

The University of North Carolina at Chapel Hill
Department of Anesthesiology
Annual Research Report
2019-2020



SCHOOL OF MEDICINE
Anesthesiology

Dear Reader:

Welcome to our 2019-2020 UNC Department of Anesthesiology Annual Research Report. I hope that this summary gives you a better understanding of the exciting research work being done in the department. Our goal is to serve our patients through discovery, and we have had a very productive year.

The research success summarized in this report is achieved by three main factors. First, we are fortunate to have gathered together an incredible group of faculty and staff in the department. Second, these individuals excel at working together in collaborative, multidisciplinary teams. Research is truly a team sport. The effective collaboration of individuals in each of the projects described in this report accounts for our success, and we are fortunate that our numbers continue to grow. Finally, we have a Chair who fully embraces the mission of the university to reduce suffering and improve outcomes through advances, which lead to improved patient health. Dr. Zvara has provided the infrastructure and leadership necessary for transformative research, even during very challenging economic times.

I encourage you to check back often and keep up with our department research activities via <http://www.med.unc.edu/anesthesiology/research>. Also, if you have any questions regarding our research or work, don't hesitate to email me any time at Samuel_McLean@med.unc.edu.

Sincerely,

A handwritten signature in dark ink, appearing to read 'Sam McLean', with a stylized, flowing script.

Samuel McLean, MD, MPH
Vice Chair, Research, Department of Anesthesiology
The University of North Carolina at Chapel Hill
Chapel Hill, NC

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Areas of Departmental Research Focus

1. Institute for Trauma Recovery

On behalf of the Anesthesiology Department, welcome to our Research Division. Our research portfolio in the department includes a thematic, NIH-funded research program focused on improving pain outcomes and recovery after stress and trauma (UNC Institute for Trauma Recovery). The goal of the UNC Institute for Trauma Recovery is to advance understanding of the processes mediating recovery after trauma, and to develop interventions that promote rapid recovery and prevent chronic symptom development. Our primary strategy for the research program is to develop and recruit outstanding faculty, and outstanding research team members who are passionate about improving the care of individuals who have experienced trauma. Our success is entirely due to the efforts of our phenomenal alumni, and current team. We continuously work to create a scientific community where research scientists have the intellectual space to develop and actualize their individual leadership potential within areas of interest, while also enriching the quality of their science by collaborating with a phenomenal team of faculty and staff. Our scholarly culture is driven by our devotion to the recovery of individuals experiencing trauma.



The Institute of Trauma Recovery Research Group, Fall 2018

A. AURORA: Longitudinal Assessment of Post-traumatic Syndromes (U01MH110925, PI McLean)



The AURORA study represents a major national initiative to improve the understanding, prevention, and recovery of individuals who have experienced a traumatic event. This is the largest-ever study of trauma recovery involving 30+ emergency departments nation-wide, more than 30 million dollars in federal and private funding, and involving partnerships with leading tech companies such as Google. Five thousand participants who present to the emergency department for evaluation after trauma exposure, meet screening and eligibility criteria, and consent to the study will undergo a brief

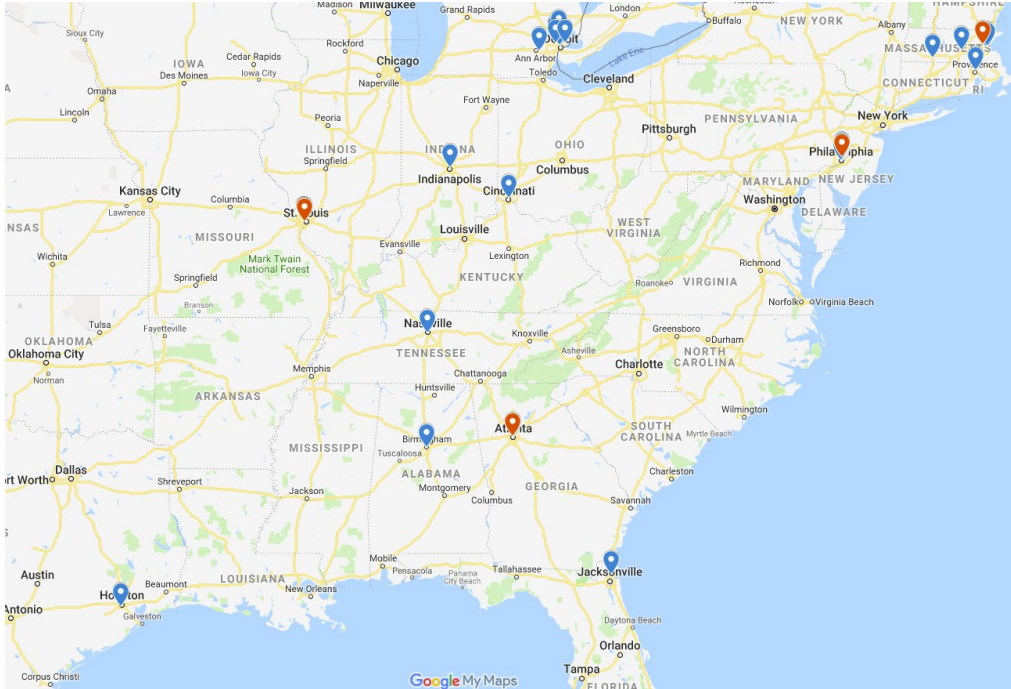
emergency department assessment of trauma-related, psychosocial, neurocognitive, and biological factors. Participants will be discharged with ecological monitoring, and will complete physiologic, biologic, neurocognitive, symptom, and health outcome assessments during one-year follow-up. Subsamples of study participants in Boston, Detroit, and Philadelphia will undergo in-person deep phenotyping at 2 weeks and 6 months, consisting of biologic collection, functional magnetic resonance imaging (fMRI), and psychophysical evaluation. This past year was spent launching enrollment at almost 10 emergency departments across the country, identifying and onboarding additional study sites, and creating a cohort of more than 2000 participants. You can learn more about the AURORA study at <https://www.med.unc.edu/itr/aurora-study>.

The Crisis

More than 2.5 million servicemen and women have been deployed to Afghanistan or Iraq, since September 11, 2001. Post-traumatic stress, depression, pain, and/or symptoms of traumatic brain injury are epidemic among these veterans. The disorders are also common in the millions of Americans who experience traumatic events, such as motor vehicle collision, sexual assault, and the unexpected death of a loved one.

The Response

In September 2016, the National Institutes of Health launched the AURORA Study—a 21 million dollar initiative to achieve critical discoveries for new treatments. The AURORA study will be the most comprehensive trauma study ever performed, and involves the efforts of 19 institutions, and 40 leading scientists. Led by scientists from the University of North Carolina and Harvard, this moonshot study will apply the latest tools in physiology, genomics, and neuroimaging to achieve the quantum leap in knowledge that military veterans and civilian trauma survivors so desperately need.



AURORA Sites
ED Sites: Blue, DP sites: Red

AURORA has 28 enrolling ED sites across the country, with a high concentration of those sites being within Massachusetts, Michigan and Pennsylvania. There are an additional 5 DP sites that are also located throughout the country.

AURORA Study 2019 Annual Conference

The AURORA Annual Conference was held over two days at the Joseph B Martin Conference Center at Harvard Medical School in Boston. The main aim of the conference was to brainstorm the next stages in analyses of the enormous data generated in the study and how best to share and utilize it. Over 60 stakeholders (investigators, consultants, site PIs, collaborators and interested researchers) took part. The Deep Phenotyping (DP) Conference that followed, was focused on training, standardizing procedures across sites and methods on improving data collection. Out of the 23 attendees, there were a handful of site PIs and stakeholders while the vast majority consisted of RAs. Held at McLean Hospital in Boston, the first day had a walkthrough of a typical day for a participant coming in for their 2 week or 6-month DP sessions. The training held on the second day, mainly for the RAs, had session with Steven Harte (for psychophysical assessment - pain) and Tanja Jovanovic (startle assessment). Jennifer Stevens also walked through the scanning procedures with the RAs.

This year, the unprecedented pandemic also led to cancellation/rescheduling of all in-person study meetings, including the AURORA Annual Conference which was planned for September 2020.



ED Conference

Jennifer Stevens (Emory University) sharing the Neuroimaging data pipelines and future plans on Day 2 of the conference.



ED Conference

Social Dinner on Day 1 at Porto, Boston.



DP Conference

A training session for the Pin Prick Stimulator test.



DP Conference

Social Dinner on Day 1 at the Copper Tavern, Boston

AURORA Study 2020 Annual Conference

This year, the unprecedented pandemic also led to cancellation/rescheduling of all in-person study meetings, including the AURORA Annual Conference which was planned for September 2020. As work and events moved to a remote format over the past 7 months, the AURORA study followed suit. The conference was aptly named “Virtually Anything is Possible; Outshining the Pandemic.” The conference involved four virtual sessions throughout the month of August, with over 120 stakeholders attending across sessions. The four sessions focused on big picture achievements and challenges for AURORA, as well as maintaining the network for future analysis. The sessions also provided analysis updates for several multidimensional outcomes including biomarkers, watch data, deep phenotyping, neurocognitive assessments, biologics, and smartphone data collection. The Zoom breakout room feature was utilized for collaborators across institutions to discuss special interest topics and brainstorm analyses and future grant proposals in a small group format. The new conference format went off without a hitch, and was a great way for all involved with the AURORA study to have valuable discussions about the wonderful accomplishments of the study so far. While everyone enjoyed the time together, albeit remotely, we look forward to hopefully connecting with the AURORA network in person in 2021.

