

2020-2021
DEPARTMENT
PROFILE



DEPARTMENT OF ANESTHESIOLOGY

VANDERBILT  UNIVERSITY
MEDICAL CENTER



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CLINICAL CARE

EDUCATION

RESEARCH

DEPARTMENT OF ANESTHESIOLOGY

VANDERBILT  UNIVERSITY
MEDICAL CENTER

Compassionate | Creative | Committed | Collaborative

Message from the Chair



Thank you for your interest in the Vanderbilt University Medical Center Department of Anesthesiology. Our growth and success stem from Vanderbilt University Medical Center's five-pillar commitment to excellence: people, service, quality, growth & finance, and innovation. Vanderbilt's credo drives us to achieve excellence in healthcare, research and education; we treat others as we wish to be treated; and we continuously evaluate and improve our performance. As the role of the anesthesiologist evolves into that of a perioperative consultant, our diverse team of experts remains at the forefront of knowledge and technology in patient care, research and education.

Our values—compassion, creativity, commitment and collaboration—are the keystones of our structure and systems. You will see evidence of this throughout this guide. Our patients are recovering faster and with greater comfort through implementation of Enhanced Recovery After Surgery (ERAS) protocols, a collaborative effort led by our faculty, our trainees and our surgical colleagues. Our informatics infrastructure uses innovative data analyses to increase patient safety and clinician effectiveness.

COVID-19 has prompted many other changes across the medical center. Despite all that is happening, Vanderbilt University Medical Center is dedicated to maintaining the same groundbreaking and outstanding care that our patients depend upon. And we are more committed than ever to all the extra missions that distinguish academic medical centers from other hospitals – education, discovery and leadership. That is a lot to ask, but I know we will not fail our patients. I have never been prouder to be the chair of our great department.

Our investigators brought in more than \$8 million in total extramural research funding in 2019-2020, including more than \$4.6 million in awarded NIH grants—placing Vanderbilt Anesthesiology 17th among U.S. academic anesthesiology departments for NIH funding. The department's research productivity, determined by publication in peer-reviewed journals, grant dollars and ongoing research studies, continues to be strong. Thirty-two members of the department have been elected into the Association of University Anesthesiologists (AUA).

Our dedicated faculty is committed to equipping graduates for a promising future in anesthesiology. We offer training using cutting edge technology along with opportunities to improve systems of care. We provide a closely guided mentorship program, balancing clinical training and experience with a broad range of academics.

Our success can be attributed to the collaboration that occurs across Vanderbilt University Medical Center and beyond. Our clinical teams participated in more than 102,000 patient encounters last year; caring for patients along their journey to wellness within and beyond Vanderbilt's traditional walls. The Vanderbilt Health Affiliated Network is the largest of its kind and growing rapidly, and our department is leading telemedicine and remote-presence projects that bring our expertise to more patients.

I invite you to peruse this guide and visit www.vumc.org/anesthesiology to learn more about our programs.

Warren Sandberg MD PhD

*Chair, Department of Anesthesiology
Vanderbilt University Medical Center
Chief of Staff, Perioperative and Critical Care Services
Vanderbilt University Adult Hospital
Professor of Anesthesiology, Surgery and Biomedical Informatics
Vanderbilt University School of Medicine*

Leadership

Executive Committee



Brian J. Gelfand, MD
Associate Vice Chair,
Educational Affairs



Matthew McEvoy, MD
Vice Chair,
Educational Affairs



Pratik Pandharipande,
MD, MSCI
Vice Chair, Faculty Affairs



Mark Rice, MD
Executive Vice Chair,
Anesthesiology



Amy Robertson, MD
Vice Chair, Clinical Affairs



Edward Sherwood,
MD, PhD
Vice Chair, Research
Cornelius Vanderbilt
Chair in Anesthesiology



Matthew Weinger, MD
Associate Vice Chair,
Faculty Affairs



Stephen Doherty, MMHC
Department Administrator

Division Chiefs



Jeanette Bauchat, MD, MS
Chief, Obstetric
Anesthesiology



Christopher Canlas, MD
Chief, Ambulatory
Anesthesiology



Eric Delpire, PhD
Director, Basic Science
Research
BH Robbins Director in
Anesthesiology Research



Brent Dunworth, CRNA,
DNP, MBA
Chief CRNA, Director
of Advanced Practice,
Anesthesiology



David A. Edwards, MD, PhD
Chief, Pain Medicine



Christopher Hughes, MD
Chief, Anesthesiology
Critical Care Medicine



Jill Kilkelly, MD
Chief, Pediatric
Anesthesiology



Bevan Londergan, MD
Chief, Pediatric
Cardiac Anesthesiology



Letha Mathews, MBBS
Chief, Neuroanesthesiology



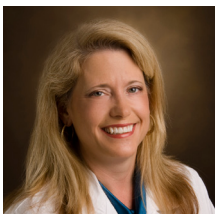
Michael Pilla, MD
Chief, Multispecialty Adult
Anesthesiology



Mias Pretorius,
MBChB, MSCI
Chief, Cardiothoracic
Anesthesiology



Ann Walia, MBBS
Chief, Veterans Affairs
Anesthesiology Service



Liza Weavind, MBBCh, MMHC
Associate Chief, Anesthesiology
Critical Care Medicine

About VUMC



US NEWS AND WORLD REPORT:

Ranks VUMC #1 Hospital in Tennessee, #1 in Nashville
National Rankings in 7 Adult Specialties,
10 Pediatric Specialties

High Performing in 6 Adult Specialties,
10 Procedures and Conditions

Becker's Hospital Review:

One of the "100 Greatest Hospitals in America"

National Institutes of Health:

Among nation's top 15 in peer reviewed funding

Magnet Designated:

VUMC is the only organization designated magnet
in Middle Tennessee

Nashville Business Journal:

Middle Tennessee's healthiest employer

39,182

SURGICAL PROCEDURES

24,039

VUMC EMPLOYEES

1,054 | RESIDENTS
TRAINING
AT VUMC

68 | HOSPITAL
LOCATIONS IN
VANDERBILT HEALTH
AFFILIATED NETWORK

About Nashville



Nashville's history of country music has earned the city its fame as Music City, USA – but this metropolis is about more than tunes and twang. Visitors and residents enjoy great dining, entertainment and cultural life. Because Nashville International Airport is a Southwest Airlines hub, travel to Nashville is convenient and inexpensive. With a growing population of 1.9 million in the Metropolitan Statistical Area, Nashville has received numerous accolades, including being one of *Forbe's Travel Guide* Top 20 Destinations of 2020 and ranking #15 on *U.S. News & World Report's* 125 Best Places to Live in the USA. Nashville typically enjoys a mild and pleasant climate, with only a few days a year having either very hot or very cold conditions and most rainfall occurring in the spring months.

Department Growth

CRNAs

+ FY18 137
+ FY20 155

FACULTY

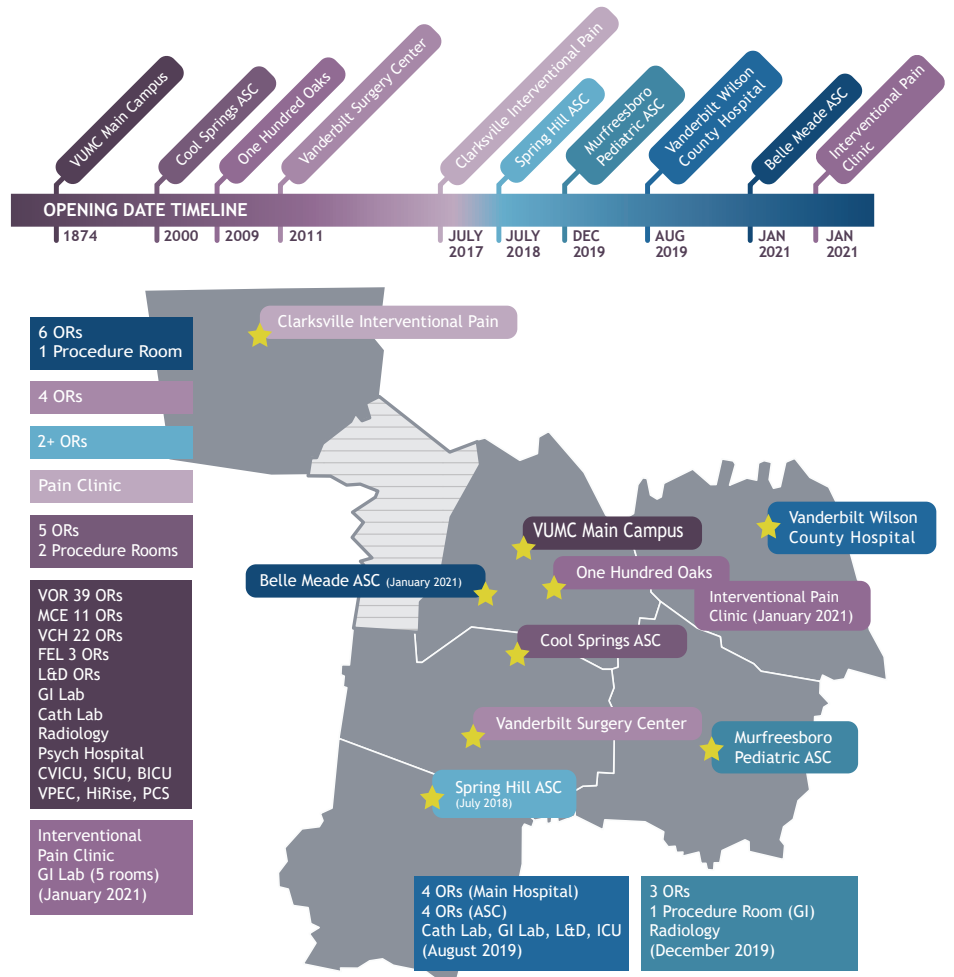
+ FY18 142
+ FY20 152

HOUSESTAFF

+ FY18 99
+ FY20 107

STAFF

+ FY18 78
+ FY20 92



Department History



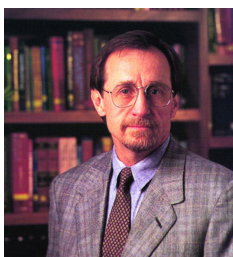
Dr. Benjamin H. Robbins
1946-1961



Dr. Charles B. Pittinger
1962-1969



Dr. Bradley E. Smith
1969-1993



Dr. Charles Beattie
1994-2001



Dr. Jeffrey R. Balsler
2001-2004



Dr. Michael S. Higgins
2004-2010

The Vanderbilt Department of Anesthesiology was one of the first independent departments of anesthesiology in the United States, established on December 12, 1945.

After observing that the battlefield-wounded of World War II were more likely to survive if they received immediate, skilled anesthesia care, Vanderbilt physicians advocated that anesthesiology be established as an autonomous department. At that time, few medical schools possessed an academic anesthesiology service of any type. This tradition of pioneering in our specialty continues today.

Our exemplary faculty provide top-quality clinical services for a full spectrum of medical specialties. Vanderbilt Anesthesiology is recognized as an innovator in perioperative management, health-care information technology, clinical outcomes research, education and international capacity building. We also have high-caliber basic science and clinical research teams pursuing fundamental and translational knowledge to directly improve patient safety and care.

CLINICAL CARE



Serving in one of the largest clinical programs in the nation, Vanderbilt University Medical Center Department of Anesthesiology's clinicians provide procedural, critical care, pain management and all perioperative anesthesia services for more than 102,000 adult and pediatric patient encounters annually at approximately 100 anesthetizing locations. Of these, more than 8,500 patients are seen annually in the Vanderbilt Interventional Pain Clinic, and approximately 25,000 Vanderbilt adult and pediatric patients receive anesthetic care during a radiologic, gastrointestinal, interventional or other diagnostic or therapeutic procedure.

The department's faculty, residents, fellows, certified registered nurse anesthetists (CRNAs) and nurse practitioners provide care in our operating rooms and five adult intensive care units. All surgical specialties are represented, including adult and pediatric cardiac surgery, organ transplantation, robotic surgery, neurosurgery, and high-risk obstetrics. Anesthetics are provided by one of our highly skilled trainees or CRNAs under the direction of an anesthesiologist. We deliver the highest quality care in a safe and effective manner according to the Anesthesia Care Team model, using the unique skills of all team members.

