

Department News | FALL 2020

Obstetric Division designated a Center of Excellence by SOAP



SOCIETY FOR OBSTETRIC ANESTHESIA AND PERINATOLOGY CENTER OF EXCELLENCE

The Obstetric Anesthesiology Division was designated as a Center of Excellence (COE) by the Society for Obstetric Anesthesia and Perinatology (SOAP). A Center of Excellence designation is for institutions and programs that demonstrate excellence in obstetric anesthesia care and sets a benchmark of superior care that adheres to evidence-based practices and national and international guidelines for maternal care.

According to "Centers of Excellence for Anesthesia Care of Obstetric Patients" published in Anesthesia & Analgesia, maternal mortality is the sixth most common cause of death among women ages 20-34 years old in the United States. SOAP's determination that provision of optimal hospital care during labor and delivery is essential to reducing maternal morbidity and mortality eventually led to the creation of the designation.

On SOAP's COE application, the criteria

for the designation cover personnel and staffing; equipment, protocols, and policies; cesarean delivery management; labor analgesia; recommendations and guidelines implementation; and quality assurance and patient follow-up.

"This designation shows the department's dedication to quality patient care," said Anesthesiology Department Chair Warren Sandberg, MD, PhD. He said it is important for the Obstetric Division to keep up with the criteria set by SOAP.

Obstetric Anesthesiology **Division Chief Jeanette** Bauchat, MD, MS, said being designated a COE was a team effort between the obstetric anesthesiologists and their multidisciplinary partners on labor and delivery. She said the division looked at where they were meeting criteria and where they could improve. "Faculty and CRNAs took on a multitude of systems improvement and quality initiatives to ensure a solid application for COE," she said.

She said the designation reflects the Obstetric Anesthesiology Division's commitment to staying current on knowledge, skills and best practices and bringing them to VUMC. "Best practices sometimes get reported then lost in the literature. This designation is a good way to bridge that gap. It pushes institutions to implement best practices."

Bauchat said being designated a COE is important because it shows patients that an institution is providing the highest quality of obstetric care. This quality care includes expertise of the anesthesia faculty, implementations of evidence-based practices within the Obstetric Anesthesiology Division and working within the multidisciplinary team on labor and delivery to design safe practices and quality initiatives.

This designation needs to be renewed every four years. "There are ongoing, continued and ever-changing practices and national guidelines, and we intend to be at the leading edge of those on Vanderbilt's labor and delivery unit," Bauchat said.

Weinger's patient safety achievements recognized

Matthew B. Weinger, MD, was recently named the recipient of the 2020 A. R. Lauer Safety Award by the Human Factors and Ergonomics Society (HFES). This award recognizes a person for outstanding contributions to human factors aspects in the broad area of safety.

"I am truly honored to be recognized by the Human Factors and Ergonomics Society for this award," Weinger said.

Weinger earned this award through a 30-year effort to improve clinical practices to reduce medical errors by applying HFE theory and methods to

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Message from the Chair



Warren Sandberg, MD, PhD Chair, Department of Anesthesiology

The weather is changing but the precautions Vanderbilt University Medical Center and the Department of Anesthesiology are taking in light of the COVID-19 pandemic have not changed and are here to stay. I am proud to say that VUMC has become a leader in our response to the pandemic.

To exemplify the strength of the VUMC brand in Middle Tennessee, VUMC is actually expanding. Leaders announced the purchase of Tennova Healthcare-Shelbyville and Tennova Healthcare-Harton hospitals from subsidiaries of Community Health Systems Inc. VUMC will also acquire minority ownership in CHS's Tennova Healthcare-Clarksville hospital.

A congratulations to the Obstetric Anesthesiology

Division. The division was designated as a Center of Excellence by the Society for Obstetric Anesthesia and Perinatology. This designation shows the department's dedication to quality patient care.

COVID-19 has changed the way we do many things, including annual meetings. The American Society of Anesthesiologists Annual Meeting was held virtually this year. That did not stop our department from participating in over 60 activities. Our very own Matt Weinger, MD, presented the Ellison C. Pierce Jr., MD, Patient Safety Memorial Lecture. With the COVID-19 pandemic, our focus needs to be on safety and self-care. We need to keep wearing masks, practicing social distancing, washing hands and complying with other suggested safety guidelines.

Safety and self-care go hand in hand, so we should not feel pressured to work when sick. Working when sick puts not only you but also your colleagues at risk. We are a big, robust and caring department, and we want people to feel comfortable taking care of themselves. We are in this for long haul, so make sure you take care of yourself and others.

designs, especially in the high-risk, highacuity procedural environment. "Matt appreciates that engineered and humanistic systems to enhance patient safety work best together. Moreover, as a scientist, Matt is unafraid to follow the empiric conclusions driven by his data, and then challenge intuitions and dogma that turn out to be appealing but wrong. For all these reasons, the anesthesia patient safety community is rightly proud to see Matt receive this award," he said.



Matt Weinger, MD, presenting the Ellison C. Pierce Jr., MD, Patient Safety Memorial Lecture on Saturday, Oct. 3, during the virtual 2020 American Society of Anesthesiologists Annual Meeting. His lecture was entitled "Is Safety Becoming the Poor Stepchild of Quality?"

WEINGER continued from front page

healthcare. His work includes methods and practices to enhance patient monitoring and medication delivery, to understand clinician performance and the factors that can affect it like fatigue and burnout, to improve clinician training through medical simulation training and assessment, and to apply human-centered design to develop better work processes, alarms, and clinical decision support systems.

"Dr. Weinger was selected from a very competitive group of applicants who are all doing incredible work in many industries to make the world safer," stated Valerie Gawron, PhD, of the MITRE Corporation, who served as Chair of the award committee.

Weinger took his expertise on patient safety to the American Society of Anesthesiologists Annual Meeting. He presented the 2020 Ellison C. Pierce Jr., MD, Patient Safety Memorial Lecture on Saturday, Oct. 3. His lecture was entitled "Is Safety Becoming the Poor Stepchild of Quality?" In his lecture, he explained the importance of safety and quality, with a key aspect being understanding how excessive zeal to achieve quality goals can negatively affect clinician and patient safety. The lecture concluded with a discussion about how anesthesiologists can play a role in the future of safety and quality. "We were the first specialty to embrace patient safety," he said during his lecture. "We are still leaders in patient safety."