2019-2020 Related Abstracts

Punches et al. At-risk Opioid Use Following a Trauma-related ED visit: Role of ED Opioid Analgesics. Accepted for Oral Presentation at Society for Academic Emergency Medicine's 2020 Annual Meeting.

Pearson et al. Insights from Patients' Experience: An Analysis of Free-text Comments from the AURORA Study. Accepted for Oral Presentation at Society for Academic Emergency Medicine's 2020 Annual Meeting.

McGrath et al. Invisible Wounds: Adverse Posttraumatic Neuropsychiatric Sequelae (APNS) Among Patients Discharged from 29 EDs. Accepted for Oral Presentation at Society for Academic Emergency Medicine's 2020 Annual Meeting.

Macchio L, et al. Multidimensional Characterization of a Large Cohort of Trauma Survivors May Improve Trauma Survivor Phenotyping. Accepted for Oral Presentation at Society of Biological Psychiatry's 2020 Annual Meeting. New York, NY, May 2020.

Taheri C, et al. Short-term mental health outcomes among individuals enrolled at the emergency department after physical assault. Accepted for Oral Presentation at Society of Biological Psychiatry's 2020 Annual Meeting. New York, NY, May 2020.

Herres J, et al. Determining patterns of post-concussive symptoms in adults presenting to the ED after MVC across age groups. Accepted for Oral Presentation at American College of Emergency Physicians 2019 Annual Meeting. Denver, CO. October 2019.

House S, et al. Smartphone and wrist-wearable based biomarkers of pain severity after emergency department discharge: preliminary results from the AURORA Study. Accepted for Oral Presentation at American College of Emergency Physicians 2019 Annual Meeting. Denver, CO. October 2019.

McLean S, et al. Improved trauma survivor phenotypes are critical for better biomarkers, prediction tools, and treatments: initial results from the AURORA study. Accepted for Oral Presentation at American College of Emergency Physicians 2019 Annual Meeting. Denver, CO. October 2019.

COVID Impact on the study

The recruitment and data collection for in-person sessions were stopped due to the pandemic in the early weeks of March 2020. Since then, more than half the sites have resumed recruitment at some capacity and are continuing to recruit participants. Remote enrollment has been approved by UNC IRB and is in the works with AURORA Executive Committee, and will be implemented soon to enable other sites (with no start date in sight as yet) to pick up on recruitment. For in-person sessions, the five Deep Phenotyping sites have resumed their research capacities to about 30%-40% and have started scheduling and seeing participants to collect biologic, neuroimaging and psychophysical data. In addition, Study staff have successfully transitioned to working remotely

B. The Women's Health Study: Influence of PTSD Symptoms on Chronic Pain Development after Sexual Assault (1R01AR064700-01A1, PI McLean)



Better Tomorrow Network

A research network dedicated to improving care and treatment of sexual assault survivors

Sexual Assault Research Network – Our Vision

The mission of the Better Tomorrow Network is to conduct high-quality research studies that yield continuously improved understanding, treatments, and services for sexual assault survivors. We conduct this work to achieve a world in which effective treatments exist so that no sexual assault survivor will experience chronic reductions in physical health, mental health, or quality of life due to sexual assault.



Women's Health Study – Celebrating the End of Enrollment

Celebrating the End of Data Collection

After five years of tireless effort by our on-the-ground Research Associates across thirteen data collection sites and our UNC-based study coordination team, the Women's Health Study successfully closed out data collection in April 2020 with follow-up rates surpassing 80% at all follow-up timepoints. This extraordinary feat demonstrates the collective passion and tenacity of the Better Tomorrow Network team.



Women's Health Study

The Department of Anesthesiology's own Nicole Short, PhD led the development and publication of the Better Tomorrow Network's first published manuscript: Protocol for the first large-scale

emergency care-based longitudinal cohort study of recovery after sexual assault: the Women's Health Study. Several more manuscripts from the study have been submitted for publication or are in development. Sexual assault is a historically under-studied area, and the research team is grateful to fill in existing gaps in the literature with data from this first-in-kind study.



Short Trauma and Anxiety Research (STAR) Lab

We were excited to welcome Dr. Nicole Short to our group this past fall! Dr. Short completed her PhD in clinical psychology at Florida State University and her clinical internship at the Medical University of South Carolina. She is now an Assistant Professor in Department, as well as an Investigator at ITR. Within the ITR-STAR Lab, Dr. Short's research focuses broadly on the etiology, prevention, and treatment of trauma and anxiety-related disorders utilizing a translational approach. Specifically, she is interested in identifying and characterizing cognitive-affective and other risk factors (e.g., anxiety sensitivity, sleep disturbance) for the development of posttraumatic stress and related symptoms (e.g., anxiety, depression, substance use disorder); better understanding how these risk factors relate to underlying biological processes; and utilizing this knowledge to develop novel preventions and treatments for these disorders, particularly by leveraging technology-based interventions. She utilizes a variety of methods to study these areas, such as ecological momentary assessment (EMA), elicitation and assessment of the human stress response, and advanced quantitative methods. Currently, under the mentorship of Dr. Samuel McLean, Dr. Short is working to better understand risk for posttraumatic stress after sexual assault in the Women's Health Study, and developing a novel cognitive-behavioral preventative intervention to reduce risk for posttraumatic stress after sexual assault.



The RISE Study is a pilot feasibility and acceptability study of a brief, cognitive behavioral smart phone-based intervention to mitigate the development of posttraumatic stress among women presenting to emergency care after sexual assault. This treatment targets anxiety sensitivity, or a fear of anxious arousal, which is a transdiagnostic risk factor that is thought to play a role not only in posttraumatic stress, but also other burdensome conditions common after sexual assault, such as anxiety, depression, pain, and insomnia. The RISE Study will take place in a select number of sites in the Better Tomorrow Network. Our goal is to optimize the intervention based on pilot feedback, and ultimately test the program in a randomized controlled trial. If successful, such an intervention could be delivered to emergency care sites

for sexual assault nationwide to mitigate the significant and under-treated distressing mental health sequelae of sexual assault.

2019-2020 Grants and Awards

2019 – UNC Junior Faculty Development Award (\$10,000)

2019-2020 Related Publications

Short NA, Lechner M, McLean BS, Tungate A, Black J, Buchanan J, Reese R, Ho J, Reed G, Platt M, Riviello R, Rossi C, Nouhan P, Phillips C, Martin SL, Liberzon I, Rauch SAM, Bollen K, Kessler RC, McLean SA. Health care utilization by women sexual assault survivors after emergency care: results of a multisite prospective study. *Depress Anxiety*. In press.

Short NA, Lechner M, Bell K, Black J, Buchanan J, Ho J, Reed G, Corzine A, Riviello R, Martin SL, Liberzon I, Rauch SAM, McLean SA. Anxiety sensitivity prospectively predicts increased acute posttraumatic stress and related symptoms after sexual assault. *J Trauma Stress*. In press.

Austin AE, **Short NA**. Sexual violence, mental health, and prescription opioid use and misuse. *Am J Prev Med*. In press.

Short NA, Allan NP, Saulnier K, Preston TJ, Joiner TE, Schmidt NB. Factor mixture modeling of the Insomnia Severity Index in psychiatric outpatients. *J Psychopathol Behav Assess*. In press.

Short NA, Morabito DM, Gilmore AK. Secondary prevention for posttraumatic stress and related symptoms among women who experienced recent sexual assault: a systematic review and meta-analysis. *Depress Anxiety*. In press.

Weiss NH, Contractor AA, Raudales AM, Greene T, **Short NA**. Extending our understanding of the association between posttraumatic stress disorder and positive emotion dysregulation: A network analysis approach. *J Anxiety Disord*. In press.

Raudales AM, Weiss NH, Schmidt NB, **Short NA**. The role of emotion dysregulation in negative affect reactivity to a trauma cue: differential associations through elicited posttraumatic stress disorder symptoms. *J Affect Disorders*. 2020;267:203-210.

Short NA, Boffa JW, Wissemann K, Schmidt NB. Insomnia symptoms predict the development of posttraumatic stress symptoms following an experimental trauma. *J Sleep Res*. 2020;29(1):e12909.

Short NA, Schmidt NB. Development and randomized clinical trial of a novel transdiagnostic treatment for insomnia and anxiety. *Behav Ther*. 2020;51(4):149-161.

2019-2020 Related Presentations

Raudales AM, Weiss NH, Contractor AA, Greene T, **Short NA**. (2020, November). Extending our understanding of the association between posttraumatic stress disorder and positive emotion dysregulation: A network analysis approach. Symposium to be presented at the 36th Annual Meeting of the International Society for Traumatic Stress Studies, Atlanta, GA.