Members of our department actively participate in the multidisciplinary perioperative care of complex patient populations, including trauma and organ transplantation. Vanderbilt University Medical Center provides trauma care for patients within 80,000 square miles and manages close to 8,000 acute trauma cases, admitting 4,700 of those annually. Last year approximately 800 patients were transferred directly to the OR from the emergency department to receive care for their acute traumatic injuries. Performing more than 500 solid organ transplants in 2018 and 8,600

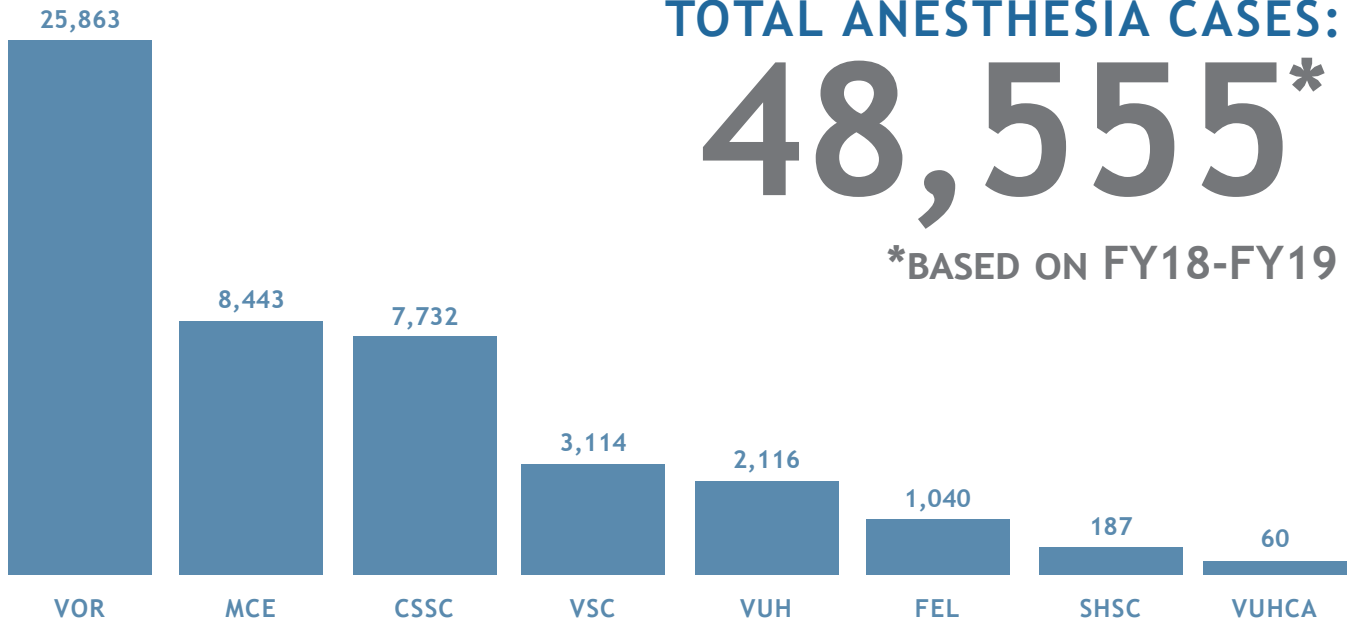
since 1962, Vanderbilt is one of the largest and most experienced transplant centers in the Southeast.

The Vanderbilt Preoperative Evaluation Center (VPEC) offers preoperative evaluation before patients undergo procedures at VUMC. VPEC faculty and staff perform comprehensive preoperative assessment, including interfacing with primary care physicians, specialist consultants and surgeons, while also making direct decisions regarding preoperative testing.

Launched in July 2019, the Department of Anesthesiology Hi-RiSE (High-Risk Surgical Encounter) Service focuses on providing personalized, evidence-based perioperative medical care, from preoperative evaluation and optimization of underlying comorbidities to postoperative recovery, for patients at the highest risk of perioperative morbidity and mortality.

As the role of the anesthesiologist evolves into that of a perioperative consultant, our diverse team of experts remains at the forefront of knowledge and is fully engaged in patient care, from diagnosis to operative recovery. A full-time perioperative teaching service is available 24/7 for consultation, utilizing system-wide information technology and mobile applications to support clinical decision-making, capture data and measure outcomes, such as the quality of recovery after surgery.

Each of our anesthesiologists is a member of one of our nine divisions, with many providing care in a secondary division. Our divisions include ambulatory anesthesiology, anesthesiology critical care medicine, cardiothoracic anesthesiology, neuroanesthesiology, multispecialty adult anesthesiology, obstetric anesthesiology, pain medicine, pediatric anesthesiology, and pediatric cardiac anesthesiology.



Hi-Rise
2,500 - 3,000 VISITS PER YEAR

SOLID ORGAN TRANSPLANTS IN 2018:

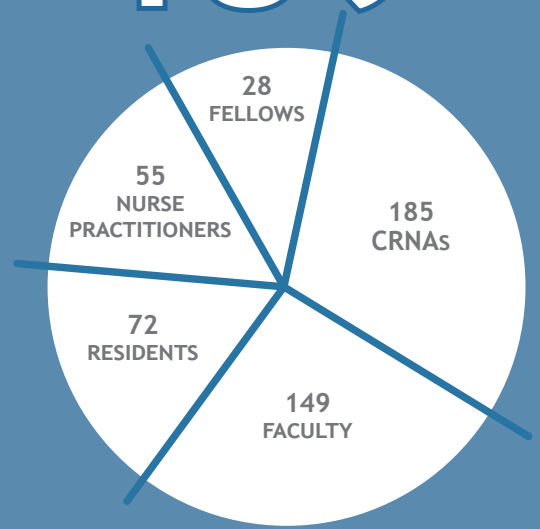
500+

SOLID ORGAN TRANSPLANTS SINCE 1962:

8,000+

TOTAL CLINICAL STAFF:

489*



*BASED ON FY18-FY19

Ambulatory Anesthesiology

Division Chief: Christopher Canlas, MD

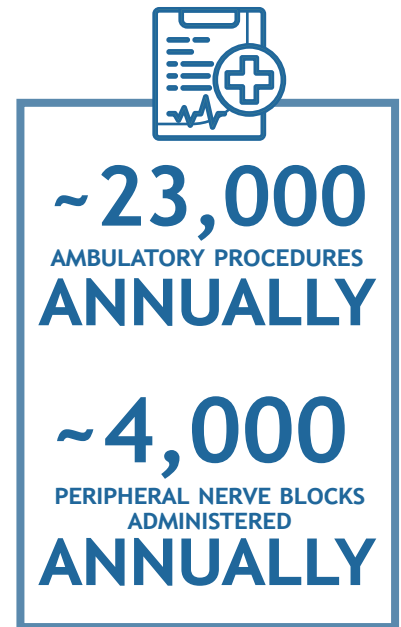
The faculty members and nurse anesthetists who make up the Division of Ambulatory Anesthesiology practice in five locations: Cool Springs Surgery Center, Spring Hill Surgery Center, Medical Center East OR, Vanderbilt Outpatient Surgery, and Vanderbilt Surgery Center. In 2021, they will also staff a new seven operating room surgery center in West Nashville, featuring orthopedic and urologic surgeries.

The Ambulatory faculty members are actively involved in the Society for Ambulatory Anesthesia (SAMBA) through committee service and presentation of abstracts at the society's annual meetings. The Ambulatory faculty are also currently enrolling patients in six randomized controlled clinical trials.

There are three different Ambulatory rotations for residents, and two regional anesthesia fellows spend a combined 32 weeks with the Ambulatory Division. They learn the critical and distinct practice of regional and ambulatory anesthesia in combination, a vital learning experience for future anesthesiologists as the population of ambulatory surgery care is expanded to include more complex cases.

The trend in surgical healthcare continues toward significant growth for outpatient surgeries. The division is committed to addressing this trend with innovation as we explore how to care safely for sicker patients undergoing more complex outpatient surgeries.

The division is unique due to its high volume of patient encounters and its partnership with community practices within the Middle Tennessee area.



Anesthesiology Critical Care Medicine

Division Chief: Christopher Hughes, MD
Associate Chief: Lisa Weavind, MBBCh, MMHC

27

CRITICAL CARE
INTENSIVISTS

30+

ACUTE CARE
NURSE PRACTITIONERS

3

R01 GRANTS

4

CAREER
DEVELOPMENT
AWARDS

60+

PUBLICATIONS

Clinical

The Division of Anesthesiology Critical Care Medicine (ACCM) provides critical care services in the burn ICU, cardiovascular ICU, neurological ICU and surgical ICU at Vanderbilt University Medical Center and in the surgical ICU at the Tennessee Valley Healthcare System (TVHS) Veterans Administration Medical Center in Nashville (Nashville VA). Additionally, division members provide intraoperative anesthetic care for diverse surgical specialties and perioperative consult service care for patients undergoing major surgeries. This includes proficiency in echocardiography, bedside procedures, shock resuscitation, advanced ventilator techniques and management of patients with mechanical circulatory support.

Education

Our ACGME-accredited ACCM fellowship provides an unparalleled innovative and in-depth critical care training opportunity. Rotations include VUMC and Nashville VA ICUs, critical care echo, and a diverse array of electives such as international experiences, medical subspecialties, and research. The teaching curriculum includes daily didactic sessions consisting of lectures, research studios, quality improvement training, echo case review, journal clubs, mortality and morbidity conferences, board preparation, simulation training and many others.

Leadership

Division faculty have leadership roles in organizations such as SCCM, ASA, SOCCA and the American Delirium Society; in clinical administration, including medical directorship of the burn, cardiovascular, neurological, and surgical ICUs at VUMC and the perioperative service and surgical ICU at Nashville VA; in directorship of the Center for Experiential Learning and Assessment and the Critical Illness, Brain Dysfunction, and Survivorship Center at VUMC; in the Vanderbilt School of Medicine via immersion programs; and in the VUMC Institutional Review Board.

Research

Division faculty present at regional, national, and international academic conferences. Faculty have received funding for research from the NIH (R01 and K23 grants), FAER, and industry. Areas of investigation include mechanistic work (acute kidney injury, delirium, cognitive and functional impairment, sepsis), clinical management strategies (sedation, oxygen tension, rapid response teams, alarms and remote monitoring, cognitive and physical training, medication reconciliation), and education (simulation, evaluation processes).



Fellowship Details

- ACGME-accredited program
- Ten positions available each year
- Core rotations include CVICU, SICU, NCU, Trauma ICU, Burn ICU, VA-SICU, ECHO/Ultrasound
- Electives include intraoperative TEE, MICU, PICU, perioperative medicine, international rotations, palliative care, medical subspecialties and research

Cardiothoracic Anesthesiology

Division Chief: Mias Pretorius, MBChB, MSCI

The Division of Cardiothoracic Anesthesiology provides anesthetic care for adult cardiac surgery, thoracic surgery, interventional pulmonology, electrophysiology and interventional cardiology at Vanderbilt University Medical Center. A subset of the division's faculty members provides critical care services in the adult cardiovascular intensive care unit.

Procedures provided include coronary artery bypass graft (on- and off-pump) surgery, valvular surgery, heart and lung transplantation, ECMO, adult congenital procedures, pulmonary endarterectomies, hybrid procedures, aortic surgery and ventricular assist device (VAD) insertions. Vanderbilt University Medical Center tied for first place as the busiest heart transplant program by volume in the United States in 2019.

VUMC performed a record 118 heart transplants last year — 96 adult and 22 pediatric patients — topping the previous year's record of 109. This growth in the heart transplant program is in part due to the innovative use of hearts from hepatitis C–positive donors. Patients who received hearts from hepatitis-C positive donors were shown to have comparable outcomes after one year to patients who received hearts from donors who did not have the disease.

