ NEXT** Virtual Conference September 13-15, 2021.

--William G. Fernandez, MD, MPH

SCHOLARLY ACTIVITIES

Ahmed S, Parker BK, Ahmed Y. Man with Missing Tongue. *J Am Coll Emerg Physicians Open*. 2020; 1(5): 1136–1137.

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Povlow A, Auerbach AJ. Acute Cerebellar Ataxia in COVID-19 Infection: A Case Report. *J Emerg Med*. 2021; 60(1):73-76.

Auerbach, A.J. Micturition Syncope: A Personal Experience With a Novel Explanation. *Annals of Emergency Medicine Correspondence* | Volume 75, ISSUE 2, P312-313, February 01, 2020.

Bierle, R. (2020). *Intraosseous Access*. In: Campo, T. and Lafferty, K. (Eds.), *Essential Procedures for Emergency, Urgent, and Primary Care Settings: A Clinical Companion* (3rd ed). New York: Springer.

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Blackmon MM, Nguyen H, Mukherji P. Acute Mastitis. 2021 Feb 2. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2021 Jan–. PMID: 32491714.

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Research Article Submissions

If you would like your paper/presentation highlighted in the next edition of the **Emergency Medicine Research Times**,

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RESEARCH HIGHLIGHTS

- **EVERITT—SAMP Prehospital Sepsis Grant**
- **EVERITT—Medcognition (pending sponsor)**
- **Riviello –Abbott COVID Swab Study**
- **Emanuel—SIDM DxQI Seed Grant**
- **De Lorenzo—POWDER is on!**
- **Fernandez—Ketamine SI Proposal**
- **De Lorenzo—Galaxy CCRO Stroke Proposal**