Short NA, An X, Ji Y, D'Anza T, Lechner M, Greene S, Bell K, Black J, Buchanan J, Reese R, Ho J, Reed, Tungate A, Bollen K, Martin SL, Liberzon I, Rauch SAM, Sullivan M, McLean SA. Patient-Centered Classifications of Mental and Physical Health Symptoms after Sexual Assault: Results from a Large Prospective Study. In A. Basu & S. A. McLean (chairs), Understanding Lifetime Trauma Profiles, Multidimensional Posttraumatic Sequelae, and Treatment Implications from Large Cohort US Emergency Departments. Symposium accepted for presentation at the annual meeting of the International Society for Traumatic Stress Studies: November, 2020, Atlanta, GA.

Short NA, Tungate AS, Bollen KA, Witkemper KD, Lechner M, Bell K, Black J, Buchanan J, Reese R, Reed GD, Liberzon I, Rauch SAM, Kessler RC, McLean SA. Acute stress symptoms mediate the transition from acute to persistent pain after sexual assault. In A. Rogers & **N. A. Short** (chairs), Improving treatment outcomes for comorbid chronic pain and posttraumatic stress: Recent translational findings. Symposium accepted for presentation at the annual meeting of the Association for Behavioral and Cognitive Therapies: November, 2020, Philadelphia, PA.

Athena Study

Improving Health Outcomes for Adolescent Survivors

The Athena Study builds upon the Women's Health Study by adapting to and learning from adolescents of sexual assault (ages 13 to 17). In collaboration with Dr. Nicole Nugent at Brown University, this study aims to not only gain insight into the recovery process of adolescents, but it will uniquely examine how digital interactions, such as Facebook and texting, play a role in recovery. Survivors' parents will also enroll, giving a more complete picture of the social context in which, these survivors heal.

Our UNC-based coordination team has completed database construction and the study received IRB approval in Spring 2020.



C. Linnstaedt Lab



The main goals of the Linnstaedt Lab are to a) identify risk factors of chronic pain development following trauma exposure and b) discover potential therapeutic targets for the prevention of chronic pain following trauma. Although COVID-19 has forced many of our lab operations to go remote this year, we have still made



significant progress toward our goals. We have been testing whether inhibiting the protein encoded by *FKBP5*, FKBP51, could prevent the development of chronic pain following stress exposure. Our experiments show that FKBP51 is a valid target for pain prevention, and that timing of inhibition of this protein following traumatic stress exposure plays an important role in long-term pain modulation. For our continued work in FKBP51 inhibition, our lab was awarded the Rita Allen Award in Pain, and an R01 for our project, *FKBP51 antagonism to prevent chronic pain: optimizing efficacy & evaluating safety and mechanisms*. Work on this project has given us the opportunity to collaborate with members of the research community both within the UNC system and in other institutions around the world.



From left to right (back row): Aaron Lee, Tina Lin, Leo Pang, Jarred Lobo (front row) Britannia Wanstrath, Esther Son, Ishani Deliwala, Serenity Bennett, Yue Pan, Sarah Linnstaedt

Following up on our work with human cohorts showing a relationship between estrogen levels at the time of trauma and chronic pain development, we have also begun to test the use of feminizing and non-feminizing estrogens to mitigate post-trauma distress in rodents. We have had promising results in our pilot project using injections of 17 β -estradiol following stress exposure, and look forward to a collaboration with Dr. Martin Kelly from OHSU to test whether a non-feminizing estrogen developed in his lab prevents persistent pain.

This year our lab also worked on a number of additional projects including creating and testing whether polygenic risk scoring could be used to understand genetic and biological overlap between chronic pain and stress following trauma exposure. We also are using machine learning techniques to develop a prediction tool that could

be used to determine who is at greatest risk of chronic pain development following trauma exposure.

2019-2020 Grant awards

Rita Allen 2020 Scholar in Pain awarded to Dr. Linnstaedt to support high risk research projects in the lab. \$150,000 over three years

R01 via NINDS and the HEAL initiative for the lab's work on FKBP51. Grant title: FKBP51 antagonism to prevent chronic pain: optimizing efficacy & evaluating safety and mechanisms.

2019-2020 Related Abstracts

Wanstrath BJ, Pazhayam NM, Bauder M, Hausch F, McLean SA, **Linnstaedt SD**. Timing of FKBP51 inhibition following stress exposure influences the duration of reduction in enduring stress-induced hyperalgesia. Submitted to the 2020 Bi-Annual Meeting of the International Association for the Study of Pain, Amsterdam, Netherlands August 2020.

Son E, Tungate AS, Mauck MC, **Pan Y**, Witkemper KD, Kurz MC, Hendry PL, Pearson C, Lewandowski C, Datner E, Cairns BA, McLean SA, **Linnstaedt SD**. Peritraumatic Circulating 17 β -Estradiol As a Resiliency Factor for Chronic Pain Outcomes in Women Following Trauma. *Poster presentation* at the 2020 Society for Biological Psychiatry Meeting, New York, NY May 2020.

Lobo JJ, Tungate AS, Peak DA, Swor RA, Rathlev NK, Hendry PL, McLean SA, **Linnstaedt SD**. Examination of genetic overlap in vulnerability to posttraumatic chronic pain, stress, and depression symptoms following motor vehicle collision using polygenic risk score analyses. *Poster presentation* at the 2020 Society for Biological Psychiatry Meeting, New York, NY May 2020.

Wanstrath BJ, Pazhayam NM, Bauder M, Hausch F, McLean SA, **Linnstaedt SD**. Timing of FKBP51 inhibition following stress exposure influences the duration of reduction in enduring stress-induced hyperalgesia. *Poster presentation* at the 2020 Society for Biological Psychiatry Meeting, New York, NY May 2020.

Kim R, **Pan Y**, Kurz MC, Hendry PL, Pearson C, Lewandowski C, Datner E, Liu Y, McLean SA, **Linnstaedt SD**. Prediction of co-morbid chronic pain and posttraumatic stress: results of a pilot analysis of clinical and microRNA data from a longitudinal cohort of African American trauma survivors. *Poster presentation* at the 2020 Society for Biological Psychiatry Meeting, New York, NY May 2020.

Barton C, Mauck MC, **Linnstaedt SD**, Kurz MC, Hendry PL, Pearson C, O'Neil B, Lewandowski C, Datner E, Liberzon I, Domeier R, McLean SA. Immune profile in the immediate aftermath of MVC

and its prediction of APNS. *Poster presentation* at the 2020 Society for Biological Psychiatry Meeting, New York, NY May 2020.

An X, Ressler KJ, Koenen K, **Linnstaedt SD**, Kessler RC, Zeng D, Mclean SA. Methods of the Aurora Study: A Large-scale, In-depth Study Of The Development Of Chronic Pain And Other Neuropsychiatric Sequelae After Traumatic Stress Exposure. *Poster presentation* at the 2019 American Society of Anesthesiology. Orlando, FL, October 2019.

Williams JH, **Pan Y**, **Blount J**, Datner E, Hendry PL, Lewandowski C, Pearson C, McLean SA, **Linnstaedt SD**. 17 β -estradiol predicts chronic musculoskeletal pain development following trauma exposure and influences the expression of pain-associated genes. *Poster presentation* at the 2019 American Society of Anesthesiology. Orlando, FL, October 2019.

2019-2020 Related Press/Media Coverage

UNC Vital Signs article published April 16, 2020 “Women's Health Research Poster Presentation Awards”, **Esther Son** interviewed about winning poster presentation on research done on the role of estrogen in predicting pain following trauma

2019-2020 Related talks

Linnstaedt SD. Molecular risk predictors of chronic pain following traumatic stress: path to preventative interventions. Invited research presentation at the Pain Society of the Carolinas 2020 Annual Meeting and Scientific Sessions, Asheville North Carolina, September 18, 2020

Linnstaedt SD. Sex and stress specific molecular mechanisms of chronic pain development following traumatic stress exposure. Invited research presentation to the Neural & Behavioral Sciences Department, Penn State College of Medicine, February 27, 2020.

Linnstaedt SD. Towards the identification of novel therapies to treat chronic pain following trauma using translational animal models of stress induced hyperalgesia. Research presentation at the Institute for Trauma Recovery, University of North Carolina at Chapel Hill, January 31, 2020.

2019-2020 Related Publications

Kessler RC, Ressler KJ, House SL, Beaudoin FL, An X, Stevens JS, Zeng D, Neylan TC, **Linnstaedt SD**, Germine LT, ..., **McLean SA**. Socio-demographic and trauma-related predictors of PTSD within eight weeks of a motor vehicle collision in the AURORA study. *Molecular Psychiatry*. Accepted for publication July 7, 2020.