The VAD program at Vanderbilt currently places about 50 devices per year. The division's structural heart disease program employs the newest techniques involving transcatheter aortic valve replacement (TAVR), catheter-based repair of mitral regurgitation (Mitraclip) and left atrial appendage occlusion devices. Intraoperative transesophageal echocardiography (TEE) is an integral part of the division's clinical practice and is performed on all adult cardiac surgery patients, in electrophysiology to guide placement of left atrial appendage occlusion devices and to guide transcatheter valve procedures.

Division faculty members conduct research in vascular biology, precision perioperative medicine, acute kidney injury and the perioperative inflammatory response. Extramural grant support comes from the Department of Defense, the National Institutes of Health and also industry.

Fellowship Details

- ACGME-accredited program
- Five positions available each year
- Core rotations include adult cardiac, thoracic, pediatric cardiac, TEE and ICU
- Electives include heart failure, TEE, CT surgery and research

VUMC tied for first place as the busiest heart transplant program by volume in the United States in 2019.

Number of Heart Transplants

22 Pediatric patients

96 Adult patients

118

2018

109

2019

118

Number of transplants up 8% since last year

~40 Lung Transplants

~2,200 TEE Exams

~50 VADs

in 2019

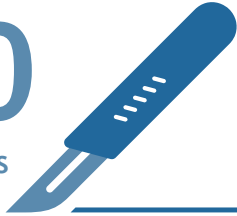


Neuroanesthesiology

Division Chief: Letha Mathews, MBBS

OVER **600** CRANIOTOMIES FOR INTRACRANIAL TUMOR AND VASCULAR LESIONS

OVER **4,000** NEUROSURGICAL CASES PER YEAR



250 NEURO INTERVENTIONAL PROCEDURES

1,700 SPINE SURGERIES

OVER **600** FUNCTIONAL NEUROSURGICAL PROCEDURES

160+ DEEP BRAIN STIMULATOR PLACEMENTS

*ALL STATS BASED ON ANNUAL NUMBERS

Neurosurgery and other neurologic services continue to expand at VUMC. The Neuroanesthesiology Division provides perioperative care for patients undergoing complex intracranial and spine surgeries and staffs 9 to 12 operating rooms daily.

Three neurointerventionalists run a busy neurovascular service in state-of-the-art interventional hybrid operating rooms dedicated solely to neurosurgical procedures. VUMC is certified as a comprehensive stroke center and provides care for patients requiring acute stroke interventions.

VUMC has designated neurosurgical operating rooms where anesthesia services are provided for operations, including brain tumors, blood vessel malformation, aneurysms, stroke intervention, trauma, complex spinal procedures, functional neurosurgery and chronic pain management. The Division of Neuroanesthesiology also provides specialized anesthesia services for “awake craniotomies,” when patients are kept under sedation rather than general anesthesia to facilitate speech and motor mapping during surgery in order to preserve the most vital areas of the brain.

Development and practice of evidence-based perioperative ERAS pathways and guidelines have improved patient outcomes and reduced length of ICU stay and overall hospital length of stay. The division includes five full time faculty and six CRNAs, as well as CRNAs from other divisions. Additionally, several faculty from the ACCM and MSA Divisions contribute significantly to the division’s work.

Faculty are actively engaged in resident, medical student and allied health professional education. The division offers one Neuroanesthesiology fellowship position each year, and it is certified by the International Council on Perioperative Neurosciences Training (ICPNT). The Neuroanesthesiology faculty make significant contributions at national and international meetings, such as SNACC, SEA, IARS, AACD and NCCS, and provide leadership in these organizations.

Like their surgical colleagues, neuroanesthesiologists face many unique challenges, including lengthy procedures (which may last more than 16 hours), unusual patient positioning and unexpected intraoperative events, such as seizures or intracranial hemorrhage. Residents on the neuroanesthesia rotation, as well as the faculty leading the training, discover that the ability to make an immediate impact on an operation is both exciting and gratifying.



Fellowship Details

- One year program (*accreditation not offered by ACGME; ICPNT certified*)
- One position available each year
- Core rotations include adult ORs, neuroICU, neuromonitoring and research
- Elective rotations include stroke neurology, neuroradiology and pediatric neuroanesthesia

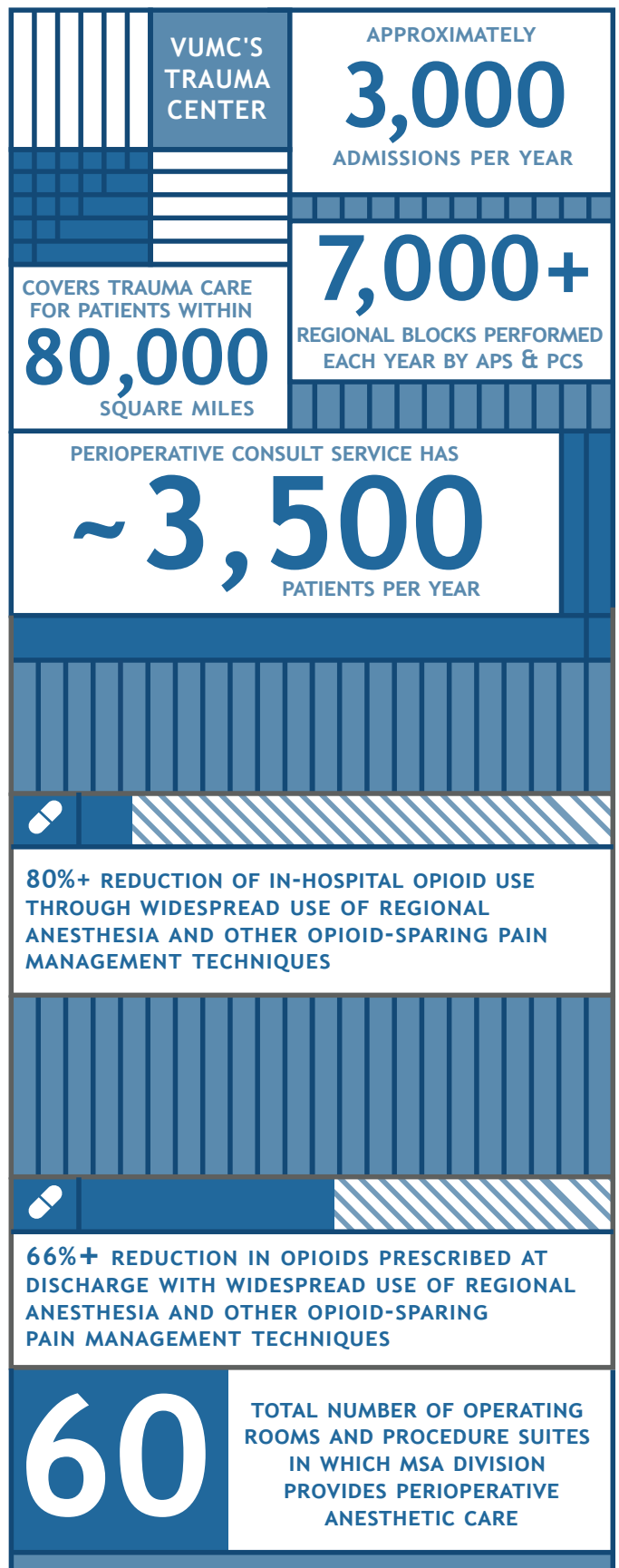
Multispecialty Adult Anesthesiology

Division Chief: Michael Pilla, MD

The Division of Multispecialty Adult Anesthesiology (MSA) is the Department of Anesthesiology's largest division, providing perioperative anesthetic care in 60 operating rooms and procedure suites for a wide variety of surgical services, including general surgery, orthopedics, urology, plastic surgery, ophthalmology, vascular surgery, otolaryngology, hepatobiliary surgery, liver and renal transplantation and oral/maxillofacial surgery. The division has 30 full-time and 10 part-time faculty members, most of whom have significant subspecialty training and expertise.

Since 2014, our Perioperative Consult Service (PCS) has provided co-management of surgical patients, beginning with the decision to operate and continuing throughout the period after hospital discharge. Starting from a pilot program involving colorectal surgical patients, the PCS has quickly grown to include care of orthopedic trauma, abdominal wall reconstruction, surgical weight loss, hepato-biliary-pancreatic/surgical oncology, gynecologic oncology and urology patients.

MSA division faculty provide our anesthesiology residents a variety of both introductory and advanced clinical experiences and make numerous contributions to the department's educational programs for medical students, residents and fellows. Additionally, MSA faculty members teach and supervise residents from other specialties, as well as student registered nurse anesthetists who rotate in the MSA division. Division faculty members pursue a wide range of academic interests, including perioperative cognitive dysfunction, echocardiography, ultrasound imaging, regional anesthesia, airway management, information technology, point-of-care diagnostics and perioperative medicine, with a common goal of providing safer and more efficient perioperative care and throughput.



Acute Pain Service & Anesthesiology Perioperative Consult Service

Director, Acute Pain Service: Edward Yaghmour, MD

Clinical Chief, Perioperative Consult Service: Matt McEvoy, MD

The Vanderbilt Department of Anesthesiology provides both an Acute Pain Service (APS) and a Perioperative Consult Service (PCS). Together these services provide preoperative evaluation and preparation, intraoperative care, acute postoperative care and pain management to Vanderbilt University Hospital, Monroe Carell Jr. Children's Hospital at Vanderbilt and the Tennessee Valley Healthcare System (TVHS) Veterans Administration Medical Center in Nashville. By providing care before, during and after surgery, these services give patients better, more personalized care throughout the entire perioperative care period. With widespread use of regional anesthesia and other opioid-sparing pain management techniques, these services have led to a more than 80 percent reduction of in-hospital opioid use and a more than 66 percent reduction in opioids prescribed at discharge.

Enhanced Recovery After Surgery (ERAS) care pathways are evidence-based protocols designed to improve pain control and facilitate faster recovery for patients. PCS/APS is a national leader in ERAS implementation. Across the Adult, Children's and VA hospitals, the department cares for several thousand patients each year, and APS and PCS perform over 7,000 regional blocks (not including our ambulatory locations). PCS/APS continues to develop ERAS protocols that improve patient outcomes and address the common reasons for prolonged hospital length of stay. Beyond this clinical work, the clinicians routinely give presentations at national and international meetings related to ERAS and non-opioid pain management. APS and PCS at VUMC are staffed by 24 anesthesiologists, with representation from multiple divisions. APS and PCS also include five nurse practitioners, fellows and residents.

Developing and implementing pediatric ERAS protocols are also an important focus of Pediatric Pain Management Services (PPMS), staffed by six pediatric anesthesiologists and one pediatric pain nurse within the Division of Pediatric Anesthesiology. Though the pediatric surgical patient is quite different from the adult patient, the basic concepts of ERAS are the same. "Setting expectations preoperatively and utilizing multimodal opioid-reducing perioperative strategies enhance the patient's experience, reduce perioperative complications and lead to earlier discharge from the hospital," states Drew Franklin, MD, MBA, Director of PPMS at Children's Hospital.

At the TVHS Veterans Administration Medical Center in Nashville, a perioperative care service (VA-PCS) was started in 2016 through the collaboration of the TVHS's Department of Anesthesiology, Pain Management & Perioperative Medicine and VUMC's Anesthesiology Department and Anesthesiology Critical Care Medicine Division. The staff for this service includes seven critical care anesthesiologists and eight acute care nurse practitioners. Collaborations exist with multiple departments. Eight ERAS pathways have been developed since 2016.