Department of Anesthesiology Chair Warren Sandberg, MD, PhD, said Weinger and his team of experts have developed over the course of a couple decades into one of a few "go to" resources in the country for patient safety

Annual Meeting Recap: American Society of Anesthesiologists

"We are here to save lives," said American Society of Anesthesiologists President Mary Dale Peterson, MD, MSHCA, FACHE, FASA, during the opening session of the society's annual meeting, which due to the COVID-19 pandemic was held virtually. The annual meeting covered numerous topics, but patient safety, COVID-19, the opioid crisis and the importance of anesthesiologists in healthcare were the focus of many presentations. The takeaway point at the end of several lectures was that no one should be harmed by anesthesia care.

Our very own Matthew Weinger, MD, presented the Ellison C. Pierce Jr., MD, Patient Safety Memorial Lecture. His presentation was titled "Is Safety Becoming the Poor Stepchild of Quality?" He stated anesthesiologists have the unique ability to improve patient safety in perioperative care. He explained that focusing on safety is vital because saving lives is important and inspiring to physicians, boosting morale. Weinger's lecture also discussed the ability to develop technology and processes to improve patient safety that are humancentered design based on the needs of the patient. "We were the first specialty to embrace patient safety," he said, and "we are still leaders in patient safety." But he emphasized that anesthesiologists must take a broader view of their role in perioperative care to further advance both safety and quality. "Think about how you can be a patient safety hero!"

COVID-19 has presented new safety concerns, and not just with patients. Weinger presented another lecture on patient safety during the session "Ten Safety Issues We've Learned From COVID." His lecture was titled "Staff Safety and Burnout Risk," which focused on the new duties and expectations associated with COVID-19, along with new stressors such as personal safety concerns, inadequate resources for new needs, degraded autonomy and mastery, and a degraded sense of community.

The Emery A. Rovenstine Lecture focused on many topics, including COVID-19 and how it affects healthcare. Joanne Conway, MD, opened the lecture by discussing virtual care and telehealth medicine in the age of COVID-19. She emphasized the fact that healthcare has become more accessible and affordable with telehealth medicine and that it is here to stay. Not only is telemedicine sticking around but another COVID-19 safety measure is here to stay-remote work. Remote work has been an excellent tool for safety, but it also has other positive benefits such as increased productivity and work satisfaction as long as there is still team connection.

The lecture then turned to the discussion of gender equality and equity within healthcare and the specialty. Statistics Conway delivered include: only 14 percent of hospital CEOs are women, only 22 percent of healthcare company directors are women, and America is not projected to reach gender equality and equity in healthcare leadership until 2050. She emphasized that having more diverse leadership leads to making better decisions. "Anesthesiologists should set an example," she said. "Step up and fix this in our specialty now." For the final topic, Conway circled back to patient safety, revisiting the idea of anesthesiologists taking a broader role in patient safety, much like Weinger did with his lecture. "It is time for us to swim outside our lane and take leadership roles outside our specialty," she said, stating that it is important to focus on patient safety even outside the operating room.

Due to the conference being online, presentations and lectures were conducted virtually. "I think it allowed the best prepared presenters to really take advantage of technology to maximize the value of their time by driving up the information flow," said VUMC Anesthesiology Department Chair Warren Sandberg, MD, PhD.

Attendees had access to a virtual lobby where they could access sessions and lectures by category. Prior to the event, participants could preview the mechanics of the meeting and build an itinerary. Attendees could ask questions of the presenters via chat format with live sessions or via a comment section with pre-recorded sessions. After the meeting, attendees could access more than 135 hours of recorded content.

While the annual meeting was different from previous meetings in terms of how it was attended, the purpose of the meeting remained the same—to learn and network with fellow physicians, scientists, researchers, and thought leaders in anesthesiology. The next ASA annual meeting is scheduled for Oct. 9 through Oct. 13, in San Diego, CA.

Academic Excellence in Action

Our department contributed over 60 activities at the virtual 2020 ASA Annual Meeting:

33 Medically Challenging Cases 8 Oral Presentations 6 Problem-Based Learning Discussions 5 Special Meetings/Featured Lectures/Sessions 4 Quality Improvement Projects 2 Subspecialty Panels 2 eAbstracts 1 60 Minute Panel 1 Resident and Fellow Session 1 Snap-Talk

Solving operational problems with eStar solutions

estar

Before June, VUMC had a big problem with big beds: they don't fit in all of the hospital's operating rooms. Scheduling mishaps were discovered the hard way, right at the operating room door, causing delays and headaches for patients and clinicians. However, as of Wednesday, June 24, VUMC solved that problem through a collaboration between the eStar OpTime/ Anesthesia team and our perioperative services leadership. They developed a system that alerts schedulers to the bed and operating room mismatch and does not allow patients in a bariatric bed or above a weight threshold to be scheduled in an incompatible operating room.

On Wednesday, May 13, the eStar OpTime/Anesthesia team received a request from Dora Haney-Snider BSN, RN, CNOR, interim manager of Perioperative Services, after an incident that resulted in a procedure starting late. A critically ill, morbidly obese patient was scheduled for urgent surgery. When the anesthesia team arrived, they discovered that the patient was on a bariatric bed, which couldn't physically be brought into the scheduled OR. The case had to be moved to a different OR, resulting in a delayed start.

"Historically," Haney-Snider said, "the communication related to the use of bariatric beds has been lacking. This is an issue, due to the fact that many of our operating suites within the VOR have a single panel door that is not wide enough to accommodate the width of the bariatric beds. This issue requires the patient to be transferred to a stretcher that may not accommodate the patient's weight, causing a patient safety issue, in order to transport the patient into the room."

Jonathan Wanderer, MD, MPhil, medical director of Perioperative Informatics, said the *e*Star OpTime/Anesthesia

team worked to create a workflowfriendly solution for the end user. "The initial request was to add an icon to the *e*ORBoard," he said. "The solution would have required the scheduler to look at the *e*ORBoard, see the icon, and realize that they were putting the case into a room that wouldn't support it."

Jo Ann Howell, principal application analyst for the eStar OpTime/Anesthesia team, collaborated with our clinical leadership to develop this system. Staff were in communication during the analyzing phase, planning phase, testing phase, demo phase and approval phase. Even after the system went live, the communication did not stop there. Howell said the eStar team will provide support as needed and follow up to ensure everything is working as desired. "This hard stop alert has essentially fixed this issue," Wanderer said, "and is a nice example of our operational team working with HealthIT in designing practical solutions that allow our clinician teams to reliably execute on efficient clinical care."