Linnstaedt SD, Rueckeis CA, Riker KD, Pan Y, Wu A, Yu S, Wanstrath B, Gonzalez M, Harmon E, Green P, **Chen C**, King T, Lewandowski C, Hendry PL, Pearson C, Kurz MC, Datner E, Velilla MA, Domeier R, Liberzon I, Mogil JS, Levine J, McLean SA. microRNA-19b predicts widespread pain and posttraumatic stress symptom risk in a sex-dependent manner following trauma exposure. *PAIN*, 2020 Jan;161(1):47-60. PMID: 31569141

Linnstaedt SD, Zannas AS, **McLean SA**, Koenen KC, Ressler KJ. Literature review and methodological considerations for understanding circulating risk biomarkers following trauma exposure. *Molecular Psychiatry*, December 20, 2019. PMID: 31863020

Mauck MC, **Linnstaedt SD**, Bortsov A, Kurz MC, Hendry PL, Lewandowski C, Velilla MA, Datner E, Pearson C, Domeier R, Fillingim RB, Beaudoin FL, Ting J, **McLean SA**. Vitamin D insufficiency increases risk of chronic pain among African Americans experiencing motor vehicle collision. *PAIN*, October 19, 2019. PMID: 31651575

Nievergelt CM,... **Linnstaedt SD**,... Koenen KC. International meta-analysis of PTSD genome-wide association studies identifies sex- and ancestry-specific genetic risk loci. *Nat Commun*. 2019 Oct 8;10(1):4558 PMID: 31594949

McLean SA, Ressler KJ, Koenen KC, Neylan TC, Germine L, Jovanovic T, Clifford GD, Zeng D, An X, **Linnstaedt SD**, Beaudoin FL, ... and Kessler RC. The AURORA Study: A Longitudinal, Multimodal Library of Brain Biology and Function after Traumatic Stress Exposure. *Molecular Psychiatry* November 19, 2019. PMID: 31745239

Stone D, Bogaardt H, **Linnstaedt SD**, Martin-Harris B, Smith AC, Walton DM, Ward E, Elliott JM. Whiplash-Associated Dysphagia: Considerations of Potential Incidence and Mechanisms. *Dysphagia*. 2019 Aug 3. PMID: 31377863

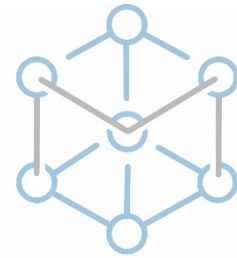
Yu S*, **Chen C***, **Pan Y**, Kurz MC, Datner E, Hendry PL, Velilla MA, Lewandowski C, Pearson C, Domeier R, McLean SA, **Linnstaedt SD**. Genes known to escape X chromosome inactivation predict co-morbid chronic musculoskeletal pain and posttraumatic stress symptom development in women following trauma exposure. *Am J Med Genet B Neuropsychiatr Genet*. 2019 Sep;180(6):415-427 (*co-first authors) PMID: 30537437

D. Mauck Lab

The Institute for Trauma Recovery is working to better understand the mechanisms underlying chronic pain development in the aftermath of major thermal burn injury. Nearly 500,000 individuals seek care after burn injury each



year in the US, and approximately 40,000 sustain major thermal injuries requiring



MAUCK LAB

hospitalization. A significant number of these individuals go on to experience life-altering chronic pain and itch. The Institute has teamed up with surgeons in the Jaycee Burn Center at UNC, as well as with leading burn centers from around the United States, to improve our understanding of the mechanisms responsible for chronic pain and suffering experienced by survivors of major burn injuries. Over

previous years, this research network has enrolled 96 burn survivors in an observation cohort in which pain and post-traumatic outcomes were longitudinally measured. We have also developed the rationale to prevent chronic pain following burn injury with Vitamin D and Fish Oil. The Mauck Lab has recently completed the Burn Recovery Trail, a pilot, randomized controlled trial to assess the efficacy of Vitamin D and Fish Oil in the prevention of chronic pain development following burn injury (NCT03313076). This study looked to specifically demonstrate potential efficacy of these agents to decrease both graft site pain severity in survivors that require surgery, and pain interference on important domains of life function. The data collected will be used to design and adequately power a larger-scale clinical trial.

Additionally, we have published results demonstrating that pathological scarring in the aftermath of burn injury is associated with chronic pain severity 6 months following major thermal burn injury. This result indicates that interventions that address scarring may improve pain outcomes and vice versa.

Matthew Mauck, MD, PhD

2019-2020 Related Abstracts

Barton, C., Mauck, MC, Linnstaedt, S, Kurz, M, Hendry, P, Pearson, C, Velilla, MA, Lewandowski, C, Datner, E, Domeier, R, Liberzon, I, **McLean, S.** Immune profile in the immediate aftermath of MVC and its prediction of APNS. Society of Biological Psychiatry Annual Meeting, New York, NY, April, 2020.

Akbar, TA, Stookey, S, **Barton, C, Tungate, A,** McGrath, K, **Mauck, MC.** Preventative Analgesia Influences Acute Pain and Opioid-use. Pain Society of the Carolinas. Charleston, SC. December, 2020.

Goldberg, M, **Mauck, MC.** When Injections and Surgery Fail, Alternative Therapy Providing Quality of Life from Anterior Thigh Pain. Medically Challenging Case. ASRA Pain Meeting, New Orleans, LA. November, 2019.

Mauck, MC, Tungate A, McLean, SA. Sex-differences in persistent opioid use following burn injury. NIH Annual BIRCWH Symposium. Bethesda, MD. November, 2019.

McGrath, KV, **Mauck, MC, Linnstaedt, S,** Sefton, C, Yu, S, Cairns, B, **McLean, SA.** Mechanistic insights into sex differences in chronic pain following major thermal burn injury. American Society of Anesthesiologists Annual Meeting. Orlando, FL. October, 2019.

2019-2020 Related Publications

Mauck MC, Linnstaedt, SD, Bortsov, A, Kurz, M, Hendry, PL, Lewandowski, CL, Velilla, MA, Datner, E, Pearson, C, Domeier, R, Fillingim, RB, Beaudoin, FL, Ting, JP, **McLean SA.** Vitamin D Insufficiency Increases Risk of Chronic Pain Among African Americans Experiencing Motor Vehicle Collision . Pain. 2020; 161(2): 274-280.

Mauck M.C., Hu JM, Sefton C, Swor R, Peak DA, Jones JS, Rathlev NK, Lee DC, Domeier RM, Hendry PL, **McLean SA.** Obesity increases the risk of chronic pain development after motor vehicle collision. Pain. 2019; 160(3): 670-675



Heroes Health Initiative

You are doing so much for *others*. Heroes Health is to support *you*.

E. Heroes Health

Need and Vision

While COVID-19 brought illness and death to growing numbers of the global population in early 2020, healthcare facilities and healthcare workers in most affected areas became overwhelmed by the logistic, professional and personal demands associated with providing quality care in the context of a worldwide pandemic. Dr. Sam McLean saw and experienced first-hand the ways that working in a healthcare facility threatened the holistic wellbeing of all employees. The stresses of the possibility of infection, passing the virus to family and friends at home, the increased patient isolation from visitors and the limited supply of PPE all weighed heavily on hospital employees, so Dr. McLean decided to work toward a solution to help healthcare workers monitor their own mental health and to deploy resources to those individuals conveniently and without cost.

Solution

The Heroes Health Initiative was birthed out of this commitment to help. In short order, a consortium of medical and research professionals under the leadership of Dr. McLean, in collaboration with Google X and supported by funding from Bank of America, the Rockefeller Foundation, OneMind and other private donations, the Heroes Health App and an institutional partnership model launched on July 14th, 2020.

The Heroes Health App, freely available on Apple and Google app stores, enables healthcare workers to monitor their mental health by investing just five minutes each week. Participants complete six short mental health self-assessment surveys (PHQ9, GAD7, PTSS, Sleep, WSAS and PPE), and the app generates a snapshot “report card” indicating levels of symptom severity as it relates to depression, anxiety, sleep health, and life impact of stress. App users can also see a trend report which reflects how each symptom severity has changed over the course of time. Most importantly, the Heroes Health app contains resources ranging from crisis hotline numbers to access to mental health self-care tools which can be incorporated into a participant’s well-being routines.

The Heroes Health app most positively benefits healthcare workers when used in the context of an institutional partnership. The Heroes Health Initiative offers a free partnership with healthcare institutions. When institutions partner with Heroes Health, the individual user and the institution enjoy added benefits. The individual now has in-app access to customized

resources offered by the institution. Institutional leadership receives de-identified aggregate reports indicating group-level mental health symptom markers and is empowered to deploy local support appropriate to the needs of their workforce. Additionally, a designated mental health outreach team has access to daily identified reports which include a list of those suffering from high symptom burden in critical mental health areas or indicate a significant level of suicidal ideation. The mental health team confidentially contacts those individuals with encouragement and offers supportive resources.

Research Value

While the Heroes Health study is primarily a quality improvement initiative focused on the current COVID-19 pandemic, there is significant research value for future efforts. The following are questions that data from the study may inform. To what extent did Heroes Health partnerships deliver successful support to those suffering from mental health crises? What resources were most accessed by participants? How can an app like this be most beneficial in future crises that put healthcare workers under additional stress? How can Heroes Health be most beneficial to healthcare workers during typical (non-pandemic) conditions? What other populations can be served through a similar initiative?