PERIOPERATIVE CONSULT SERVICE COLLABORATIONS: CURRENT STATE

~3,500
PATIENTS A YEAR

15-20%
REDUCTION IN COST

-1.2D
LOWER AVERAGE LENGTH OF STAY

REDUCED OPIOIDS

>80%
INTRAOPERATIVELY

>80%
POSTOPERATIVELY

>66%
AT DISCHARGE

Perioperative Medicine Fellowship Details

- One year program (*accreditation not offered by ACGME*)
- Four positions available each year
- Core rotations include perioperative consult service, high-risk preoperative evaluation clinic, echocardiography and cardiac device management, geriatrics and research

Regional Anesthesia & Acute Pain Medicine Fellowship Details

- ACGME-accredited program
- Two positions available each year
- Core rotations include anesthesiology perioperative consult service, OR anesthesia, oromaxillofacial surgery, addiction psychiatry, ambulatory regional anesthesia, pediatric pain management, inpatient chronic pain, and international anesthesia
- Electives include: research, obstetric anesthesia

Obstetric Anesthesiology

Division Chief: Jeanette Bauchat, MD, MS

The Division of Obstetric Anesthesiology, led by Division Chief, Jeanette Bauchat, MD, MS, and Medical Director Susan Dumas, MD, provides dedicated, 24-hour, in-house obstetric anesthesia care for over 4,700 deliveries at Vanderbilt University Medical Center annually—over half of the deliveries are considered high risk. The division provides a full complement of techniques for labor analgesia and operative deliveries. The faculty are consultants and critical care specialists for high-risk obstetric patients, abnormal placentation cases and intrauterine fetal surgeries. The division performs anesthesia services for gynecological surgeries in a suite of three operating rooms adjacent to the labor and delivery unit. The division faculty also assume leadership roles in quality initiatives to improve maternal health, including the use of multidisciplinary simulation training for obstetric emergencies.

The division works collaboratively with other medical specialties to ensure women in the perioperative period have optimal outcomes. The division collaborates with the VUMC maternal-fetal medicine (MFM) group in caring for mothers with congenital heart defects and other co-morbidities. The obstetric anesthesiologists work with the MFM, gynecologic oncology, urology and emergency general surgery physicians in the care of patients with abnormal placentation. In conjunction with the department's perioperative consult service, division faculty and staff provide anesthesia care using multimodal, enhanced recovery after surgery (ERAS) protocols for gynecological cases and cesarean deliveries.

The division sponsors a highly regarded, ACGME-accredited obstetric anesthesia fellowship led by Fellowship Director Holly Ende, MD. Recent clinical research projects include an award-winning research project using customized opioid prescription practices to reduce overall use and excess opioid tablet availability after cesarean delivery. Ongoing research investigations include the genomics of uterine atony, respiratory depression in pre-eclampsia and outcomes using enhanced recovery after gynecological surgery.



87% CHOOSE NEURAXIAL LABOR ANALGESIA



TOTAL DELIVERIES APPROXIMATELY 4,800

TOTAL GYNECOLOGICAL SURGICAL CASES APPROXIMATELY 2,800

Fellowship Details

- ACGME-accredited program
- Two positions available each year
- Core rotations include experiences in maternal-fetal medicine and neonatology, with abundant time for research and training



SOCIETY FOR OBSTETRIC ANESTHESIA AND PERINATOLOGY

CENTER of EXCELLENCE

Pain Medicine

Division Chief: David A. Edwards, MD, PhD

Clinicians from the Division of Pain Medicine use a multidisciplinary approach to pain care, offering thorough evaluations, consultations and referrals in order to employ the most effective evidence-based treatments.

We offer care in pain management centers at several locations: Nashville One Hundred Oaks, Clarksville, Franklin, Spring Hill, Ingram Cancer Center, The Village at Vanderbilt, Lebanon, and Monroe Carell Jr. Children's Hospital at Vanderbilt.

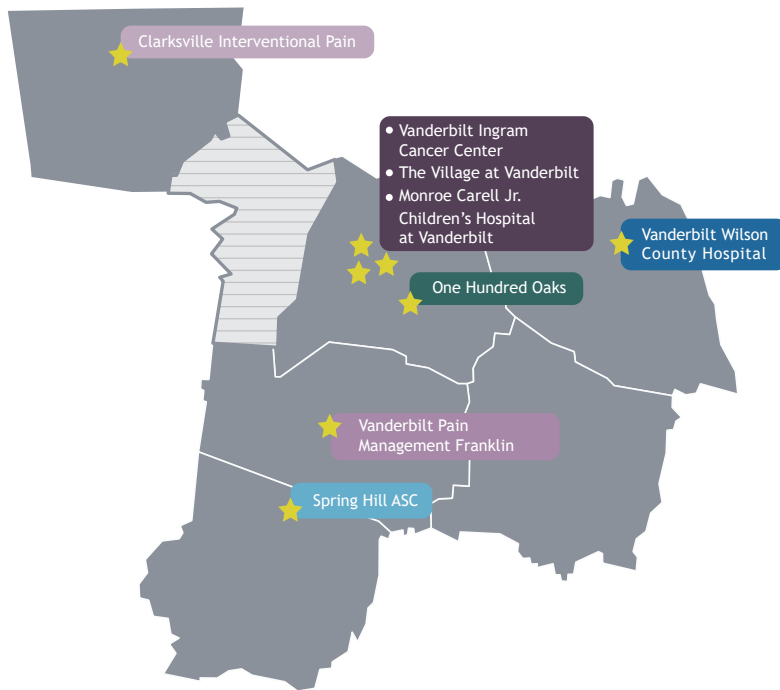
Our clinicians see patients with all types of pain caused by all kinds of disease processes. During the first clinic visit, a patient's medical history is thoroughly reviewed, and the patient is evaluated by a board certified Pain Management Specialist to develop a team-based treatment plan.

The Pain Medicine Division includes pain specialist physicians with training in anesthesiology, physical medicine and rehabilitation, addiction medicine, neurology, pain psychology, and functional neurosurgery. Colleague clinicians include eleven faculty, five advanced practice nurse practitioners, registered nurses and licensed practical nurses, radiology technologists, medical assistants, patient service specialists, schedulers and managers.

The division is active in research encompassing clinical trials to develop new treatment modalities in peripheral ablation and neuromodulation, therapies for opioid use disorder, functional mapping of the spinal cord, safety with intrathecal drug delivery devices, acupuncture and acupressure, mindfulness, population health, drug development, perioperative acute and chronic pain transitions, and more.

Fellowship Details

- ACGME-accredited program
- Four positions available each year
- Focus on comprehensive, multi-disciplinary treatment of acute, sub-acute and chronic pain
- Rotations in interventional pain, psychiatry, addiction medicine, neurology, radiology, physical therapy, cancer pain, integrative medicine, and international pain delivery
- High volume training exposure with state of the art therapies such as implantable spinal and peripheral stimulators, ablative/lytic therapies, fluoroscopic and ultrasound-guided procedures, neurosurgical treatments, intrathecal drug delivery systems
- Completion of publishable academic projects



Conditions We Treat

- Abdominal pain
- Arthritis pain
- Back pain
- Cancer-related pain
- Complex head and neck pain
- Complex regional pain syndrome (CRPS)
- Fibromyalgia
- Knee pain
- Muscle spasm
- Neuropathy (including diabetes, HIV, and chemotherapy related)
- Pain after chest surgery
- Pelvic and inguinal pain
- Post spine surgery pain
- Small fiber neuropathy
- Surgery-related pain
- Shoulder and arm pain
- Other primary and secondary pain disorders

Pediatric Cardiac Anesthesiology

Division Chief: Bevan Londergan, MD

The Division of Pediatric Cardiac Anesthesiology is made up of four faculty members and seven certified registered nurse anesthetists whose primary practice sites are the two cardiac operating rooms and two catheterization laboratories at the Monroe Carell Jr. Children's Hospital at Vanderbilt. The division's average yearly case volume is approximately 500 cardiac surgeries and 1,100 cardiac catheterizations and electrophysiologic procedures.

The division is also involved in the care of the congenital cardiac population having noncardiac operations and procedures, providing anesthesia care or coordinating the appropriate level of anesthesia care for each child.

Beyond the operating rooms, members of the division may be involved in providing care for patients undergoing procedures occurring in the pediatric cardiac intensive care unit or may be called upon to utilize their expertise in vascular access in either the pediatric or the neonatal intensive care unit.

The educational mission of the division is multifaceted. Both pediatric anesthesiology and adult cardiothoracic anesthesiology fellows rotate on the service. Senior anesthesiology residents rotate with the service on an elective basis. The division faculty provides didactic sessions to anesthesiology residents rotating in pediatric anesthesiology and are involved in the basic resident lecture series, resident journal club and mock oral board sessions.

Division faculty members are involved in a range of research fields, with Brian Donahue, MD, PhD, serving as research mentor for both the Pediatric Anesthesiology and the Pediatric Cardiac Anesthesiology Divisions. Heidi Smith, MD, MSCI, carries grant funding for delirium research. The division coordinates across the Pediatric Heart Institute on research and quality improvement initiatives, including coagulation therapies and postoperative pain management.



**9TH BUSIEST IN THE NATION FOR
PEDIATRIC CARDIAC SURGERIES AT**

**470
SURGERIES**

**11TH BUSIEST IN THE NATION FOR
PEDIATRIC CATH PROCEDURES WITH**

**1,100
PROCEDURES**

**2
CARDIAC
OPERATING
ROOMS**

**2
CATH
LABS**

Pediatric Anesthesiology

Division Chief: Jill Kilkelly, MD

TOTAL ANESTHETICS

23,354

IN OPERATING
& SEDATION
ROOMS

18

Pediatric
Liver Transplants

96

Craniofacials

226

Spine Fusions

**all stats based on annual numbers*



The Division of Pediatric Anesthesiology provides perioperative care for more than 23,000 patients annually at the Monroe Carell Jr. Children's Hospital at Vanderbilt, middle Tennessee's only comprehensive regional pediatric center.

Academic interests of the division include situational awareness during induction of anesthesia, best practice in handovers of care, pediatric pain management and international efforts for the care of children.

Pediatric Pain Management Services, led by Drew Franklin, MD, MBA, is engaged in an increasing number of perioperative regional anesthesia techniques, has implemented Pediatric Perioperative Interdisciplinary Surgical Home Protocols with the goal of enhanced recovery after those procedures, and handles a growing volume of both inpatient consultations and patients seen in our Pediatric Pain Clinic.

The Department of Anesthesiology oversees Pediatric Sedation Services under the leadership of Peter Chin, MBBS, who also leads anesthetic care in the division's remote anesthetizing locations, specifically our radiology suites at Children's Hospital.

Some of the division's most complex patients are cared for by special clinical teams, including our pediatric liver transplant team led by Amanda Lorinc, MD, our craniofacial reconstruction team led by Sri Reddy, MD, MBA, and our pediatric spine fusion team led by Brian Emerson, MD.

To provide the safest, best care practices for patients in the post-operative recovery room (PACU) area, the division has a robust nursing-anesthesia collaboration led by Carrie Menser, MD.

The division also has a unique Complex Coordination of Care program, led by Jill Kilkelly, MD, which seeks to minimize multiple disconnected episodes of surgical care for pediatric patients by coordinating anesthetic care, whenever appropriate, into single continuous anesthetic plans for procedural and imaging needs.

As of January 2020, pediatric anesthesiology efforts have widened to include a new facility in Rutherford County. This is the first free standing pediatric ambulatory surgery center with three operating rooms, a GI suite and sedated MRI capacity.

Fellowship Details

- ACGME-accredited program
- Four positions available each year
- Electives include ability to travel to Guatemala and/or Kenya for international care experiences
- Core rotations include Pediatric OR & Pediatric Cardiac OR, PICU, NICU, Pediatric Pain Service, Preoperative Evaluation Clinic, & Recovery Room Management
- Final month dedicated to 'supervisory' role to foster transition to the attending role

Veterans Affairs Anesthesiology Service

Chief: Ann Walia, MBBS

The Anesthesiology Service at the Tennessee Valley Healthcare System (TVHS) provides a variety of anesthesia services for over 125,000 veterans every year across its three main campuses in Nashville, Clarksville and Murfreesboro.

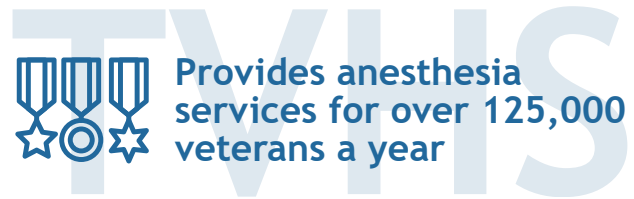
The service includes 17 full-time anesthesiologists, 7 part-time anesthesiologists, 20 CRNAs, 19 nurse practitioners, 2 anesthesiology residents, 1 fellow, 7 medical instrument technicians and 4 administrative support staff. The service is heavily engaged in educational activities within TVHS as well as nationally.