Aliquots: Land of plenty (of opioids)

Originally published in the VUMC Reporter on Aug. 24, 2020

By Paul Govern

Adult surgical patients in the U.S. and Canada who receive opioid prescriptions for postsurgical pain management tend to be given more pills than they need. On average, 61 percent of opioids prescribed to these patients are leftover at the time of postoperative assessment, according to a meta-analysis reported in Systematic Reviews by Lori Schirle, PhD, CRNA, Stephen Bruehl, PhD, and colleagues. The analysis draws on 44 observational studies published from 2000 to 2018.

The type of surgical procedure and level of invasiveness had



statistically significant effects, with minimally invasive surgeries resulting in a greater proportion of opioids leftover.

The authors note that previous studies have shown that opioid prescribing varies widely across providers and the more pills patients receive, the more they tend to consume, raising the risk of addiction.

According to the Centers for Disease Control and Prevention, opioids were involved in more than 46,000 deaths in the U.S. in 2018. Joining the study were Amanda Stone, PhD, Matthew Morris, PhD, Sarah Osmundson, MD, MS, Philip Walker, MLIS, MSHI, and Mary Dietrich, PhD, MS. The study was supported by the National Institutes of Health (grants TR002371, DA037891).

VUMC expected to grow with new healthcare purchases

Originally published in the VUMC Reporter *on Sept. 30, 2020*

By John Howser

Leaders of Vanderbilt University Medical Center announced plans to purchase Tennova Healthcare-Shelbyville and Tennova Healthcare-Harton hospitals from subsidiaries of Community Health Systems Inc. (CHS). At the same time, VUMC will acquire minority ownership in CHS's Tennova Healthcare-Clarksville hospital.

A definitive agreement has been signed by VUMC for the acquisition of the Shelbyville and Tullahoma (Harton) hospitals and their related businesses, including physician clinic operations and outpatient services.

VUMC has also signed an agreement with Tennova's existing minority partner, GHS Holdings, LLC, a wholly owned subsidiary of Clarksville Volunteer Health, Inc. (CVH), a Clarksville nonprofit, to acquire its 20 percent minority interest in Tennova Healthcare-Clarksville and related physician practices.

The partnership between Tennova Healthcare-Clarksville and VUMC is expected to create new opportunities to expand local medical resources for Clarksville, Montgomery County, and the surrounding region. Already, Tennova Healthcare-Clarksville and VUMC collaborate on oncology and neonatal intensive care in the community. Oncologists and a multidisciplinary team from Vanderbilt-Ingram Cancer Center provide care at the Gateway-Vanderbilt Cancer Treatment Center. And Tennova Healthcare-Clarksville's Level 2B newborn intensive care unit is serviced by neonatologists from Monroe Carell Jr. Children's Hospital at Vanderbilt who provide care for pre-term babies.

Through the acquisition of the hospitals in Shelbyville and Tullahoma and the partnership with Tennova Healthcare-Clarksville, VUMC significantly increases its presence across Middle Tennessee with facilities and services now located in Bedford, Coffee, Davidson, Montgomery, Rutherford, Sumner, Williamson and Wilson counties. Currently under construction in Sumner



Jeff Balser, MD, PhD, President and CEO of VUMC and Dean of the Vanderbilt University School of Medicine

County (Hendersonville) is a 31,000-squarefoot facility that will offer adult outpatient specialty care, along with limited pediatric specialty care. In December 2019 VUMC opened the Monroe Carell Jr. Children's Hospital Vanderbilt Surgery and Clinics in Rutherford County.

In a 2019 transaction with subsidiaries of CHS, VUMC acquired Tennova Healthcare-Lebanon, a 274-bed hospital in Lebanon, Tennessee, now called Vanderbilt Wilson County Hospital.

"We are continuing to strengthen our presence across Middle Tennessee so that we can fulfill the Medical Center's mission to advance the health and well-being of the region we serve. As we have in other counties, we are making a significant commitment to the citizens of these communities and look forward to working together toward this important goal with our new colleagues at these hospitals and clinics," said Jeff Balser, MD, PhD, President and CEO of VUMC and Dean of the Vanderbilt University School of Medicine.

The purchase of the Shelbyville and Tullahoma facilities and the minority ownership agreement with Tennova Healthcare-Clarksville are subject to regulatory review and are expected to be completed in the fourth quarter of 2020. Terms of the transactions will remain confidential.

In the interim, patients of the Shelbyville and Tullahoma hospitals will experience no interruption in care while leaders with VUMC and CHS work closely together to ensure a smooth transition of ownership.

"Serving the citizens of Shelbyville and Tullahoma through these hospitals and strengthening our relationship with Tennova Healthcare-Clarksville is an exciting next step for our health system. Each facility plays a vital role in their community and we are delighted to join with the physicians, nurses and staff at each hospital in their important work," said C. Wright Pinson, MBA, MD, Deputy CEO and Chief Health System Officer for VUMC.

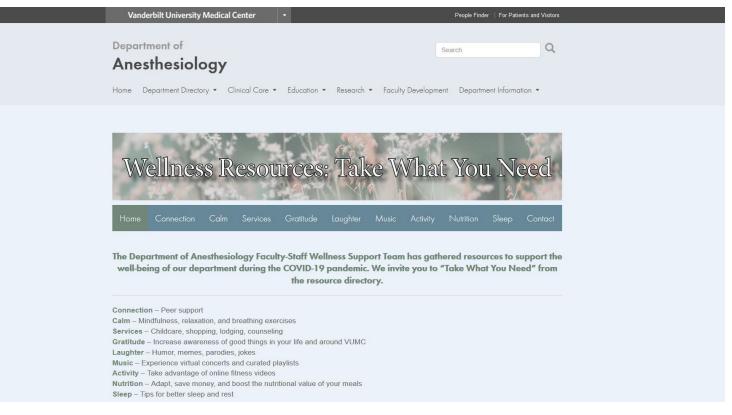
It is the commitment of VUMC to hire substantially all employees of Tennova Healthcare-Shelbyville and Tennova Healthcare-Harton who are in good standing when transfer of the hospitals' ownership is complete. Tennova Healthcare-Clarksville and its employees and medical staff will remain a part of the Tennova network of hospitals.

"Clarksville Volunteer Health looks forward to the expansion of Vanderbilt's role in the Clarksville-Montgomery County area," said William H. Wyatt, Chairman of the Board of Directors of CVH. "Ensuring our residents have access to high quality health care is critical to the mission of CVH, and we are excited about the opportunity to grow Tennova Healthcare-Clarksville's partnership with a world-class academic health system and ensure the citizens of our community enjoy continued and enhanced opportunities to receive first-rate care."