Progress

Since launching in July, the Heroes Health team remains committed to helping as many healthcare workers and institutions as possible. As of this report, 762 individuals are using the app and that number climbs weekly. Two institutions, UNC Chapel Hill Hospital and Cooper University Hospital, have fully functioning partnerships with Heroes Health. Eight other institutions are committed to establishing partnerships in the coming months, and many others are showing interest. The team has a strong commitment to continuous improvement of the app itself and the systems that support good partnerships. Boston Technology Corporation provides technical support.

The Heroes Health team displays a strong pioneering and entrepreneurial spirit and is dedicated to expanding the audience benefiting from Heroes Health. They have begun a social media campaign using Twitter and look to expand to Instagram and Facebook to undergird the vision of the initiative. Additionally, the team is considering how to broaden the positive impact of the initiative both beyond the COVID-19 pandemic and beyond the scope of healthcare workers.

2. Anesthesiology Clinical Trials Research Unit

The UNC Anesthesiology Clinical Trials Research Unit specializes in pain management studies involving medications or devices. Their facilities at the hospital of UNC Health Care and the Pain Management Center at Southern Village allow them to attract a diverse patient population. They work with Department of Anesthesiology faculty to manage and conduct both industry-sponsored clinical trials and investigator-initiated studies. Their team of professionals includes a full-time research coordinator and nurse, as well as regulatory and other support staff. Individual faculty studies performed in collaboration with the clinical trials team are described below.



Clinical Research Team, 2019-2020

Left to Right: Drs. Harendra Arora, Fei Chen, Kathleen Smith, Brian Specht (Pediatric Fellow) & Priya Kumar; Vicki Sandlin (Nurse Consultant), Drs. Meena Bhatia & Concetta Lupa; Lindsey Boerger (Research Assistant)

A. PeriOperative Ischemic Evaluation-3 (POISE-3) Trial (PI: Kumar)



The primary objective of this study is to determine if TXA is superior to placebo for the occurrence of life-threatening, major, and critical organ bleeding, and non-inferior to placebo for the occurrence of major arterial and venous thrombotic events; and to determine the impact of a hypotension-avoidance strategy versus a hypertension-avoidance strategy on the risk of vascular death and major vascular events in patients who are followed for 30 days after noncardiac surgery. This study began in September 2018 and is currently enrolling.

B. Phase 3b, Randomized, Open-Label Study of HTX-011 as the Foundation of a Non-opioid, Multimodal Analgesic Regimen to Decrease Opioid Use Following Unilateral Open Inguinal Herniorrhaphy (PI: Arora)



The primary objective is to identify which of 2 postoperative non-opioid multimodal analgesic (MMA) regimens, with intraoperative administration of HTX-011 as the foundation, results in the highest proportion of subjects who do not require a prescription for postoperative opioid medication following unilateral open inguinal herniorrhaphy. UNC was selected as a site on June 10, 2019.

C. SOAP Registry for COVID-19 in Pregnancy (PI:Smith)



This is a multicenter registry supported by the Society for Obstetric Anesthesiology and Perinatology (SOAP) of pregnant patients diagnosed with COVID-19.

D. VRAS- Virtual Reality After Surgery (PI: Specht)



Virtual Reality After Surgery. Exploring the impact virtual reality headset use has on poan scores, opioid use and overall satisfaction among post-operative pediatric patients. VR headsets will be compared to the standard of care - iPad use.

E. Presurgical Education and Pain Coping Skills: A Video Intervention –Part 1 (PI: Patidar)



Our goal is to develop a video recording to guide patients through the original pain psychology intervention during their preoperative visit, to replace the pain psychology phone calls as part of our ongoing QI project. Postoperative assessment is being completed as part of ongoing clinic protocol and will help assess QI outcomes.

F. Does In Shock improve clinicians empathy and professionalism? (PI: Martinelli)



Clinicians (residents, CRNAs, faculty) in the Anesthesiology department will be invited to take a short empathy survey. They will then be invited to read the book In Shock. We will host 3 book club facilitated discussions, each consisting of 8-10 clinicians at varying levels of role and experience. The empathy survey will be sent out to the department again following these sessions.

G. Nitrous Oxide Analgesia for External Cephalic Version: A Randomized Controlled Trial (PI: Smith)



Women having external cephalic version were randomized to nitrous oxide or oxygen placebo. Pain and anxiety scores were recorded during procedure as well as satisfaction, procedure difficulty etc.

H. Sedation Techniques for Transcatheter Aortic Valve Replacement (PI: Kolarczyk)



Retrospective cohort study that comparing outcomes in patients who receive commonly used sedation medications for TAVR. The aim of the project is to evaluate sedation-related complications in these high-risk surgical patients undergoing TAVRs.

I. Anesthesia practices and adverse events in pediatric patients undergoing MRI (PI: Phelps)



This study is a retrospective look at our pediatric MRI data through the sedation service to evaluate patient demographics, the types of anesthesia/sedation, adverse events, and ordering services. This presents an overview of sedation/anesthesia services for pediatric MRI and associated adverse events based on type of anesthesia.

J. Preoperative regional anesthesia techniques and their effect on post-operative pain and opiod consumption in percutaneous nephrolithotomy (PNL) (PI: Nanda)



Retrospective cohort study using data from EPIC, comparing patient pain outcomes between 2 groups- those who received pre-op trunk block versus those who did not.

K. Incentive Spirometry as a pain measure (PI: Lobonc)



We followed 100 post-operative patients with epidurals for pain control and tested incentive spirometry before and after surgery to determine if it correlated with the level of pain control. Patients were asked for their VAS “pain score”, a subjective measure of pain control (not controlled, somewhat controlled, well controlled) and were asked to use their incentive spirometer. They were followed until discharge or 6 days postoperatively. Hypothesis: that incentive spirometry values will correlate with level of pain control so that they can be used as a objective marker for postoperative pain control.

L. Evaluation of Virtual Reality Intervention after Pediatric Idiopathic Scoliosis Surgery to Reduce Postoperative Pain and Opioid Consumption (PI: Lawrence)



Randomized controlled study comparing virtual reality to standard electronic use (iPad) after idiopathic scoliosis surgery. Patients age 11-17 years old undergoing idiopathic scoliosis surgery on the ERAS spine protocol will be included and randomized. Participants will be offered two 30 minute sessions of their respective electronic use on postoperative day 1; pain scores and opioid use will be recorded.

M. Evaluating pain, function and satisfaction after implementation of precision prescribing recommendations for postoperative opioids. (PI:Chidgey)



We have implemented opioid prescribing recommendations for over 80 surgical populations and conducted surveys using PROMIS measures to evaluate function etc.

N. Enhanced Recovery After Surgery for Cystectomies (PI: Allen)



A pathway was developed to standardize the pre-, intra-, and post-op care of patients undergoing cystectomies. We gradually added to the pathway as we monitored patient length of stay, intra-op and post-op opioid use. PACU pain scores and readmission rates.

O. Interscalene Catheter vs. Interscalene Liposomal Bupivacaine for Arthroscopic Rotator Cuff Repair (PI: Schoenherr)



This is a prospective comparison of patients undergoing rotator cuff repair that receive one of two types of interscalene nerve block, both of which are currently being used at UNC. Group 1 will be comprised of patients with a preoperative interscalene nerve catheter placed with 20mL 0.25% bupivacaine and a 0.2% ropivacaine infusion by an OnQ pain pump. Group 2 will be comprised of patients with a preoperative interscalene nerve block placed with 10mL 0.5% bupivacaine and 10mL 1.3% Liposomal Bupivacaine (Exparel). All patients in both groups will have a similar intraoperative general anesthetic with multimodal analgesic pre-op oral medications. Outcomes measured by PACU assessment and telephone follow up.