The TVHS Anesthesiology Service has been recognized nationally as best practice for its Perioperative Care Service, which was started in 2016. Since implementation, this service has been credited with savings in excess of \$10 million/year by decreasing patient ICU and hospital length of stay. Since implementation, this service has also been instrumental in decreasing in-hospital and long-term opioid use by greater than 80 percent of baseline.

TVHS has the only service in the Veterans Integrated Service Network (VISN 9) that provides comprehensive complex pain management, including invasive procedures like radiofrequency ablation, spinal cord and peripheral stimulator implantation, suboxone implants and inpatient ketamine infusions for unremitting pain and detoxification. The ketamine clinic has been successful in many ways, including helping about 50 percent of the veterans wean themselves from their narcotics completely. Of the 50 percent remaining on narcotics, 62 percent have required significantly fewer doses of narcotics. Sixty-seven percent of the patients treated reported a significant improvement in their quality of life.

The service is credited with over 6,000 surgical and 4,000 non-OR procedures, 5,000 pain clinic visits, 3,500 interventional procedures and 2,500 telehealth visits across three campuses. In addition, the Anesthesiology Service is responsible for oversight of the facility surgical intensive care, perioperative service, Rapid Response Team, moderate sedation program and resuscitation and airway management activities.

Faculty members teach at national conferences and the national simulation center, along with serving as a resource to several other facilities in key areas such as the ERAS protocols, Ketamine Infusion program for complex chronic pain and opioid detoxification, Labor mapping and workload capture.



CREDITED WITH OVER 6,000 SURGICAL CASES

4,000
NON-OR PROCEDURES

5,000
PAIN CLINIC VISITS

3,500 INTERVENTIONAL PROCEDURES

2,500 TELEHEALTH VISITS



Certified Registered Nurse Anesthetists

Chief: Brent Dunworth, CRNA, DNP, MBA

The Vanderbilt University Medical Center Department of Anesthesiology continues to set the nationwide standard for true collaborative practice and innovation in its approach to patient care, involving anesthesiologists and residents, certified registered nurse anesthetists (CRNAs), student registered nurse anesthetists (SRNAs) and anesthesia technicians. Serving as Chief CRNA and Director of Advanced Practice in Anesthesiology, Brent Dunworth, CRNA, DNP, MBA, leads the division.

The 200 CRNAs in the nurse anesthesia division provide anesthesia for all types of surgical procedures, including cardiac, pediatrics, vascular, trauma, neurosurgery, plastics, radiologic and special procedures throughout the medical center. CRNAs administer general, regional and monitored anesthesia care for scheduled and emergency surgical, obstetric and diagnostic procedures. Our nurse anesthesia professionals have a “can-do” attitude and are always ready for the challenges that come from working in a complex academic medical center that cares for the most challenging patients in Tennessee.

Over 25 CRNAs are actively pursuing doctoral education to further enhance their teaching, scholarship and leadership skills within the department. Five CRNAs serve as divisional managers to facilitate practice evolution, education and professional development of their respective teams. Thus, the CRNAs are essential to many core endeavors, with a sharp focus on patient experience and outcomes. In terms of personnel, the CRNA Division is the largest within the Department of Anesthesiology.

Vanderbilt is proud to serve in a teaching capacity for three different nurse anesthesia programs that are clinical

affiliates. Middle Tennessee School of Anesthesia (MTSA), based in Madison, Tennessee, is the second largest nurse anesthesia program in the country. Vanderbilt is also a clinical affiliate for Emory University Nurse Anesthesia Program in Atlanta, Georgia, and Marian University, based in Indianapolis, Indiana. Student nurse anesthetists participate in over 7,000 anesthetics per year while on Vanderbilt rotations. Both CRNAs and anesthesiologists provide expert clinical teaching to these learners, who are highly sought after in the marketplace upon graduation. Internally, we continue to offer robust continuing education opportunities that are coordinated by our two dedicated CRNA Educators.

With the COVID-19 pandemic this year, the department faced new challenges that had not been experienced previously. The CRNA team was an integral component to medical center operations during the pandemic, stepping up to provide assistance wherever it was needed: on the COVID airway team, in the ICUs managing complex patients with our nurse practitioner colleagues, and staffing COVID phone lines and follow-up to patients recovering at home with COVID. No task was too great or too small to serve VUMC and the community.

VUMC is staffed by 39 anesthesia technicians who contribute to safe, efficient anesthesia care by providing highly skilled assistance to our anesthesia professionals at both on- and off-campus clinical locations. In recent years, we have partnered with the anesthesia technology program at Columbia State Community College in Columbia, Tennessee, as a clinical affiliate for student rotations in both adult and pediatric anesthesiology.

200 CRNAs
PROVIDE SUPPORT FOR SURGICAL PROCEDURES INCLUDING:

- CARDIAC
- PEDIATRICS
- VASCULAR
- TRAUMA
- NEUROSURGERY
- PLASTICS
- RADIOLOGIC
- AMBULATORY
- GASTROENTEROLOGY

over 25 CRNAs are pursuing doctoral education

39 anesthesia technicians and technologists contribute to safe, efficient anesthesia care

SRNAs participate in over 7,000 anesthetics per year



EDUCATION



Residents

The Anesthesiology Department's residency program is highly sought after by the nation's top medical students.

The physician educators in the Anesthesiology Department are nationally and internationally recognized as leaders in their fields, and the department successfully supports residents interested in academic anesthesiology so they can develop careers focused on advancing knowledge in the specialty. Peer-reviewed publications and the presentation of research by residents at national meetings are clear indications that the department's educational programs are creating physician-scholars who are prepared for medical practice, peer-education and scientific investigation.

The educational program for residents and fellows consists of a combination of comprehensive didactic conferences, hands-on workshops, mentored clinical training by subspecialists in every domain of anesthesiology, simulation training, and self-study. Simulation training features prominently in the cognitive, procedural, and teamwork aspects of anesthesia education, and the Center for Experiential Learning and Assessment (CELA) is a nationally renowned, on-campus resource for this training.

The goal of ongoing curriculum development and revision in the Milestones era is to continue to reach the highest level of educational achievement using modern learning techniques. Accordingly, Leslie Fowler, MEd, Director of Educational Development and Research, is overseeing departmental curriculum advancements along with Associate Vice Chair for Educational Affairs Brian Gelfand, MD, and the core education faculty. Among other projects, Leslie and the VU School of Medicine Spark team have worked together, utilizing VUSMs IT platform for education management to develop multimodal models of learning for anesthesiology education. This has been expanded across varying learner groups both within our institution and internationally.

Fellows

Building from the department's strength in subspecialties, 10 clinical fellowships, as well as a research fellowship, are offered to individuals seeking advanced, focused training.

Clinical Fellowships Offered

- Adult Cardiothoracic Anesthesiology* **5 fellows**
- Anesthesiology Critical Care Medicine* **10 fellows**
- Clinical Informatics* **1-2 fellows**
- Global Anesthesiology** **1-2 fellows**
- Neuroanesthesiology** **1 fellow**
- Obstetric Anesthesiology* **2 fellows**
- Pain Medicine* **4 fellows**
- Pediatric Anesthesiology* **4 fellows**
- Regional Anesthesia and Acute Pain Medicine* **2 fellows**
- Perioperative Medicine** **4 fellows**

*ACGME Accredited

**Accreditation not offered by ACGME

Nurse Anesthetists

The continuing education of more than 100 certified registered nurse anesthetists (CRNAs) in the department is supported with recurring programs, including Grand Rounds and Mortality, Morbidity & Improvement (MM&I) Conferences. In addition, Vanderbilt is a primary clinical affiliate of the Middle Tennessee School of Anesthesia and the Emory University Nurse Anesthesia Program. On-campus training is coordinated by CRNA leaders in the Department of Anesthesiology.

Advanced Practice Nurses

The Department of Anesthesiology has a unique partnership with the Vanderbilt University School of Nursing to offer an Acute Care Nurse Practitioner

Continued on page 24

18

CATEGORICAL
POSITIONS
PER YEAR

10

CLINICAL
FELLOWSHIP
PROGRAMS

6

ADVANCED
LEADERSHIP
TRACKS

ADVANCED
LEADERSHIP TRACKS:

- GLOBAL HEALTH
- CLINICAL/TRANSLATIONAL
RESEARCH
- BUSINESS
- BIOMEDICAL INFORMATICS
- PERIOPERATIVE MEDICINE
- EDUCATION RESEARCH

ACTIVE FUNDING FOR
EDUCATIONAL RESEARCH:

OVER

\$1 MILLION

100% BOARD PASS RATE

CA-3S TRAVEL TO KENYA
FOR AN ACGME-ACCREDITED
ROTATION:

50%



2019 ASA
ANNUAL MEETING
POSTERS PRESENTED:

42



Continued from page 22

(ACNP) Intensivist track as part of the ACNP master's degree program. The program combines the didactic training of the School of Nursing's ACNP Program with supplemental specialty lectures in critical care medicine. Students perform their clinical rotations in seven of the Vanderbilt and VA ICUs. Students also receive additional exposure to ICU medicine through twice-monthly simulation sessions and weekly clinical case conferences, taught jointly by members of both faculties.

Additional partnership programs between the Anesthesiology Department and the School of Nursing are being planned. Vanderbilt University Medical Center is one of the largest employers of nurse practitioners in the country. The Division of Anesthesiology Critical Care Medicine has 30 acute care nurse practitioners who work in intensive care settings. The Preoperative Evaluation Clinic and Perioperative Consult Service include another 17 nurse practitioners as an integral part of these teams.

The Center for Experiential Learning and Assessment

Under the leadership of Arna Banerjee, MBBS, CELA offers medical learners at all levels a simulation education on computerized, life-like mannequins. CELA was endorsed by the American Society of Anesthesiologists (ASA) as one of approximately 40 centers in the nation officially approved to deliver certified educational programs. Anesthesiologists can receive continuing medical education (CME) simulation training at CELA that qualifies for American Board of Anesthesiology Maintenance of Certification in Anesthesiology (MOCA®) credit. To achieve the ASA endorsement, the CELA program met strict criteria, which includes having strong leadership and the necessary equipment, facilities and personnel to provide consistent, effective training.

MOCA® simulation courses are taught at Vanderbilt's Center for Experiential Learning and Assessment (CELA), where state of the art immersive patient simulation training is offered.



Educational Research

The department is a national leader in rigorous educational research, and numerous faculty are involved with the latest in pedagogical and educational implementation science research. Leslie Fowler, MEd, J. Matthew Kynes, MD, Matthew McEvoy, MD, Mark Newton, MD, Britany Raymond, MD, Brian Allen, MD, Amy Robertson, MD, Jonathan Wanderer, MD, MPhil, Brian Gelfand, MD, and Bantayehu Sileshi, MD, are the current education researchers.

Kynes's research focuses on the impact of high-fidelity simulation workshops on clinical skills for providers involved in obstetric care in Kenya. He also studies the preparation and experience of anesthesiology residents participating in international rotations and their impact on improving clinical exposure and long-term engagement in humanitarian activities. Kynes's research includes the FAER grant impact of and utilization of online curricula in pediatric anesthesiology by providers in low- and middle-income countries.

McEvoy's research involves understanding the best methods to deliver information so clinicians deliver evidence-based, timely care. This research is within the domain of assessing curriculum development and the application of checklists and smartphone applications related to crisis and perioperative medicine management. In the clinical arena, he is interested in implementation science within the perioperative sphere and using novel educational methods, such as spaced education via a smartphone web application, to drive practice change.

Sileshi has funded research investigating the effects of education capacity-building efforts and the implementation of a novel perioperative data collection tool in low- and middle-income countries, including Kenya and Ethiopia.



Special Lectureships and Awards

The department hosts special lectureships throughout the year and presents distinct recognitions to department members who have provided exemplary service both to their patients and to their colleagues.

Many of these are a direct result of philanthropic support from our alumni, as well as from current department members and other program supporters. Funding is provided by private donors, whose gifts materially improve the academic life of the Vanderbilt Department of Anesthesiology.