Tennova Healthcare-Shelbyville is a 60-bed, Joint Commission-accredited hospital that employs approximately 275 physicians, nurses and staff and offers a range of inpatient and outpatient medical and surgical services, along with urgent care services. The hospital is certified by the American Heart Association. After 60 years of service to the citizens of Bedford County in its original facility, a new hospital was constructed in 2008. In 2019, nearly 1,000 patients were admitted to the hospital and approximately 1,600 inpatient and outpatient surgical procedures were performed.

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Department of Anesthesiology offers COVID-19 pandemic wellness resources



By Yvonne Poindexter

When news of the COVID-19 pandemic broke in March, leaders in the Department of Anesthesiology pivoted quickly to ensure that faculty and staff had the resources they would need to face the pandemic's unprecedented challenges. A Faculty and Staff Support Team, led by Amanda L. Stone, PhD, was established and charged with curating a list of resources on topics from dealing with the extreme stress faced by frontline clinicians to dealing with practical issues, such as finding child care and, for staff, figuring out how to "work from home."

The many resources are featured on the department's "Take What You Need" website. With a link featured on the department's home page, the site is designed to help faculty and staff adapt to and manage the many ways in which life has changed since "lockdown" entered our everyday lexicon. Site visitors can choose resources from nine broad categories:

Connection - Peer support

Calm – Mindfulness, relaxation, and breathing exercises **Services** – Childcare, shopping, lodging, counseling **Gratitude** – Increase awareness of good things in your life and around VUMC

Laughter – Humor, memes, parodies, jokes Music – Experience virtual concerts and curated playlists Activity – Take advantage of online fitness videos Nutrition – Adapt, save money, and boost the nutritional value of your meals

Sleep – Tips for better sleep and rest

Now eight months into the pandemic, the Support Team continues to update the site as needed.

Scan QR code below to access the Take What You Need webpage.



Freundlich, senior author on study examining bleeding vs clotting

Originally published in the VUMC Reporter on Jul. 20, 2020

By Craig Boerner

Post-surgical bleeding is associated with more deaths than blood clots from surgery, according to a Vanderbilt University Medical Center study published in the journal *Anesthesia & Analgesia*.

Researchers used nearly 15 years of data on millions of patients from the American College of Surgeons' National Surgical Quality Improvement Program database, and some very advanced computer techniques, to do a direct comparison of bleeding versus clotting after surgery for patients in the U.S.

"We wanted to do a head-tohead comparison of those two in a large surgical population and look at the tradeoff in terms of mortality. We found, in every single year, a consistent signal for bleeding," said senior author Robert Freundlich, MD, assistant professor of Anesthesiology and Biomedical Informatics at Vanderbilt University Medical Center.

"Bleeding had very, very high attributable mortality, mean-

ing death that you could say statistically was related to the occurrence of bleeding. Whereas, in every single year, we didn't see that same signal for blood clots," he said.

The America College of Surgeons tracks bleeding for the first 72 hours after surgery in their database whereas blood clots are tracked for up to 30 days after surgery. Most bleeding related to the surgery itself is generally early, in the first three days, whereas blood clots, even if they are related to the surgery itself, can takes weeks or up to a month to occur.

"Clinically, we often think of bleeding and blood clots as competing interests, so a lot of the things that we do to decrease bleeding can increase the risk of blood clots," Freundlich said. "And, conversely, a lot of the things that we do to treat blood clots can increase the risk of bleeding.

Adjustments were made for patients' baseline risk of dying after surgery, what procedure they were having and for other complications which may have happened after surgery.

Freundlich and first author Melissa Bellomy, MD, clinical fellow, Division of Cardiothoracic Anesthesiology, noted that clotting has been studied very intensely in recent years, with a number of large national groups putting out recommendations for how best to treat and prevent blood clots after surgery.

"I think people are doing a really good job of addressing blood clots after surgery, making sure that even when blood clots do happen they aren't bad enough to lead to a patient dying," Freundlich said. "And I would like to think that current medical therapy is probably working well, which is what we see in the database. Really just very, very undetectable mortality."

But bleeding remains a very concerning complication after surgery, based on what he and colleagues found in the database.

"The mortality attributable to bleeding in the time period around surgery was significantly higher than from blood clots in every year that we studied," Bellomy said. "This raises the important questions of why bleeding is associated with more death and how can we best treat patients to prevent death associated with bleeding."



Robert Freundlich, MD, is a senior author on a study published in Anesthesia & Analgesia.

Treatments depend on the source of the bleeding but can include going back and reexploring or revising the initial surgery, giving blood products to help prevent bleeding, and pharmacologic therapies used to try to prevent bleeding after surgery.

"What is most important is having a team of expert providers who know when they need to be very aggressive in treating these post-operative complications, particularly with bleeding," Freundlich said.

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Located in Tullahoma and employing approximately 450 physicians, nurses and staff, Tennova Healthcare-Harton is a 135-bed Joint Commission-accredited hospital offering a full range of inpatient and outpatient surgical and specialty services including a sleep center, cardiac rehabilitation and physical rehabilitation.

The hospital is accredited by the Joint Commission and features an accredited Chest Pain Center. In 2017, the hospital celebrated 50 years of service to its community. In its most recent year, Tennova Healthcare-Harton admitted nearly 3,500 patients and performed nearly 4,800 inpatient and outpatient procedures. Tennova Healthcare-Clarksville is a 270-bed facility that features a comprehensive range of inpatient and outpatient, medical and surgical services. Tennova Healthcare-Clarksville has been designated as an Accredited Chest Pain Center, a Blue Distinction Center for Maternity Care, a Wound Care Center of Distinction and earned the Gold Seal of Approval from The Joint Commission. The hospital also has a freestanding Emergency Room located a short distance from the hospital.

Department Spotlight: Celebrating Departmental Accomplishments

Sarah Anderson and **Lexi Tittor** received the Department Staff Credo Award during the Oct. 7 staff meeting.

Matthew Barajas, MD, was recently awarded a starter grant by the Society of Cardiovascular Anesthesiologists. The grant is titled "Altered Efficacy of Ischemic Post Conditioning after Cardiac Arrest in a Diabetic Rat Model."

Josh Billings, MD, and David McIlroy, MB.BS., MD, MCIinEpi, FANZCA, have been invited to participate in the 2021 Mid-career Leadership Development Program.

Christina Boncyk, MD, received a FAER Mentored Research Training Grant for her project "The Impact of Increased Prescribing on ICU Survivors."

Congratulations to **Leslie Fowler, MEd,** on the publication of "Development

and Implementation of a Nonclinical Professional Development Rotation" in *A&A Practice.*

Congratulations to **Brad Koss**, who assumed the role of CRNA Manager of Education.