3. Resident Conference Presentations

Presenter	Title	Conference/Date	Place
CBY Residents			
Cook, Arianna	CRPS with Independent Spread to the Face and Corneal Scarring	Pain Society of the Carolinas, December 6-8, 2019	Charleston, SC
CA-1 Residents			
Brown, Kenneth	Effects of spinal cord stimulation in pts with gastroparesis and chronic refractory abdominal pain 2. Long term control of abdominal pain related to POTR. Two case report in pediatrics	Pain Society of the Carolinas, December 6-8, 2019	Charleston, SC
Gonzalez, Michael	Take it to the Next Level: Use of Laser Levels to Improve Pressure Transducer Positioning	NCSA Annual Meeting, September 13-15, 2019	Asheville, NC
Gonzalez, Michael	Managing the First-Start Regional Rush: Extracting Maximal Benefit while Maintaining Efficiency for Lower Extremity Skin Grafting	ASRA Annual Meeting, April 23-25, 2020	Virtual
Greenberg, Michael	Unexpected critical airway in an Infant: Undiagnosed subglottic stenosis in a 12-month old with congenital heart disease	SPA, Annual Meeting, February 27-March 1, 2020	Nassau, Bahamas
Leone, Nathan	Hip Fracture Repair in the Patient Bordering Centenarian: Weighing Anesthetic Alternatives to GETA	ASA, Annual Meeting, October 19-23, 2019	Orlando, FL
Levene, Jacob	Asymptomatic Large Pneumothorax after Mastectomy with Tissue Expander Placement	SAMBA, Annual Meeting, June 6-7, 2020	Virtual
Mills, Kathryn	There's an App for That: iPads improve Patient Satisfaction During Pain Procedures	ASA, Annual Meeting, October 18-21, 2019	Orlando, FL
Pham, Tiffany	Intraoperative Diagnosis of Pneumothorax Using Point-of-care Ultrasound in a Desaturating Trauma Patient After Extubation	NCSA, Annual Meeting, September 13-15, 2019	Asheville, NC
Pham, Tiffany	Cardiac Arrest Following Retrobulbar Block for Vitrectomy	ASA, Annual Meeting, October 19-23, 2019	Orlando, FL
CA-2 Residents			
Akbar, Adam	On Committee / not presenting	NCSA, Annual Meeting, September 13-15, 2019	Asheville, NC
Akbar, Adam	Care Of An Adult Patient With Arthrogyposis Having Uterine Myomectomy	ASA, Annual Meeting, October 19-23, 2019	Orlando, FL
Akbar, Adam	Preventative Analgesia Influences Acute Pain and Opioid-use	Pain Society of the Carolinas, December 6-8, 2019	Charleston, SC

Allred, Amber	Juvenile Arthritis Contributing to Failure to Intubate Failure to Ventilate	ASA, Annual Meeting, October 19-23, 2019	Orlando, FL
Doan, Vivian	1. When Your Pressors Are Not Working: Refractory Hypotension Caused by Anti-Thymocyte Infusion During Renal Transplantation 2. Hypoventilation Caused by a Mass Obstructing the Nasal Endotracheal Tube Lumen	ASA, Annual Meeting, October 19-23, 2019	Orlando, FL
Doan, Vivian	Nasal Fiberoptic Intubation in a Patient with a Tongue Lymphatic Malformation Utilizing Ketamine and a Nasopharyngeal Airway Circuit for Oxygenation	SPA, Annual Meeting, February 27-March 1, 2020	Nassau, Bahamas
Goldberg, Michael	When Ace-inhibitor Allergy Proves More Than A Cough: Acute Airway Compromise Following Cystoscopy Procedure	ASA, Annual Meeting, October 19-23, 2019	Orlando, FL
Goldberg, Michael	When Blocks Fail: Examining the Data and Formulating Contingency Plans for the Returning Patient	ASRA, November 14-17, 2019	New Orleans, LA
Goldberg, Michael	When Injections and Surgery Fail, Alternative Therapy Providing Quality of Life from Anterior Thigh Pain	Pain Society of the Carolinas, December 6-8, 2019	Charleston, SC
Hart, Michael	Labor Analgesia Choice in History of Transverse Myelitis	NCSA, Annual Meeting, September 13-15, 2019	Asheville, NC
Kadari, Sanjay	ST Depressions on the Morning of Surgery: Proceed or Cancel?	ASA, Annual Meeting, February 27- March 1, 2020	Orlando, FL
Kadari, Sanjay	Bilateral Rectus Sheath Blocks in PACU for a 9-year old patient following a difficult intubation	SPA, Annual Meeting, February 27- March 1, 2020	Nassau, Bahamas
Khatiri, Nasir	1. Broken Tooth During a Critical Airway – How to Proceed After Dental Trauma Proceed 2. Practice Patterns for Preserving the Right Internal Jugular Vein for Central Venous Access During Cardiac Transplantation	ASA, Annual Meeting, October 19-23, 2019	Orlando, FL
Khatiri, Nasir	New onset severe leg pain following spinal cord stimulator implant	ASA, Annual Meeting, November 14-17, 2019	New Orleans, LA
Leopold, Robin	Lightning Strikes Twice: Oral Surgery Complicated by Angioedema and Tension Pneumoperitoneum	ASA, Annual Meeting, October 18-20, 2019	Orlando, FL
Richman, Michael	Use of Point of Care Ultrasound for the Diagnosis of Negative Pressure Pulmonary Edema	ASA, Annual Meeting Meeting, October 19-23, 2019	Orlando, FL
Richman, Michael	Pediatric Burn Patients Managed with Regional Anesthesia: A case series 2. Transcatheter Pulmonary Valve Occlusion Leading to Emergent Sternotomy and Valve Replacement 3. Continuous Quadratus Lumborum Catheters in a 3-Year old female for excision biopsy of a retroperitoneal Mass	SPA, Annual Meeting, February 27- March 1, 2020	Nassau, Bahamas

	then left Adrenalectomy: A Case Study for Regional Analgesia in the Pediatric		
Suggs, Jimmy	Propofol Detox for Rapid Hydromorphone Infusion Wean	SPA, Annual Meeting, February 27- March 1, 2020	Nassau, Bahamas
Unnithan, Ajay	Utilizing an Informational Clinic Policy Handout Prior to the First Clinic Visit	ASRA, November 14-17, 2019	New Orleans, LA
Whitehouse, Anne	Improves Chronic Pain Patient Satisfaction with Proposed Treatment Plans	NCSA, Annual Meeting, September 13-15, 2019	Asheville, NC
Whitehouse, Anne	Newly Diagnosed Anterior Mediastinal Mass, Suspected Severe Pulmonary Hypertension, And An Unstable Cervical Spine Fracture	ASA, Annual Meeting, October 19-23, 2019	Orlando, FL
Yatsky, Yaro	Peri-operative management of a pt with severe restrictive 3-vessel coronary artery disease and uncontrolled hypertension presenting for anterior cervical discectomy and fusion	ASA, Annual Meeting, October 19-23, 2019	Orlando, FL
CA-3 Residents			
Doerr, Patricia	Does Legistaion Change Opioid Prescribing Practices?	ASA, Annual Meeting, October 19-23, 2019	Orlando, FL
Ezimora, Candy	Management of Massive Hematosis from Aberrant Right Subclavian Artery to Esophageal Fistula	ASA, Annual Meeting, October 19-23, 2019	Orlando, FL
Ezimora, Candy	A paperclip in the Aorta	SCA, Annual Meeting, April 17-22, 2020	West Palm Beach, FL
Hallman, Matt	Incertive Spirometry as a tool to assess post-operative pain control in surgical oncology pts	ASA, Annual Meeting, October 19-23, 2019	Orlando, FL
Hammond, Brandon	1. Anesthetic Approach to Post pneumonectomy syndrome 2. QI- Replacing Intraoperative Administration of Normal Saline with Balanced Electrolyte Solutions	ASA, Annual Meeting, October 19-23, 2019	Orlando, FL
Hammond, Brandon	Enhancing Critical Care for Malawian Children at a Central Hospital	Consortium of University for Global Health Conf, April 18-20, 2020	Washington, DC
Lawrence, Marley	"What Matters? Teaching Pediatric Residents How to Effectively Perform Preoperative Clinic Assessments"	ASA, Annual Meeting, October 19-23, 2019	Orlando, FL
Lawrence, Marley	1. Novel Uses of Erector Spinae Blocks in Pediatric Patients 2. Unexpected Reduction in Surgical Blood Loss after Safety Intervention	SPA, Annual Meeting, February 27-March 1, 2020	Nassau, Bahamas
Rojas, Andres	Preoperative Ace Inhibitor and Angiotensin Receptor Blocker Therapy Associated with Increased Vasopressor Use in Patients Undergoing Video Assisted Thoracoscopic Wedge Resection or Lobectomy	ASA, Annual Meeting, October 19-23, 2019	Orlando, FL

Whitlow, Bryan	A medically challenging case: What do you do when all else fails?	NANS, January 23-26, 2020	Las Vegas, NV
Whitlow, Bryan	A medically challenging case: What do you do when all else fails?	SPA, Annual Meeting, February 27- March 1, 2019	Nassau, Bahamas
Woodward, Stephanie	Opioid Education: Education: Reducing Unsecured Pills Postoperatively	ASA, Annual Meeting, October 19-23, 2019	Orlando, FL
Woodward, Stephanie	N/A	September 9- October 4, 2019	International Rotation

Departmental Research Products

1. Published Abstracts (in alphabetical order of first author)

Alan Smeltz, MD and Priya Kumar, MD, Con: Qualitative left ventricular ejection fraction is not sufficient for patients undergoing cardiac surgery, Journal of Cardiothoracic and Vascular Anesthesia. Submitted: May 2020

Barton C, Mauck M, Linnstaedt S, Kurz M, Hendry P, Pearson C, O'Neil B, Lewandowski C, Datner E, Liberzon I, Domeier R, McLean S. Immune Profile in the Immediate Aftermath of MVC and Its Prediction of APNS. Accepted for Oral Presentation at Society of Biological Psychiatry's 2020 Annual Meeting. New York, NY, May 2020

Chen, F., Lee, Y. Hubal, R. (June, 2020) Testing of a Virtual Patient: Linguistic and Display Engagement Findings, poster presentation. iLRN 2020 virtual conference online and in virtual reality.