Dr. James Phythyon Endowed Lectureship in Pediatric Anesthesiology

The lectureship was established by the family of Dr. James Phythyon, a founding member of the Pediatric Anesthesiology Division. Dr. Phythyon's widow, Mrs. Marlin Sanders, and the couple's daughters, Mary Neal Meador, Elizabeth Donner and Sarah Miller, are strong department supporters.

The Sandidge Pediatric Pain Management Endowed Fund

Retired Vanderbilt anesthesiologist Paula C. Sandidge, MD, created The Sandidge Pediatric Pain Management Endowed Fund at Monroe Carell Jr. Children's Hospital at Vanderbilt in 2010 to recognize and encourage progress in pain management for children. Dr. Sandidge passed away in September 2018. Drew Franklin, MD, MBA, director of Pediatric Pain Management Services, is working closely with the family of Dr. Sandidge to establish an ongoing lecture series at Vanderbilt to ensure that her genuine commitment to optimizing pain management in children lives on.

The Dila Vuksanaj Memorial Fund for Resident Education

Pediatric anesthesiologist Dila Vuksanaj, MD, practiced at Children's Hospital for 13 years, dedicating herself to her patients and to the hundreds of trainees who looked to her as a role model, mentor and friend. Following her death in 2009, her family, including her husband, Jacques Heibig, MD, founded the Dila Vuksanaj Memorial Fund for Resident Education.

Dr. Bradley E. Smith Endowed Lectureship on Medical Professionalism

Former chairman Bradley E. Smith, MD, defined what it means to be a true professional, and in 2009 a lectureship on medical professionalism was established in his name by then Department Chairman Michael Higgins, MD. The goal of the lectureship is to reflect on the characteristics, responsibilities and rewards of professionalism as applied to the practice of anesthesiology.

Dr. Charles Beattie Endowed Lectureship on Perioperative Medicine

Established by Dr. Warren Sandberg, the lectureship is intended to bring innovators in anesthesiology from unique backgrounds and compelling world views to Vanderbilt as visiting professors.



On Friday, Dec. 13, 2019, Kevin K. Tremper, PhD, MD, presented at the inaugural Dr. Charles Beattie Endowed Lectureship on Perioperative Medicine. His presentation was entitled "Quality/Safety and a Path to Precision Anesthesia." Pictured here from left to right: Warren Sandberg, MD, PhD, Kevin K. Tremper, PhD, MD, and Jeff Balsler, MD, PhD.



On Friday, Feb. 21, 2020, Deborah J. Culley, MD, was the featured guest speaker for the 11th annual Dr. Bradley E. Smith Endowed Lectureship on Medical Professionalism. Her presentation was entitled "Professionalism in Anesthesiology: Paving a Path Forward."

Vanderbilt International Anesthesia

Five billion people around the world do not have access to safe surgery and anesthesia. Through Vanderbilt International Anesthesia (VIA), the Department of Anesthesiology is committed to improving perioperative and anesthetic care in underserved regions of the world to help close this gap through service, education and research. The commitment of our department is shown through the involvement of faculty, trainees and staff in a variety of innovative projects across 12 low- and middle-income countries. From long-established partnerships of educational capacity-building to short-term service trips to international advocacy and research, VIA has invested in improving anesthesia care to save lives, promote health and impact the healthcare systems of countries in need.

Among these initiatives is the ImpACT Africa (Improving Perioperative and Anesthesia Care and Training in Africa) program, which continues to expand. Supported by grants from GE Foundation and The ELMA Foundation and led by Mark Newton, MD, and Bantayehu Sileshi, MD, the program works with local institutions, hospitals and ministries of health to train physician and non-physician anesthesia providers and build capacity for education, empowering educators with tools and techniques to teach anesthesia in the classroom, simulation center and operating room.

In addition to this educational and research program, VIA offers an ACGME/ABA-accredited elective rotation to Kenya for the department's residents and fellows. Since the rotation began ten years ago, VIA has sent 91 residents and fellows to AIC Kijabe Hospital in Kenya to provide anesthesia care and education. The rotation is a highlight for many of the department's trainees and helped pave the way for the Global LEAP (Global Leadership in Anesthesia Pathway) program, an advanced track for residents interested in developing in-depth global health expertise and extensive international experience. Led by J. Matthew Kynes, MD, the track is now in its third year and boasts eight Global LEAP Scholars.

The department is also proud of the on-going global health contributions of our CRNA team members. Over the past several years, numerous CRNAs have traveled to underserved countries of the world, including Guatemala, Kenya, Nigeria, Uganda, and others, for teaching and service projects. In 2020, our CRNAs organized a fundraising campaign to support the first Pan-African Nurse Anesthetist Conference and collected over \$36,000 in donations. Our CRNAs look forward to leading sessions at the conference, which will take place in Nairobi in 2021, and providing conference scholarships and medical supplies for their African colleagues.

In response to the global COVID-19 pandemic, VIA collaborated with the Vanderbilt Institute for Global Health and the humanitarian organization Assist International to deliver a tele-education series on COVID-19 tailored

for hospital-based providers in low- and middle-income countries. The series impacted a broad range of healthcare workers in over 30 countries across Africa and South East Asia.

The Department of Anesthesiology's on-going global advocacy efforts include advising ministries of health in low- and middle-income countries in the development of National Surgery, Obstetric and Anesthesia Plans (NSOAPs). Through VIA, the Department of Anesthesiology also offers the Vanderbilt Global Anesthesiology Fellowship, hosts visiting ASA Global Scholars and convenes the quarterly Vanderbilt International Journal Club. Several department members, including Jill Moore, CRNA, Tiffany Richburg, MD, and Jenna Sobey, MD, lead specialized tele-education lecture series for anesthesia providers and trainees in East Africa.

The department looks forward to continuing to expand efforts to improve anesthesia care across the globe in 2021 and beyond.



12 COUNTRIES

WHERE OUR TEAMS ARE INVOLVED
AROUND THE GLOBE



8 EDUCATION PROGRAMS

ON-GOING FOR
TRAINEES & PROVIDERS
IN LOW-INCOME COUNTRIES

> \$6 MILLION

IN GRANT FUNDING FOR GLOBAL
HEALTH EDUCATION & RESEARCH

91 RESIDENTS & FELLOWS

COMPLETING INTERNATIONAL ROTATIONS
SINCE 2010



RESEARCH

The vision of the Research Division is to advance knowledge in the fields of perioperative medicine, critical care, pain medicine and other related disciplines by fostering excellence, collaboration and the development of young investigators.

In federal fiscal year 2019, the Vanderbilt University School of Medicine (VUSM) ranked 11th among U.S. medical schools for National Institutes of Health (NIH) funding, with more than \$378 million in funding, and VUSM funding from all sources has more than doubled since 2001.

Anesthesia investigators brought in more than \$8 million in total extramural research funding. This included more than \$4.6 million in awarded NIH grants, which placed Vanderbilt Anesthesiology 17th among U.S. academic anesthesiology departments in NIH funding.

Within the department, faculty published 279 papers in fiscal year 2019, up from 69 papers in fiscal year 2010, within the peer-reviewed literature.

The department's Clinical Research program focuses on improving healthcare through clinical research and education. The program includes both investigator-initiated and industry-sponsored clinical projects, including NIH-supported single center and multicenter clinical trials. The program is advancing medical practice in the fields of perioperative care, critical care, chronic pain and medical devices. Investigators are practicing physicians who use clinical expertise to develop research protocols that seek to answer clinically significant questions and test novel treatments.

Clinical research is supported and facilitated by the Perioperative Clinical Research Institute (PCRI), Vanderbilt Anesthesiology Clinical Research Advisory Committee (VACRAC) and Vanderbilt Anesthesiology & Perioperative Informatics Research (VAPIR).

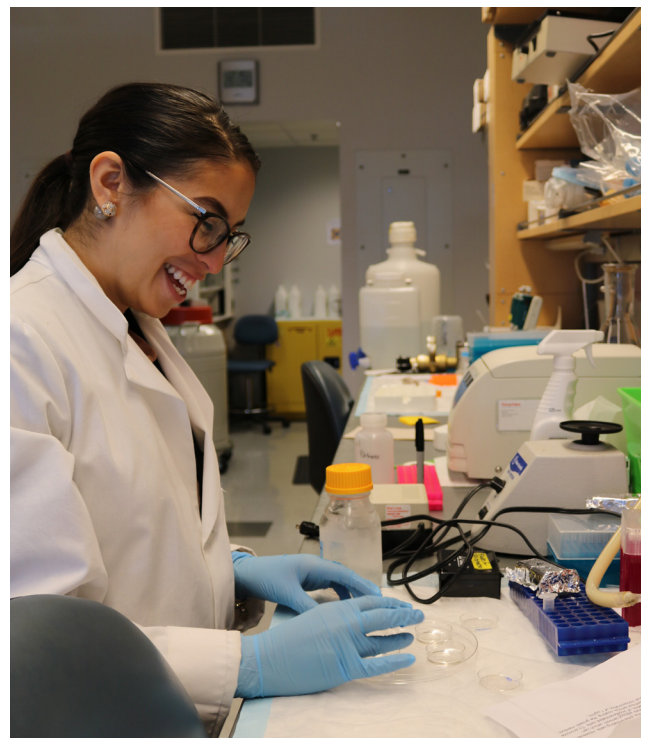
PCRI provides a full range of services necessary for successful clinical research. These services include regulatory management, data management, contracts management, biostatistics, bioinformatics, study execution and financial oversight. The PCRI oversees more than 155 active clinical trials, with many more studies in development. The PCRI is led by Director of Clinical Research David McIlroy, MB.BS., MD, MClinEpi, Vice Chair for Research Edward Sherwood, MD, PhD, and Director of Clinical Trials Research Debra Craven, MSN, MMHC. The team consists of highly trained and broadly experienced research professionals, including four research nurses, four clinical trial coordinators, a regulatory specialist and an administrative assistant.

VACRAC is composed of a panel of experienced clinical investigators who review research protocols and discuss design and implementation with investigators. This process improves the design and execution of clinical research projects, resulting in more rapid and effective study origination and completion.

Through the development of automated email systems and dashboards, VAPIR has strengthened internal communication and plays a vital role in providing near real time feedback to clinicians to help them improve perioperative care. VAPIR is led by Medical Director Robert Freundlich, MD, MS, MSCl. The division collaborates internally with other departments at Vanderbilt to facilitate information analysis and dissemination, with the goal of improving outcomes for surgical patients. The division also supports access to the electronic medical record to allow for high quality data acquisition and analysis to support research and quality improvement initiatives.

Investigators in the Basic Science Division conduct high quality basic and translational research, with the goal of advancing current knowledge and improving patient care. Specific areas of interest include ion transport, cell signaling, drug discovery, organ protection, pain management, the neurobiology of addiction, host response to infection and fetoplacental circulation.

The Vanderbilt Department of Anesthesiology has a strong, multifaceted approach to research, which can be viewed on the following pages.



\$378 MILLION
MORE THAN
IN NIH FUNDING

Ranked 11th
*among United States
medical schools
for NIH funding*



ANESTHESIA INVESTIGATORS BROUGHT IN MORE THAN

\$8 MILLION
IN EXTRAMURAL FUNDING

\$4.6 MILLION
IN NIH GRANTS

279
PEER-REVIEWED
PAPERS IN FY2019

MORE THAN
155
ACTIVE CLINICAL TRIALS OVERSEEN BY THE
PERIOPERATIVE CLINICAL RESEARCH INSTITUTE

Lab Research Advancing Medical Science

Director: Eric Delpire, PhD

The work of the Basic Science Research Division is diverse and ranges from ion channel physiology and pharmacology to immunology to pain. Multiple projects by investigators are sponsored by the National Institutes of Health. Brief descriptions of work within the Research Division and its core investigators are provided here.

Stephen Bruehl, PhD, Professor of Anesthesiology, has identified pain-related alterations in interacting cardiovascular-pain modulatory systems that contribute to enhanced pain responsiveness.

Eric Delpire, PhD, Professor of Anesthesiology, Molecular Physiology and Biophysics, Director of Basic Science Research and BH Robbins Director in Anesthesiology Research, utilizes genetically modified mouse models and a variety of molecular techniques to investigate how neuronal Cl^- transporters modulate inhibitory synaptic transmission and how renal Na^+ transporters and associated proteins regulate salt reabsorption and blood pressure.