James Lozada, DO, and David Chestnut, MD, were invited to serve on VUMC's Racial Equity Task Force.

Allison Owen, PhD, has been selected to be a part of the Immunological Mechanisms of Disease Training Program.

Crystal Parrish has been promoted to Team Lead for APPs on the Acute Pain & Perioperative Services team.

Naeem Patil, MBBS, PhD, received the Vanderbilt Faculty Scholars Award for his grant *"Targeting mitochondrial* quality control to improve host immunity during sepsis."

Congratulations to **Laura Payne**, who assumed the role of Service Specialist in the Pediatric Anesthesiology Division.

Congratulations to **Mary Peters** who assumed the role of CRNA Manager for the Cardiothoracic Anesthesiology Division.

Kimberly Rengel, MD, received a seed grant from the Center for Musculoskeletal Research, VUMC, for her study assessing skeletal muscle weakness in critically ill patients.

Gale Rowe has been named the new coordinator for the Vanderbilt University Hospital SRNAs.

NEW DEPARTMENT MEMBERS



Hawa Abubakar, MD Fellow Anesthesiology Critical Care Medicine

EDUCATION: Residency, Anesthesiology, Washington University, St. Louis, MO (2020) MD, King's College London GKT School of Medicine, London, UK (2010)

FUN FACT: I speak Swahili fluently.



Clayton Adams, MD Assistant Professor of Clinical Anesthesiology Pediatric Anesthesiology

EDUCATION: Fellowship, Pediatric Anesthesiology, Vanderbilt University Medical Center, Nashville, TN (2020) Residency, Anesthesiology, University of Alabama, Birmingham, AL (2019) MD, Emory University, Atlanta, GA (2015)

FUN FACT: Won state XC and track titles in high school.



Matthew Barajas, MD Instructor Multispecialty Adult Anesthesiology

EDUCATION: Fellowship, Adult Cardiothoracic Anesthesiology, Columbia University, New York, NY (2019) Residency, Anesthesiology, Columbia University, New York, NY (2018) MD, Columbia University, New York, NY (2014)

FUN FACT: I am an avid rock climber. I would love to have a chicken coop.



Hannah Bechtold, MD Fellow Anesthesiology Critical Care Medicine

EDUCATION: Residency, Anesthesiology, Stanford University, Palo Alto, CA (2019) MD, University of California, Los Angeles, CA (2015)

FUN FACT: I've climbed Mount Fuji in Japan.

> **FUN FACT:** I love scones and running to earn them.

Picture Unavailable

Emilee Borgmeier, MD

Fellowship, Perioperative

of Utah, Salt Lake City, UT

Residency, Anesthesiology,

University of Utah, Salt Lake

MD, Indiana University,

Indianapolis, IN (2016)

Echocardiography, University

Perioperative Medicine

EDUCATION:

City, UT (2019)

Fellow

(2020)



Meghan Breed, MD Fellow Anesthesiology Critical Care Medicine

EDUCATION:

Residency, Emergency Medicine, Vanderbilt University Medical Center, Nashville, TN (2020) MD, George Washington School of Medicine and Health Sciences, Washington D.C. (2017)

FUN FACT:

I have two redbone coonhounds named Pete and Charley.



Kaitlyn Brennan, DO, MPH Fellow Obstetric Anesthesiology

EDUCATION:

Residency, Anesthesiology, Mayo Clinic, Rochester, MN (2019) DO, Lake Erie College of Osteopathic Medicine, Erie, PA (2015) MPH, The Dartmouth Institute for Health Policy and Clinical Practice, Hanover, NH (2009)

FUN FACT:

I am a fan of all things farm related, including raising chickens and growing lots of veggies.



Lucille Brunker, MD Fellow Anesthesiology Critical Care Medicine

EDUCATION:

Residency, Anesthesiology, Vanderbilt University Medical Center, Nashville, TN (2020) MD, University of Utah, Salt Lake City, UT (2016)

FUN FACT:

I continue to be a Utah Jazz NBA fan even though I moved to Nashville from Utah four years ago.



Pamela Butler Associate Business Intelligence Analyst

EDUCATION:

BS, Business Administration/ Finance Concentration, Valparaiso University, Valparaiso, IN (1990)

FUN FACT: I owned a knitting store in

Nashville (Green Hills) for 14 years.



Christopher Carver Certified Registered Nurse Anesthetist

EDUCATION: MS, Nurse Anesthesia,

Middle Tennessee School of Anesthesia, Madison, TN (2018) **BS**, Nursing, University of Akron, Akron, OH (2009)

FUN FACT:

I am a former professional tag player.



Nicole Cavanaugh Administrative Assistant Cardiothoracic Anesthesiology

EDUCATION:

BS, Health and Human Performance, Austin Peay State University, Clarksville, TN (2009)

FUN FACT:

I love animals, the beach, and my favorite color is purple.



Ling Chan Certified Registered Nurse Anesthetist

EDUCATION:

MS, Nurse Anesthesia, Wolford College, Naples, FL (2019) BSN, Charleston Southern University, Charleston, SC (2002)

FUN FACT:

Although I am Chinese and born overseas, I love to cook and eat Italian food!!



Jared Cummings, MD Assistant Professor of Clinical Anesthesiology Multispecialty Adult Anesthesiology

EDUCATION:

Fellowship, Adult Cardiothoracic Anesthesiology, Vanderbilt University Medical Center, Nashville, TN (2020) Residency, Anesthesiology, Vanderbilt University Medical Center, Nashville, TN (2019) MD, Virginia Commonwealth University, Richmond, VA (2015)

FUN FACT:

I have my private pilot license. I am a sailor. I love SCUBA diving, travel, and cooking.



Jonathan Day, MD Fellow Pain Medicine

EDUCATION:

Fellowship, Regional Anesthesiology and Acute Pain Medicine, Mayo Clinic, Jacksonville, FL (2012) Residency, Anesthesiology, University of Florida, Gainesville, FL (2011) MD, Uniformed Services University of the Health Sciences, Bethesda, MD (2005)

FUN FACT: I speak Spanish and Portuguese.



Austin DeBeaux, MD Fellow Anesthesiology Critical Care Medicine

EDUCATION: Residency, Anesthesiology, Harvard Medical School, Boston, MA (2020) MD, University of Texas Health, Houston, TX (2016)

FUN FACT: I love to cook Cajun dishes.