D'Ercole F, Dhanda V, Rhodes H, Stander S, McMillan D, Flynn D, Lamm M, Levi M. The Utility of Radio Frequency Identification Technology for Pyxis Inventory Optimization in the Operating Room. ASA 2020 eAbstract. submitted April 6, 2020.

D'Ercole F, Dhanda V, Rhodes H, Stander S, McMillan D, Flynn D, Lamm M, Levi M. The Utility of Radio Frequency Identification Technology for Pyxis Inventory Optimization in the Operating Room. ASA 2020 eAbstract. Accepted July 30, 2020.

Grasser LR, Wanna C, Minton S, Phillips KA, Durmornay N, Seligowski A, McLean S, Jovanovic T. Fear-potentiated startle prospectively predicts alcohol use patterns in individuals exposed to

trauma. Accepted for presentation at Society of Biological Psychiatry's 2020 Annual Meeting. New York, NY, May 2020

Gullett L, Short NA, Burud G, Lechner M, Bell K, Black J, Buchanan J, Reese R, Reed G, Rossi C, Nouhan P, Phillips C, Martin SL, Liberzon I, Rauch SAM, Bollen K, McLean SA. Psychological and physical morbidity of sexual assault among adult women students. Accepted for Oral Presentation at Society of Biological Psychiatry's 2020 Annual Meeting. New York, NY, May 2020

Hart, M., Gue, J., Cobb, B., Newborn Cyanosis During Post-Cesarean Skin-to-Skin in the OR, submitted for ASA 2020 Annual Meeting May 20, 2020.

Abstract presented at ASA 2019. "Idiopathic Juvenile Arthritis Contributing To Failure To Intubate Failure To Ventilate" 10/20/2019. Caryn M. Hertz, MD and Amber Allred, MD

Kim R, Pan Y, Kurz MC, Hendry PL, Pearson C, Lewandowski C, Datner E, Liu Y, McLean SA, Linnstaedt SD. Prediction of co-morbid chronic pain and posttraumatic stress: results of a pilot analysis of clinical and microRNA data from a longitudinal cohort of African American trauma survivors. Submitted to the Society for Biological Psychiatry Meeting, New York, NY May 2020.

Kim R, Pan Y, Kurz MC, Hendry PL, Pearson C, Lewandowski C, Datner E, Liu Y, McLean SA, Linnstaedt SD. Prediction of co-morbid chronic pain and posttraumatic stress: results of a pilot analysis of clinical and microRNA data from a longitudinal cohort of African American trauma survivors. Accepted to the Society for Biological Psychiatry Meeting, New York, NY May 2020.

Kim R, Pan Y, Kurz MC, Hendry PL, Pearson C, Lewandowski C, Datner E, Liu Y, McLean SA, Linnstaedt SD. Prediction of co-morbid chronic pain and posttraumatic stress: results of a pilot analysis of clinical and microRNA data from a longitudinal cohort of African American trauma survivors. Submitted to the Society for Biological Psychiatry Meeting, New York, NY May 2020.

Lobo JJ, Tungate AS, Peak DA, Swor RA, Rathlev NK, Hendry PL, McLean SA, Linnstaedt SD. Examination of genetic overlap in vulnerability to posttraumatic chronic pain, stress, and depression symptoms following motor vehicle collision using polygenic risk score analyses. Submitted to the Society for Biological Psychiatry Meeting, New York, NY May 2020.

Lobo JJ, Tungate AS, Peak DA, Swor RA, Rathlev NK, Hendry PL, McLean SA, Linnstaedt SD. Examination of genetic overlap in vulnerability to posttraumatic chronic pain, stress, and depression symptoms following motor vehicle collision using polygenic risk score analyses. Accepted to the Society for Biological Psychiatry Meeting, New York, NY May 2020.

Lund, Elisa; Bean, Helen. Regional Anesthesia Technique for Transforaminal Lumbar Interbody Fusion: A Successful Case Report. Submitted to ASRA 18th Annual Pain Medicine Meeting September 4, 2019. Accepted September 26, 2019. To be presented November 15, 2019.

Macchio L, An X, Dougherty R, Zeng D, Ji Y, Agala C, Liu M, Dagum P, House S, Beaudoin F, Kessler R, Koenen K, Ressler K, McLean SA for the AURORA study investigators.

Multidimensional Characterization of a Large Cohort of Trauma Survivors May Improve Trauma Survivor Phenotyping. Accepted for Oral Presentation at Society of Biological Psychiatry's 2020 Annual Meeting. New York, NY, May 2020

Ashley Pappas, PharmD, MHA, Matthew Nielsen, MD, Clark McCall, MHA, Brooke Chidgey, MD, Peggy McNaull, MD

Submitted-February 2019

Accepted-May 2019

Presented-September 2019 (Vizient Connections Education Summit)

Short NA, Tungate AS, Bollen KA, Witkemper KD, Lechner M, Bell K, Black J, Buchanan J, Reese R, Reed GD, Liberzon I, Rauch SAM, Kessler RC, McLean SA. (submitted). Acute stress symptoms mediate the transition from acute to persistent pain after sexual assault. In A. Rogers & N. A. Short (chairs), Improving treatment outcomes for comorbid chronic pain and posttraumatic stress: Recent translational findings. Symposium accepted for presentation at the annual meeting of the Association for Behavioral and Cognitive Therapies, Philadelphia, PA

Short NA, Myers US, Keller SM, Wangelin BC. Do sleep disturbances interfere with the completion and effectiveness of Prolonged Exposure for PTSD? In: S Blakey (chair), Expanding impact: Addressing co-occurring and complicating factors during evidence-based treatments for PTSD. Symposium presented at: 53rd Annual Convention for the Association of Behavioral and Cognitive Therapies; November, 2019; Atlanta, GA.

Short NA, Myers US, Keller SM, Wangelin BC. Do sleep disturbances interfere with the completion and effectiveness of Prolonged Exposure for PTSD? In: P Colvonen (chair), Trauma, PTSD, and Sleep II: Examining the Relationship between Insomnia and PTSD Treatments. Symposium presented at: ISTSS 35th annual meeting; November, 2019; Boston, MA.

Son E, Tungate AS, Mauck MC, Pan Y, Witkemper KD, Kurz MC, Hendry PL, Pearson C, Lewandowski C, Datner E, Cairns BA, McLean SA, Linnstaedt SD. Peritraumatic Circulating 17β-

Estradiol As a Resiliency Factor for Chronic Pain Outcomes in Women Following Trauma. Submitted to the Society for Biological Psychiatry Meeting, New York, NY May 2020.

Son E, Tungate AS, Mauck MC, Pan Y, Witkemper KD, Kurz MC, Hendry PL, Pearson C, Lewandowski C, Datner E, Cairns BA, McLean SA, Linnstaedt SD. Peritraumatic Circulating 17 β -Estradiol As a Resiliency Factor for Chronic Pain Outcomes in Women Following Trauma. Accepted to the Society for Biological Psychiatry Meeting, New York, NY May 2020.

Straube L, de Ridder G, Huber C, Blacker S. A Spinal Anesthetic in a Patient with a Platelet Count of 7,000 X 10⁹/L and Undiagnosed Thrombotic Thrombocytopenic Purpura: A Case Report. A&A Practice; 2020; 14(6): e01184. Published 4/29/20. Accepted for publication 01/27/20. Submitted 09/05/2019.

Swain HAV, Short NA, McLean BS, Tungate AS, Lechner M, Bell K, Black J, Buchanan J, Reese R, Reed G, Liberzon I, Rauch SAM, Kessler RC, McLean SA. Increased posttraumatic stress symptoms are associated with increased substance use in sexual assault survivors during the year after sexual assault. Accepted for Oral Presentation at Society of Biological Psychiatry's 2020 Annual Meeting. New York, NY, May 2020

Taheri C, Ziemba N, Jones C, Agala C, Soward A, House S, Beaudoin F, Lewandowski C, Hendry P, Musey P, Kessler R, Koenen KC, Ressler K, McLean S for the AURORA Study Investigators. Short-term mental health outcomes among individuals enrolled at the emergency department after physical assault. Accepted for Oral Presentation at Society of Biological Psychiatry's 2020 Annual Meeting. New York, NY, May 2020

Emily Teeter, MD and Harendra Arora, MD, Pro: Qualitative left ventricular ejection fraction is sufficient for patients undergoing cardiac surgery, Journal of Cardiothoracic and Vascular Anesthesia, Submitted: May 2020

Tran C, Kleemann E, Tungate AS, Witkemper KD, Lechner M, Bell K, Black J, Buchanan J, Reese R, Reed G, Liberzon I, Rauch SAM, Kessler RC, McLean SA. Pain in the immediate aftermath of sexual assault and its relationship to physical trauma during assault. Accepted for Oral Presentation at Society of Biological Psychiatry's 2020 Annual Meeting. New York, NY, May 2020

Tungate AS, Bollen KA, Short NA, Witkemper KD, Lechner M, Bell K, Black J, Buchanan JA, Reese R, Reed GD, Liberzon I, Rauch SAM, Kessler R, McLean S. Peritraumatic Stress Symptoms Partially Mediate Pain Persistence after Sexual Assault. Accepted for Oral Presentation at Society of Biological Psychiatry's 2020 Annual Meeting. New York, NY, May 2020

Wanstrath BJ, Pazhayam NM, Bauder M, Hausch F, McLean SA, Linnstaedt SD. Timing of FKBP51 inhibition following stress exposure influences the duration of reduction in enduring stress-induced hyperalgesia. Submitted to the Society for Biological Psychiatry Meeting, New York, NY May 2020.