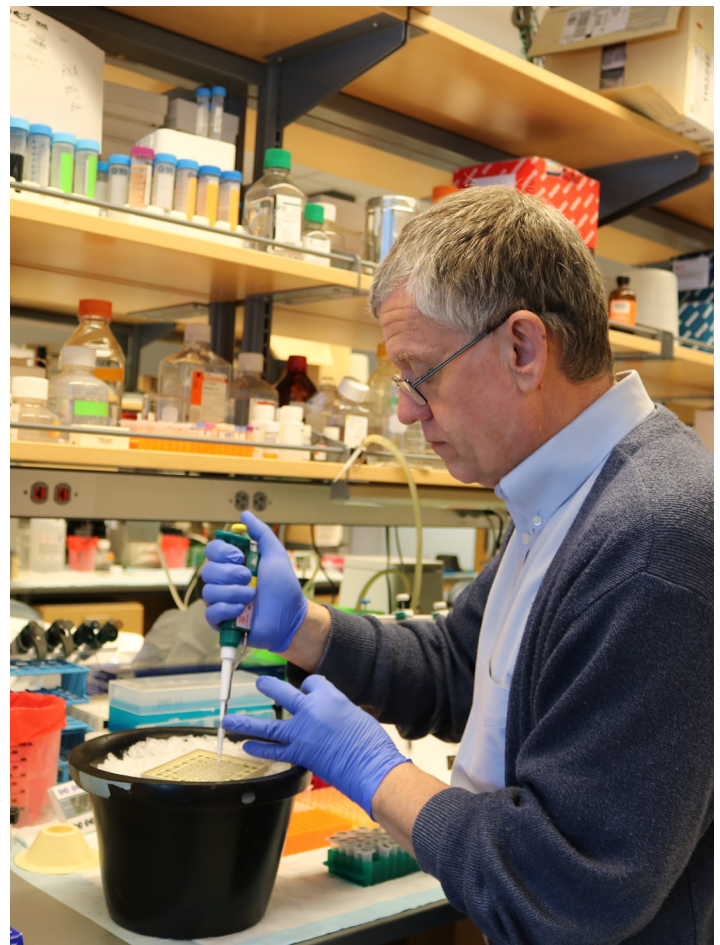
Jerod Denton, PhD, Associate Professor of Anesthesiology and Pharmacology, is doing early-stage drug discovery for a family of potassium channels involved in renal, endocrine, cardiac and brain function. The goal is to develop sharp pharmacological tools for exploring the integrative physiology and, ultimately, druggability of these channels.

Brad Grueter, PhD, and Carrie Grueter, PhD, Assistant Professors, are researching the neurobiology of addiction and reward-related behaviors. They utilize state-of-the-art electrophysiology techniques, including optogenetics, as well as a battery of specialized neurobehavioral tests performed in genetically modified mouse models.

Matthias Riess, MD, PhD, Professor of Anesthesiology and Pharmacology, is investigating the mechanisms of cardio- and neuroprotection following cardiac arrest, myocardial infarction and stroke in various translationally relevant cell, isolated organ and animal models.

Edward Sherwood, MD, PhD, Professor of Anesthesiology, Pathology, Microbiology and Immunology, Cornelius Vanderbilt Chair in Anesthesiology and Vice Chair for Research, Julia Bohannon, PhD, Assistant Professor of Anesthesiology, and Antonio Hernandez, MD, Associate Professor of Anesthesiology, are studying several aspects of sepsis and burn injury and the application of immunotherapy in critically ill patients.

The Billings Laboratory focuses on developing new therapy for perioperative organ injury by conducting clinical trials and evaluating mechanisms of surgery-induced organ injury. Broadly this includes studying and manipulating the patient response to acute surgical stress to reduce morbidity, but specifically they are investigating the impact of perioperative oxidative damage as a mechanism of acute kidney and brain injury in patients having surgery.



Advancing Technology & Improving Patient Care

The informatics groups work outside the operating room, advancing patient care through innovations in patient safety and quality. By harnessing innovative technology into clinical applications, **VAPIR** and **Perioperative Informatics** are advancing the frontiers of science and healthcare. Faculty members engage with students through mentorship and training programs, equipping the next generation of professionals.

INFORMATICS
DATABASE SIZE

16

TERABYTES



Perioperative Informatics

Perioperative Informatics, led by Jonathan Wanderer, MD, MPhil, designs, develops, and implements system enhancements for the periprocedural and inpatient care areas. The team supports vendor-based solutions and integrates them with the Epic unified application suite. Using health information technology solutions, the Perioperative Informatics group supports best practice care and workflows to improve patient safety, care quality, efficiency and communication through accurate and reliable real-time data acquisition and delivery.

Recent accomplishments include:

- Implementation of an electronic health care record at Vanderbilt Wilson County Hospital.
- Integration of new anesthesia quality improvement tool with Epic.
- Participating in the VUMC/Epic Collaborative to extend notification and communication functionality within Epic.

Vanderbilt Anesthesiology & Perioperative Informatics Research (VAPIR) Division

VAPIR, led by Robert Freundlich, MD, MS, MSCI, collaborates broadly to better understand perioperative care. Students, residents and fellows can participate in seminars, journal clubs and a structured summer research training program. Experts in biomedical informatics and clinical research share their research at monthly seminars as visiting scholars.

Among its many ongoing projects, VAPIR has:

- Created the informatics backbone that supports the Vanderbilt Perioperative Consult Service.
- Analyzed the impact of real-time decision support tools created by the Perioperative Informatics team.
- Worked closely with Perioperative Informatics to develop a common data architecture, enabling seamless data analysis from our legacy Electronic Health Record, VPIMS (Vanderbilt Perioperative Information Management System) and current eStar (Epic) system.

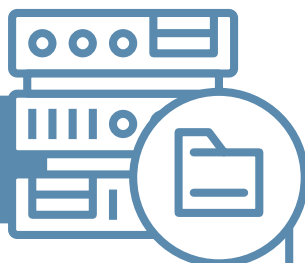
CURRENT ACTIVE
PROJECTS

36



CASES CONTAINED
IN THE PERIOPERATIVE
DATA WAREHOUSE

1,358,742



Perioperative Clinical Research Institute & Vanderbilt Anesthesiology Clinical Research Advisory Committee

The Perioperative Clinical Research Institute (PCRI) is led by Edward Sherwood, MD, PhD, David McIlroy, MB.BS., MD, MClinEpi, and Debra Craven, MSN, MMHC. The mission of the PCRI is to support high quality clinical research as a means of advancing the practice of anesthesiology, pain management and critical care medicine, as well as aiding the development of academic careers for faculty. Operational management is guided by the Vanderbilt Anesthesiology Clinical Research Advisory Committee (VACRAC).

The team provides a full range of support services, including study protocol development, initiation and execution, regulatory and compliance oversight, data management, contracts management, biostatistics and biomedical informatics. The end goal is execution and publication of well-designed clinical research projects that answer important questions, including smaller studies designed to generate preliminary, pilot or feasibility data to support subsequent grant applications and trials through to multi-center investigator-initiated studies.

Clinical research within the department includes industry-sponsored, extramural grant-funded and investigator-initiated clinical projects that focus on the advancement of medical practice in the fields of perioperative care, critical care and pain management, and chronic pain. Most of the department's investigators are practicing physicians who use their clinical expertise to develop research protocols that answer clinically important questions.

The PCRI oversees a multitude of randomized clinical trials and observational studies, with many more studies in development. The team consists of highly trained and broadly experienced research professionals, including four research nurses, four clinical trial coordinators, a regulatory specialist and an administrative assistant.

All proposed clinical research studies go through VACRAC for development and refinement. There is dedicated informatics and biostatistical support within the department, with focus on supporting studies that can lead to important clinical trials.

Vanderbilt Anesthesiology Clinical Research Advisory Committee

VACRAC (Vanderbilt Anesthesiology Clinical Research Advisory Committee), in partnership with the Perioperative Clinical Research Institute (PCRI), supports new and established investigators as they develop clinical research projects, with the goal of optimizing study design and resource utilization. The committee oversees the development and conduct of industry-sponsored and investigator-initiated research by providing guidance to assure optimal study design and protocol development as well as managing essential research services and programs.

The mission of VACRAC is to:

- Mentor investigators throughout the research development and implementation process.
- Create opportunities for ongoing learning about research methods, proposal writing, IRB applications, data management, statistical analysis and presentation/publication skills.
- Review new research proposals and regularly audit ongoing investigations for effectiveness and compliance with regulatory and safety guidelines.
- Optimize resource utilization by assessing manpower and facilities availability and utilization.

VACRAC is co-chaired by Edward Sherwood, MD, PhD (Vice Chair for Research), David McIlroy, MB.BS., MD, MClinEpi (Director of Clinical Research), Pratik Pandharipande, MD, MSCI (Vice Chair for Faculty Affairs), and Matthew Shotwell, PhD (Department of Biostatistics). The committee's membership is composed of established clinical investigators in the Department of Anesthesiology.

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| MULTICENTER DATA COLLABORATIVE..... | 1 |
| MULTICENTER REGISTRY | 6 |
| INTERNATIONAL STUDIES | 8 |
| OBSERVATIONAL CLINICAL TRIALS | 10 |
| INTERVENTIONAL CLINICAL TRIALS | 10 |

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| DATA REVIEWS | |
| SURVEYS..... | 3 |
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| STUDIES IN DATA ANALYSIS / | 40 |
| MANUSCRIPT DEVELOPMENT | |
| TOTAL STUDIES ACTIVE IN IRB | 114 |

Key Clinical Research Studies

Brian Allen, MD

A Randomized Controlled Trial of Regional versus General Anesthesia for Promoting Independence After Hip Fracture (REGAIN Trial)

Bret Alvis, MD

Non-Invasive Venous waveform Analysis (NIVA)-a proof of concept study

Jeanette Bauchat, MD, MS

Retrospective study of timing and efficacy of oral iron therapy for iron deficiency anemia in inpatient pregnant women

The Incidence of Clinically Significant Respiratory Depression in Women with a BMI (≥ 40 kg/m²) Receiving Neuraxial Morphine Post-Cesarean Delivery: A Retrospective Chart Review

The SOAP COVID-19 Delivery Registry

Clayne Benson, MD

Renal Venous Pressure Monitoring with IVC clamping during Liver Transplantation

Christina Bonczyk, MD

Current Procedural Terminology Accuracy in the Perioperative Setting

David A. Edwards, MD, PhD

A Randomized, Double-Blind, 2-Way Crossover Trial to Assess the Efficacy of Guanfacine and Lidocaine Combination versus Lidocaine Alone in Trigeminal Nerve Block for Pain Management in Painful Trigeminal Neuropathy Patients

Evaluation of state-mandated acute and post-surgical pain-specific CDC opioid prescribing guidelines

Perioperative Quantitative Measurement of Pain Thresholds in Thoracotomy Patients

TN Together and opioid prescribing at VUMC. A retrospective interrupted time series analysis of opioid prescribing data

Holly Ende, MD

Development of a clinical risk prediction tool for uterine atony following vaginal or cesarean delivery

Effect of a labor epidural "top-up" algorithm on time to replacement, number of interventions, and catheter failure rates for cesarean delivery

Effect of multimodal analgesia on postoperative pain control and opioid use following cesarean delivery in patients receiving buprenorphine

Feasibility study for genetic variations associated with uterine atony following elective cesarean delivery

Genetic variations associated with uterine atony following elective cesarean delivery

Robert Freundlich, MD, MS, MSCI

Development of a Dynamic Predictive Model for Postoperative Respiratory Decompensation in non-Intensive Care Unit Patients

Impact of Baseline Functional Status on Postoperative Resiliency

Projected Hospital and Intensive Care Unit Volumes in a Simulated Pandemic

Reducing Reintubation Risk in High-Risk Cardiac Surgery Patients with High-Flow Nasal Cannula

Rajnish Gupta, MD

Exponential Increase in Guideline Adoption Rates Using the Smartphone App ASRA Coags 2.0