Daniella DiNizo, MD Fellow Anesthesiology Critical Care Medicine

EDUCATION: Residency, Vanderbilt University Medical Center, Nashville, TN (2020) MD, University of North Carolina, Chapel Hill, NC (2016)

FUN FACT: I'm in the process of

obtaining my Italian citizenship!



Rebecca Donald, MD Assistant Professor Pain Medicine & Multispecialty Adult Anesthesiology

EDUCATION:

Fellowship, Interventional Pain, Vanderbilt University Medical Center, Nashville, TN (2020) Residency, Anesthesiology, Duke University Hospital Durham, NC (2019) MD, University of Virginia, Charlottesville, VA (2015)

FUN FACT:

One of the best experiences of my life was spending a year studying art history in France.



Charles Doyle, MD Fellow Regional and Acute Pain Medicine

EDUCATION: Residency, Anesthesiology, University of Florida, Gainesville, FL (2020) MD, University of Central Florida, Orlando, FL (2016)

FUN FACT:

I've played ice hockey (in Florida) since I was four years old.



Elizabeth Emhardt, MD Fellow Anesthesiology Critical Care Medicine

EDUCATION:

Residency, Anesthesiology, Indiana University, Indianapolis, IN (2020) MD, Indiana University, Indianapolis, IN (2016)

FUN FACT:

I am the oldest of four and my siblings are my favorite people.



Benjamin Fedeles, MD Fellow Anesthesiology Critical Care Medicine

EDUCATION:

Residency, Anesthesiology, University of Maryland Medical Center, Baltimore, MD (2020) MD, University of South Florida, Tampa, FL (2016)

FUN FACT:

I am an avid gardener, hunter, and I love to cook.



Bianca Flores, PhD Research Fellow Research

EDUCATION:

PhD, Neuroscience, Vanderbilt University, Nashville, TN (2020) BS, Neuroscience, University of Rochester, Rochester, NY (2014)

FUN FACT: I have two dogs



Alexander George, MD Instructor Multispecuality Adult Anesthesiology

EDUCATION:

Residency, Anesthesiology, Vanderbilt University Medical Center, Nashville, TN (2020) MD, Tulane University, New Orleans, LA (2016)

FUN FACT: I am SCUBA certified.



Andrew Gessouroun, MD Fellow Anesthesiology Critical Care Medicine

EDUCATION:

Residency, Anesthesiology, Vanderbilt University Medical Center, Nashville, TN (2020) MD, University of Oklahoma, Kansas City, OK (2016)

FUN FACT:

I taught 4th and 5th grades with Teach for America.



Sengdao Ha Certified Registered Nurse Anesthetist

EDUCATION:

MS, Nurse Anesthesia, Middle Tennessee School of Anesthesia, Madison, TN (2010)BSN, Cumberland University, Lebanon, TN (2006)

FUN FACT: I have a twin sister who is also a CRNA.



Saad Hashmi, MD Assistant Professor of Clinical Anesthesiology Multispecialty Adult Anesthesiology

EDUCATION:

Fellowship, Anesthesiology Critical Care Medicine, Medical College of Wisconsin, Milwaukee, WI (2016) Residency, Anesthesiology, Medical College of Wisconsin, Milwaukee, WI (2015) MD, Aga Khan University, Karachi, Pakistan (2006)

FUN FACT:

Once upon a time, I was a participant in a nationwide video gaming competition. When I came in second place, it pushed me into taking up medicine as a career.



Kristina Heering Certified Registered Nurse Anesthetist

EDUCATION: MS, Middle Tennessee School of Anesthesia, Madison, TN (2016)BS, Nursing, Belmont University, Nashville, TN (2011)

FUN FACT:

I am married to my high school sweetheart and we have two beautiful girls. My favorite hobbies are watercolor, weaving, baking, kayaking, and camping.



Karl Hillenbrand, MD Fellow Cardiothoracic Anesthesiology

EDUCATION:

Residency, Anesthesiology, University of Virginia, Charlottesville, VA (2020) MD, Virginia Commonwealth University, Richmond, VA (2012)

FUN FACT:

I lived in Italy for three years and my son had visited 25 countries by the age of three



Michael Hof, MD, PhD Associate Professor of Clinical Anesthesiology Multispecialty Adult Anesthesiology & Neuroanesthesiology

EDUCATION:

PhD, Ludwig Maximilian University, Munich, Germany (1996)

Residency, Anesthesiology, Board-Chamber of Physicians, Düsseldorf, Germany (1995) MD, Philipps University of Marburg, Germany (1990)

FUN FACT:

I have practiced medicine in many different places around the world.



Julio Gonzalez-Sotomayor, MD

Associate Professor of Clinical Anesthesiology Multispecialty Adult Anesthesiology

EDUCATION:

Fellowship, Pain Medicine, Johns Hopkins University School of Medicine, Baltimore, MD (2000) Residency, Anesthesiology, Pontificia Universidad Catolica de Chile, Santiago, Chile (1993) MD, Universidad de Concepcion, Concepcion, Chile (1990)

FUN FACT:

I am interested in Global Health and have participated in medical mission trips to Ethiopia. I am fluent in Spanish, English and French. My hobbies include hiking, bicycling, scuba diving, and traveling around the world.



Jordan Hollinshead Certified Registered Nurse Anesthetist

EDUCATION:

DNP, Nurse Anesthesia, Medical University of South Carolina, Charleston, SC (2020) BS, Nursing, Charleston Southern University, North Charleston, SC (2014)

FUN FACT:

I played golf in college.



Sandra Holtzclaw Associate Program Manager Cardiothoracic Anesthesiology

FUN FACT:

I enjoy writing and performing skits and plays. I am a great cook and enjoy baking.



Christopher Huber, MD Fellow Cardiothoracic Anesthesiology

EDUCATION:

Residency, Anesthesiology, University of North Carolina, Chapel Hill, NC (2020) MD, University of Kentucky, Lexington, KY (2016)

FUN FACT:

I am a diehard University of Louisville fan.



Zachary Jeanes, MD, PhD Fellow Pediatric Anesthesiology

EDUCATION:

Residency, Anesthesiology, Medical University of South Carolina, Charleston, SC (2020) MD, Texas A&M University, Bryan, TX (2016) PhD, Pharmacology, University of Texas, Austin, TX (2012)

FUN FACT:

I'm a pretty decent baker.



Megan Kemp, MD Fellow Pediatric Anesthesiology

EDUCATION:

Residency, Anesthesiology and Perioprative Medicine, Augusta University, Augusta, GA (2020) MD, University of Queensland, New Orleans, LA (2015)

FUN FACT:

I love the ocean, swimming, and scuba diving. Summer is my absolute favorite season.