Wanstrath BJ, Pazhayam NM, Bauder M, Hausch F, McLean SA, Linnstaedt SD. Timing of FKBP51 inhibition following stress exposure influences the duration of reduction in enduring stress-induced hyperalgesia. Accepted to the Society for Biological Psychiatry Meeting, New York, NY May 2020.

Whitehouse A, Heller BJ. Top 12 Medically Challenging Cases: Newly Diagnosed Anterior Mediastinal Mass, Suspected Severe Pulmonary Hypertension, And An Unstable Cervical Spine Fracture. Poster Presentation presented at American Society of Anesthesiologists Annual Meeting. Orlando, FL. October 20 2019.

Witkemper KD, Short NA, Sullivan MM, Lechner M, Bell K, Black J, Buchanan J, Reese R, Reed G, Rossi C, Martin SL, Liberzon I, Rauch SAM, McLean SA. Peritraumatic Anxiety Sensitivity Predicts Posttraumatic Stress Symptoms after Sexual Assault. Accepted for Oral Presentation at Society of Biological Psychiatry's 2020 Annual Meeting. New York, NY, May 2020

Improving Opioid Stewardship; Standardizing Provider Prescribing and Education for Storage and Disposal Nathan Woody, CSSBB, Jessie Gilmore, DNP, RN, CPN, Jami Mann, PharmD, MBA

2. Journal Articles (in alphabetical order of first author)

Bhatia M, Merlo A. Pro: The New Heart Allocation System is a Positive Change in the Listing of Patients Awaiting Transplant. JCVA. Accepted Feb 24, 2020. In Press.

Hart WM, Doerr P, Qian Y, McNaul PM. What Constitutes Effective Team Communication After an Error? AMA J Ethics. 2020;22(4): E298-E304. Published 2020 Apr 1.

Smeltz, Alan M., Arora, Harendra, Kumar, Priya A. Con: The new UNOS heart allocation system is not a positive change in listing patients for transplant. Journal of Cardiothoracic and Vascular Anesthesia

3. Books

Teeter EG, Afonso AM, Popescu WM. “Enhanced recovery after thoracic surgery”, book chapter in Cohen's Comprehensive Thoracic Anesthesia. Submitted 1/20/20.

Smeltz A, Teeter E, Kumar P. “Comprehensive Textbook of Intraoperative Transesophageal Echocardiography 3E “, book chapter in Cardiac Masses. Submitted 3/25/20.

Smith KA. Rosenkrans D. Keeping infants warm in the perioperative period is important, challenging, and at times dangerous. In Marcucci C, Gierl BT and Kirsch JR(eds.). Avoiding Common Anesthesia Errors. Lippincott Williams & Wilkins, Philadelphia, Pennsylvania; 2019 Oct.

4. Grants Funding

Title: Heroes Health Rockefeller Foundation Grant

Grant Amount: \$250,000

Funding Agency: Rockefeller Foundation

Grant Period: 2020-20201

Grant Status: Awarded

Principal Investigator: Samuel McLean

Title: FKBP51 antagonism to prevent chronic pain: optimizing efficacy & evaluating safety and mechanisms

Grant Type (or Number): R01NS118563

Grant Amount: \$2,589,652

Funding Agency: National Institutes of Health (NIH)

Grant Period: 2020-2024

Grant Status: Awarded

Principal Investigator: Sarah Linnstaedt

Title: Examination of the Impact of COVID-19 Pandemic on Management and Care of Sickle Cell Patients

Grant Amount: \$94,233

Funding Agency: Global Blood Therapeutics

Grant Period:

Grant Status: Awarded

Principal Investigator: Martha Kenney

Title: FKBP51 inhibition to prevent chronic pain following traumatic stress

Grant Type (or Number): Rita Allen Award in Pain

Grant Amount: \$150,000

Funding Agency: Rita Allen Foundation

Grant Period: 2020-2023

Grant Status: Awarded

Principal Investigator: Sarah Linnstaedt

Title: Boston Scientific Fellowship Grant 2019-2020

Grant Type (or Number): Fellowship Grant

Grant Amount: \$20,000

Funding Agency: Boston Scientific Fellowship

Grant Period: 2019-2020
Grant Status: Awarded
Principal Investigator: Dominika James

Title: Influence of PTSD Symptoms on Chronic Pain Development after Sexual Assault
Grant Type (or Number): R01-AR064700
Grant Amount: \$3,565,171
Funding Agency: NIH National Institute of Arthritis and Musculoskeletal and Skin Diseases (NIAMSD)
Grant Period: 2014-2020
Grant Status: Awarded
Principal Investigator: Samuel McLean

Title: Supplement for Influence of PTSD Symptoms on Chronic Pain Development after Sexual Assault
Grant Type (or Number): Supplemental funding
Grant Amount: \$213,865.95
Funding Agency: Mayday Fund
Grant Period: 2014-2020
Grant Status: Awarded
Principal Investigator: Samuel McLean

Title: A Multi-site Retrospective Review of the use of Ketamine Infusion as Adjunctive Pain Therapy for Vasooclusive Episodes (VOEs) in Patients with Sickel Cell Disease (SCD)
Grant Type (or Number): SRP-2019-02
Grant Amount: \$11,664
Funding Agency: Augusta University
Grant Period: 2019-2020
Grant Status: Awarded
Principal Investigator: Martha Kenney

Title: The Family Experience: A Family-Focused Support Intervention to Enhance Wellness in Undergraduate Medical Education
Grant Amount: \$11,770
Funding Agency: Group on Educational Affairs (GEA)
Grant Period: 2018-2022
Grant Status: Awarded

Principal Investigator: Susan Martinelli

Title: Longitudinal Assessment of Post-traumatic Syndromes

Grant Type (or Number): U01-MH110925

Grant Amount: \$25,838,629

Funding Agency: NIH National Institute of Mental Health (NIMH)

Grant Period: 2016-2021

Grant Status: Awarded

Principal Investigator: Samuel McLean

Title: Supplemental funding for the Longitudinal Assessment of Post-traumatic Syndromes

Grant Amount: \$291,995

Funding Agency: Mayday Fund

Grant Period: 2016- 2021

Grant Status: Awarded

Principal Investigator: Samuel McLean

Title: Longitudinal Assessment of Post-traumatic Syndromes Diversity Supplement

Grant Type (or Number): U01-MH110925-04S1

Grant Amount: \$279,707

Funding Agency: NIH National Institute of Mental Health (NIMH)

Grant Period: 2020-2021

Grant Status: Awarded

Principal Investigator: Samuel McLean

Title: Verily Research Agreement

Grant Type (or Number): 4100003436

Grant Amount: \$280,000

Funding Agency: Verily Life Sciences, LLC

Grant Period: 2020-2023

Grant Status: Awarded

Principal Investigator: Samuel McLean

Title: Family Anesthesia Experience: Educating Residents and their Support Persons to Improve Relationships and Increase Wellness

Grant Type (or Number): AMA 36488 236747

Grant Amount: \$50,366.80

Funding Agency: American Medical Association (AMA)

Grant Period: 2019-2022
Grant Status: Awarded
Principal Investigator: Susan Martinelli

Title: PeriOperative ISchemic Evaluation-3 Trial
Grant Amount: \$46,696.27
Funding Agency: Hamilton Health Sciences Corporation
Grant Period: 2018-2022
Grant Status: Awarded
Principal Investigator: Priya Kumar

Title: Key Molecular Mechanisms of Chronic Pain Vulnerability in Women Experiencing MVC
Grant Type (or Number): K01-AR071504-01
Grant Amount: \$376,805
Funding Agency: NIH National Institute of Arthritis and Musculoskeletal and Skin Diseases (NIAMSD)
Grant Period: 2018-2022
Grant Status: Awarded
Principal Investigator: Sarah Linnstaedt

Title: Optimizing the Care of Patients with Tricuspid Valve Endocarditis Related to Intravenous Drug Abuse (IVDA) through Interdepartmental and Interhospital Collaboration
Grant Amount: \$50,000
Funding Agency: UNC Institute for Healthcare Quality and Improvement (IHQI) Scholars Grant
Principal Investigator: Claire Mock MD, CPPS
Core Project Team: McNaull P, Kolarczyk L, Randall M, Ikonomidis J, Tessmann P, Jordan R, Phillips I, Schranz A, Stern B, Bowen G, Goetzinger A, Corbin K, Perry-James L, Ornelas C.