Shaun Kuoni, MD Fellow Pain Medicine

EDUCATION:

Residency, Anesthesiology, Vanderbilt University Medical Center, Nashville, TN (2020) MD, McGovern Medical School at the University of Texas Health Science Center at Houston, Houston, TX (2016)

FUN FACT:

I'm a coffee connoisseur, and I love to try new beans while brewing espresso at home.



Seung Yup Lee, PhD Research Fellow Research

EDUCATION:

PhD, Industrial and Systems Engineering, Wayne State University, Detroit, MI (2018) MS, Industrial and Systems Engineering, Wayne State University, Detroit, MI (2014)

FUN FACT:

I am married to my childhood girlfriend who I first met when we were 9 years old.

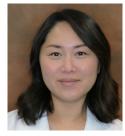


Katherine Loh, MD Assistant Professor Pediatric Anesthesiology

EDUCATION:

Fellowship, Pediatric Anesthesiology, Children's Hospital of Philadelphia, Philadelphia, PA (2020) Residency, Anesthesiology, New York Presbyterian, Weill Cornell, New York, NY (2019) MD, Emory University School of Medicine, Atlanta, GA (2015)

FUN FACT: I love coffee.



Dianne Lou, MD, PhD Instructor Multispecialty Adult Anesthesiology

EDUCATION:

Residency, Anesthesiology, Vanderbilt University Medical Center, Nashville, TN (2020) MD, University of Texas, Galveston, TX (2016) PhD, Cell and Molecular Biology, University of Texas, Austin, TX (2014)

FUN FACT: I was in ESL classes until the third grade.



Benjamin MacDougall, MD Assistant Professor of Clinical Anesthesiology Pain Medicine & Multispecialty Adult Anesthesiology

EDUCATION:

Fellowship, Pain Medicine, Brigham and Women's Hospital, Boston, MA (2020) Residency, Anesthesiology, Massachusetts General Hospital, Boston, MA (2019) MD, Yale University, New Haven, CT (2015)

FUN FACT:

I am from Canada and I'm a big hockey fan! I am excited to start watching and playing again in Nashville.



Kevin Manz, PhD Research Fellow Research

EDUCATION:

PhD, Vanderbilt University, Nashville, TN (2019) BA, Psychology, Ramapo College of New Jersey, Mahwah, NJ (2013)

FUN FACT:

I surfed competitively in high school.



Kyle Marose, MD Assistant Professor of Clinical Anesthesiology Multispecialty Adult Anesthesiology

EDUCATION:

Fellowship, Regional Anesthesia and Acute Pain, University of Pittsburgh, Pittsburgh, PA (2020) Residency, Anesthesiology, New York University, New York, NY (2019) MD, Indiana University, Indianapolis, IN (2015)

FUN FACT:

Although not for a lack of trying, I have never beat my wife in a round of golf.



Brittany McCann, MD Fellow Anesthesiology Critical Care Medicine

EDUCATION:

Residency, Anesthesiology and Perioperative Medicine, Pennsylvania State University, Hershey, PA (2020) MD, Pennsylvania State University, Hershey, PA (2016)

FUN FACT:

I ran the Disney marathon in 2016.



Samantha McClenahan, PhD Research Fellow Research

EDUCATION:

PhD, Pharmacology & Toxicology, University of Arkansas for Medical Sciences, Little Rock AR (2019) BA, Environmental Studies, Vassar College, Poughkeepsie, NY (2013)

FUN FACT:

I love spending time with my two boys, Odin and Abel. I enjoy playing softball and gardening.



Marc McLawhorn, MD Assistant Professor Neuroanesthesiology

EDUCATION: Fellowship,

Neuroanesthesiology, Duke Univesity, Durham, NC (2017) Residency, Anesthesiology, Medical University of South Carolina, Charleston, SC (2016) MD, Medical University of South Carolina Charleston, SC (2012)

FUN FACT:

I serve on a Critical Care Air Transport Team for USAF.



Julia Mitchell Research Nurse Specialist III

EDUCATION:

RN, University of Massachusetts, Graduate School of Nursing, Worcester, MA (2013) MS, Medical Sciences/ Biochemistry, Boston University School of Medicine, Boston, MA



Joseph Netterville, MD Assistant Professor of Clinical Anesthesiology Multispecialty Adult Anesthesiology

EDUCATION: Residency, Baptist Hospital, Memphis, TN (1986) MD, University of Tennessee Center for Health Sciences, Memphis, TN (1985)

FUN FACT:

I have been on over 20 medical mission trips to Guatemala, Africa, and Haiti.



Michelle Orr Associate Program Manager Administration

EDUCATION: BS, Business, Welch College, Nashville, TN (1987)

FUN FACT:

People who know me well think I should open up my own bakery.



Andew Pisansky, MD Assistant Professor of Clinical Anesthesiology Pain Medicine and Multispecialty Adult Anesthesiology

EDUCATION:

Fellowship, Pain Medicine, Brigham and Women's Hospital, Boston, MA (2020) Residency, Anesthesiology, Brigham and Women's Hospital, Boston, MA (2019) MD, University of Minnesota Medical School, Minneapolis, MN (2015)

FUN FACT:

I have driven through the highest mountain pass in the Himalayan Mountains.



Lauren Poe, DO Assistant Professor of Clinical Anesthesiology Pain Medicine and Multispecialty Adult Anesthesiology

EDUCATION:

Fellowship, Interventional Pain, Virginia Mason Medical Center, Seattle, WA (2020) Residency, Anesthesiology, Vanderbilt University Medical Center, Nashville, TN (2019) DO, Texas College of Osteopathic Medicine, Fort Worth, TX (2015)

FUN FACT:

I'm a third degree black belt.



Leila Price Certified Registered Nurse Anesthetist

EDUCATION:

MS, Nurse Anesthesia, East Carolina University, Greenville, NC (2020) BS, Nursing, University of North Carolina, Charlotte, NC (2014)

FUN FACT:

I love to visit aquariums and learning about sea life.



Brandon Pruett, MD Fellow Regional and Acute Pain Medicine

EDUCATION:

Residency, Anesthesiology, Ohio State University Wexner Medical Center, Columbus, OH (2020) MD, University of Mississippi Medical School, Jackson, MS (2016)

FUN FACT: I play guitar.



David Roberts, MD Assistant Professor Pediatric Anesthesiology

EDUCATION:

Fellowship, Pediatric Anesthesiology, Vanderbilt University Medical Center, Nashville, TN (2020) Residency, Anesthesiology, Vanderbilt University Medical Center, Nashville, TN (2019) MD, Mayo Medical School, Rochester, MN (2015)

FUN FACT: I once had a pet

mockingbird.



Kaylyn Sachse, MD Assistant Professor Multispecialty Adult Anesthesiology

EDUCATION: Fellowship, Regional

Anesthesia and Acute Pain Medicine, Vanderbilt University Medical Center, Nashville, TN (2020)

Residency, Anesthesiology, University of Texas Health Science Center, San Antonio, TX (2019) MD, University of Texas Southwestern Medical Center, Dallas, TX (2015)

FUN FACT:

I have an adorable miniature labradoodle puppy.



Sarah Schroeder, MD Fellow Pain Medicine

EDUCATION:

Residency, Anesthesiology, University of Wisconsin, Madison, WI (2020) MD, University of Wisconsin, Madison, WI (2016)

FUN FACT:

I have six brothers and





Danial Shams, MD Assistant Professor Multispecialty Adult Anesthesiology

EDUCATION:

Fellowship, Regional Anesthesia and Acute Pain Medicine, Vanderbilt University Medical Center, Nashville, TN (2020)

Residency, Anesthesiology, Rush University Medical Center, Chicago, IL (2019) MD, University of Texas Medical School, Houston, TX (2015)

FUN FACT:

I'm a Texas-raised Packers fan.



Benjamin Seiler Certified Registered Nurse Anesthetist

EDUCATION:

MSN, Anesthesia, University of Tennessee, Chattanooga, TN (2019) BSN, University of Wisconsin, Oshkosh, WI (2006)

FUN FACT:

After playing Division 3 football in college, I played a season in Finland for the Helsinki Wolverines.



Michael Taylor, MD Fellow Obstetric Anesthesiology

EDUCATION:

Residency, Anesthesiology, Northwestern University, Chicago, IL (2020) MD, Wayne State University, Detroit, MI (2016)

FUN FACT: I love to cook.



Amanda Toye, MD Assistant Professor of Clinical Anesthesiology Pain Medicine

EDUCATION:

Fellowship, Interventional Pain Medicine, Wake Forest University, Winston-Salem, NC (2012) Residency, Anesthesiology, University of Texas Southwestern Medical Center, Dallas, TX (2011) MD, Oklahoma University College of Medicine, Oklahoma City, OK (2007)

FUN FACT:

I enjoy gardening and I also play the harp.



Jennifer Vest Certified Registered Nurse Anesthetist

EDUCATION:

MS, Nurse Anesthesia, Middle Tennessee School of Anesthesia, Madison, TN (1998)BS, Nursing, Harding University, Searcy, AR (1993)

FUN FACT:

I just purchased a new Boxer puppy. His name is Brooks.



David Vinsant Business Intelligence Analyst Vanderbilt Anesthesiology & Perioperative Informatics Research

EDUCATION:

BS, Business Informatics, Western Kentucky University, Bowling Green, KY (2017)

FUN FACT:

I have run a relay race from Chattanooa, TN to Nashville, TN.



Katherine Williams, DO Fellow Pain Medicine

EDUCATION:

Residency, Anesthesiology, Vanderbilt University Medical Center, Nashville, TN (2020) DO, Touro College of Osteopathic Medicine, New York, NY (2012)

FUN FACT: I can snowblade.



David Willis, MD, PhD Assistant Professor of Clinical Anesthesiology Multispecialty Adult Anesthesiology

EDUCATION:

Fellowship, Perioperative Medicine, University of Utah, Salt Lake City, UT (2009) Residency, Anesthesiology, University of Utah, Salt Lake City, UT (2008) PhD, Molecular Cell Biology, Washington University, St. Louis, MO (2004) MD, Washington University, St. Louis, MO (2004)

FUN FACT:

I was snowed in at my in-laws' house on my honeymoon.



Jenna Wineka Certified Registered Nurse Anesthetist

EDUCATION:

MSN, Anesthesia, University of South Carolina, Columbia, SC (2012) BSN, University of North Carolina at Chapel Hill, Chapel Hill, NC (2008)

FUN FACT: I love to bake.



Austin Woolard, MD Fellow Cardiothoracic Anesthesiology

EDUCATION:

Residency, Anesthesiology, Vanderbilt University Medical Center, Nashville, TN (2020) MD, University of Tennessee Health Science Center, Memphis, TN (2016)

FUN FACT: I played Division 1 soccer at

Vanderbilt.

I am hardworking, reliable, always seeking knowledge, team player, and easy to work with.

FUN FACT:

Picture Unavailable

Cardiothoracic Anesthesiology

Eyob Yinnesu, MD

Fellow



Stefanie Zeeman Certified Registered Nurse Anesthetist

EDUCATION:

MSN, Anesthesia, University of North Carolina, Charlotte, NC (2017) BSN, University of North Carolina, Wilmington, NC (2011)

FUN FACT: I'm half Dutch.

EDUCATION: Residency, Anesthesiology, Case Western Reserve University, Cleveland, OH (2018)MD, Addis Ababa University, Addis Ababa, Ethiopia (2001)

Recent Publications

Abrams B, **Kertai MD**, Weitzel N. Contribution of Cardiothoracic and Abdominal Transplant Anesthesiologists: Leading the Way for the Full Spectrum of Patients in Midst of COVID-19 Pandemic. Semin Cardiothorac Vasc Anesth. 2020 Sep;24(3):199-201. doi: 10.1177/1089253220946176. PMID: 32721203.

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Bruehl S, France CR, **Stone AL, Gupta R,** Buvanendran A, **Chont M,** Burns JW. Greater Conditioned Pain Modulation Is Associated With Enhanced Morphine Analgesia in Healthy Individuals and Patients with Chronic Low Back Pain. Clin J Pain. 2020 Oct 20. doi: 10.1097/AJP.000000000000887. Epub ahead of print. PMID: 33086239.

Brummel NE, Girard TD, **Pandharipande PP**, Thompson JL, Jarrett RT, Raman R, **Hughes CG**, Patel MB, Morandi A, Gill TM, Ely EW. Prevalence and Course of Frailty in Survivors of Critical Illness. Crit Care Med. 2020 Jun 26. doi: 10.1097/CCM.000000000004444. Epub ahead of print. PMID: 32618688.

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Cui Y, Cao R, Wang Y, Li G. Lung Recruitment Maneuvers for ARDS Patients: A Systematic Review and Meta-Analysis. Respiration. 2020;99(3):264-276. doi: 10.1159/000501045. Epub 2019 Jul 22. PMID: 31330508.

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