Antonio Hernandez, MD

A study analyzing human blood monocytes and macrophages upon stimulation of cells with TLR ligands

Christina Jelly, MD

Multimodal Pain and Sedation Management for Enhanced Recovery After Cardiac Surgery

Patricia (Trish) Juozas-Clark, MS

Autism Spectrum Disorder: Clinician Interaction Assessment

Miklos Kertai, MD, PhD

Genome-wide association study of acute kidney injury after non-cardiac surgery

Intraoperative and postoperative dexmedetomidine and delirium, severity of postoperative pain and outcomes after cardiac surgery

Intraoperative processed EEG and delirium, neurologic complications and mortality after cardiac surgery

Platelet Counts, Mean Platelet Volume and Acute Kidney Injury after Transcatheter Aortic Valve Replacement

Preemptive Pharmacogenetic-guided Metoprolol Management for Postoperative Atrial Fibrillation in Cardiac Surgery: the PREEMPTIVE-Pilot Trial

J. Matthew Kynes, MD

Evaluation of Two Forms of Booster Training on Long-Term Retention of Clinical Skills for Caesarean Delivery in a Low-Resource Setting

The effectiveness of perioperative pain management following the implementation of an acute pain service in a low-resource setting

Marcos Lopez, MD

Perioperative Vascular Reactivity

James Lozada, DO

Severe Maternal Morbidity among delivery and postpartum hospitalizations in Tennessee, 2008-2018

Kelly Mishra, MD

Peripheral IntraVenous Analysis (PIVA) for Predicting Volume Responsiveness and Fluid Status: An observational study

Puneet Mishra, MD

GREAT Knee Pain Reduction Trial, Genicular Radiofrequency Ablation Efficacy in Achieving Total Knee Pain Reduction Trial

GREAT Knee Postsurgical Pain Reduction Trial, Genicular Radiofrequency Ablation Efficacy in Achieving Total Knee Postsurgical Pain Reduction Trial

David Moore, MD

Outcomes and Health Care Resource Utilization in Congenital Heart Disease Patients Undergoing Noncardiac Procedures

Pediatric Difficult Intubation (PeDI) Registry – Improving Safety and Quality of Airway Management in Children with Difficult Airways

Dorothee Mueller, MD

Incidence and Risk Factors for Discretionary Postoperative Mechanical Ventilation

Jonathan Niconchuk, MD

Characterizing Short Term Surgical Mission Complication Rates at the Moore Pediatric Surgery Center

Srijaya Reddy, MD, MBA

Pediatric Craniofacial Surgery Perioperative Registry (PCSPR)

Mark Rice, MD

Understanding the Impact of a Student Registered Nurse Anesthesia Staffing Model on Perioperative Patient Outcomes: A Single-Center Retrospective Analysis of Patient Outcomes

Joseph Schlesinger, MD

A prospective, psychophysical study comparing auditory and vibrotactile cues to inform clinicians of patients' vital signs under varied workload conditions

A Prospective, Single Center Study of the Effects of Modulating Music in the Operating Room

Assessing the impact of music in the intensive care unit (ICU) to improve care for critically ill patients

Edward Sherwood, MD, PhD

Macrophage Mitochondrial Reprogramming and Innate Immune Memory

Kara Siegrist, MD

Mini Mitral Valve Repair/Replacement and Erector Spinae Catheter Quality Improvement Project

Bantayehu Sileshi, MD

An Evaluation of the KRNA Learning Management System

Defining Perioperative Morbidity and Mortality in Western Kenya: A Quality Improvement Project

The use of portable ultrasound in low resource settings to aid in perioperative assessment of patients

Loren Smith, MD, PhD

High Density Lipoprotein Characteristics and the Risk of Acute Kidney Injury Following Cardiac and Vascular Surgery

Jenna Sobey, MD

Assessment of Current Pain Management Practices in East Africa

Camila Walters, MD

The Effect of Maintaining Physiologic Oxygenation on Oxidative Stress During Cardiac Surgery

Jonathan Wanderer, MD, MPhil

Development and Validation of Prediction Models for Postoperative Pulmonary Complications

Multicenter perioperative outcomes group (MPOG) performance site

National Practice Patterns for Postoperative Nausea and Vomiting Prophylaxis

Quantification of Variability in Anesthesia Residency Training

Risk of Postoperative Pneumonia: A Comparison of Sugammadex and Neostigmine Using the National Surgical Quality Improvement Program Database

Center for Research and Innovation in Systems Safety

Director: Matthew Weinger, MD

VUMC's Center for Research and Innovation in Systems Safety (CRISS), directed by Matt Weinger, MD, is a highly interdisciplinary and collaborative center, with projects spanning numerous clinical domains and disciplines.

Using a range of human factors, usability and systems engineering, cognitive psychology, and implementation science techniques, CRISS studies performance during patient care and in realistic simulations to better understand how and why care deviates from optimal, then designs and studies interventions to improve care safety and quality.

CRISS investigators include anesthesiologists, PhD researchers, nursing and design staff, and faculty collaborators across Health Sciences and in the School of Engineering.

CRISS is particularly interested in designing and evaluating medical technologies and the use of electronically generated clinical data to identify evolving events and support decision-making.

CRISS explores the nature of expertise, clinician communication, situational awareness, the workload and stress of individual clinicians and of teams, teamwork, individual and group performance-shaping factors, alarms, human-technology interactions and novel methods of information presentation to improve care processes and outcomes.

CRISS provides internal and external consulting services for numerous customers. At VUMC, CRISS faculty and staff currently provide support for a number of health informatics and quality improvement initiatives. CRISS conducts formal usability testing of software applications and of medical devices.

Externally, CRISS is involved in numerous academic collaborations to re-engineer medical processes, improve clinician decision-making and enhance the usability and usefulness of clinical technology. For example, CRISS has provided more than a dozen years of support to the Department of Veterans Affairs to improve its national EHR system, including the development, testing and implementation of decision support tools in several clinical domains.

CRISS also helped to create a national standardized approach to human factors and user-centered design in VA healthcare. Further, CRISS conducts FDA-compliant human factors engineering consulting for proprietary medical devices.



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| PEER-REVIEWED PUBLICATIONS BY CRISS INVESTIGATORS | 34 |
| INVITED PRESENTATIONS LAST YEAR | 52 |
| INTERNAL COLLABORATORS | 73 |
| EXTERNAL COLLABORATORS | 57 |
| STAFF MEMBERS | 9 |
| FACULTY MEMBERS | 10 |

ANNUAL RESEARCH BUDGET **\$1.6 MILLION**

Two Active Research Projects

The Cancer Patient Safety Learning Laboratory (CaPSLL)

CRISS is in the second year of a multimillion-dollar federal grant to develop and test an artificial intelligence-based system and processes to better detect clinical deterioration in the ambulatory setting. The team is studying adult cancer patients undergoing or recovering from cancer treatment as outpatients. The system under development includes passive sensing of patient physiology and activity, active patient-reported symptoms, a predictive algorithm based on machine learning to detect clinical deterioration earlier and a response arm to more quickly and appropriately intervene in these patients.

IMPACTS

This five-year federally funded multicenter study, led by CRISS, focuses on understanding and improving the clinician's ability to manage critical events. The multidisciplinary study will ask anesthesiologists to manage simulated perioperative events and then be interviewed to ascertain their decision-making processes. The goal is to define better approaches to improve crisis management. While designed for anesthesiologists, the results will be generalizable to all types of acute care clinicians who may have to manage crisis events.

Benjamin Howard Robbins Scholar Program

The Benjamin Howard Robbins Scholar Program was initiated in 2007 to support the professional development of department early-stage physician-scientists. The program builds critical research skills under direct mentorship of established scientists with the goal that all Robbins Scholars establish vigorous, independently funded research programs. The program is named in honor of the department's first chairman, a renowned physician-scientist. The BH Robbins Scholar Program is multidisciplinary, encouraging and supporting mentorships and collaborations that extend well beyond traditional boundaries of anesthesia. Scholars apply and are rewarded on a competitive basis.

Department Chair Warren Sandberg, MD, PhD, notes, "The BH Robbins Scholar Program provides a unique mentored research experience for young scholars that culminates in a two-year multidisciplinary fellowship, with at least one year devoted to research. Our Robbins Scholars benefit from one-on-one mentorship, a wealth of research and educational resources, protected research time and a stipend during their residency and fellowship."

The BH Robbins Scholar Program is directed by F. T. (Josh) Billings IV, MD, MSCI. Two scholars have recently completed the program, both advancing (summer 2020) to NIH-funded K23 career development awards. Robert Freundlich, MD, MS, MSCI, with the mentorship of Pratik Pandharipande, MD, MSCI, is initiating his project, "Reducing reintubation risk in high-risk cardiac surgery patients with high-flow nasal cannula--the 'I-CAN' study," and Loren E. Smith, MD, PhD, with the mentorship of Josh Billings, is initiating her project, "Perioperative high-density lipoproteins and postoperative AKI." Both of these projects will advance the understanding of critical illness and provide opportunities to improve patient care.

Areas of research for our current scholars are described briefly here.

Christina Boncyk, MD (Scholar 2018-2022) is currently investigating the impact of inappropriate medications following intensive care unit (ICU) survival, with a special focus on antipsychotic medications for the management of ICU delirium. She was recently awarded (summer 2020) a FAER Mentored Research Training Grant for her project investigating the impact of increased medication prescribing on ICU survivors. Her long-term research interests include improving ICU survivorship through identification of modifiable medication interventions. Boncyk is mentored by Christopher Hughes, MD, MS, and Pratik Pandharipande, MD, MSCI.

Dianne Lou, MD, PhD (Scholar 2019-2022) is currently investigating the pathological processes that result in widespread chronic pain in head and neck cancer survivors, using functional and structural MRI, quantitative sensory testing, and patient reported outcomes. In addition, she is the principal investigator of an upcoming randomized controlled trial using multimodal treatment for the prevention of chronic systemic symptoms after treatment, such as widespread pain and cognitive dysfunction.

She is mentored by Barbara Murphy, MD, Dept of Medicine, Division of Hematology/Oncology, and David A. Edwards, MD, PhD, Dept of Anesthesiology, Division of Pain Medicine. She started her second year of the T32 research year in July 2020 and will complete an Interventional Pain Fellowship in 2021-2022.

Puneet Mishra, MD (Scholar 2016-2021) conducts research that is dedicated to finding effective treatment options for patients suffering from chronic knee pain. He is the principal investigator of a randomized control trial examining the efficacy of preoperative genicular nerve radiofrequency ablation in reducing pain and improving functional outcomes in patients undergoing total knee arthroplasty. This upcoming fall, he will be participating in a multicenter trial exploring the effectiveness of pharmacological, behavioral and interventional treatment modalities for patients suffering from chronic knee pain. Given the vast number of patients suffering from chronic knee pain, Mishra's research serves a critical role in helping patients improve their quality of life. He is mentored by Stephen Bruehl, PhD.

Naem Patil, MBBS, PhD (Scholar 2018-2022) is investigating the molecular mechanisms leading to sepsis-induced alterations in innate leukocyte function, under the T32 training grant. His current studies are focused on characterization of macrophage mitochondrial metabolism upon Toll-like receptor ligand stimulation and evaluation of mitochondrial metabolic intermediates as novel mediators altering host innate immunity. He is a recipient of the US Shock Society Faculty Research Award. In 2020, Patil received the Vanderbilt Faculty Research Scholars Award (career development award). He is mentored by Edward R. Sherwood MD, PhD.

Kimberly Rengel, MD (Scholar 2017-2022) is interested in improving functional outcomes for patients after major surgery or critical illness and the role of skeletal muscle health in acquired disability. Her current research program is focused on the use of ultrasound to examine skeletal muscle health throughout critical illness and its relationship to long-term acquired disability. Further, working with her mentors, she plans to translate this research into the perioperative space identifying patients at risk for acquired disability and using interventions like prehabilitation to prevent physical decline after major surgery. Rengel is mentored by Christopher Hughes, MD, MS, and Pratik Pandharipande, MD, MSCI.

Amanda Stone, PhD (Scholar 2018-2021) is a clinical psychologist with primary interests in pediatric pain and intergenerational factors affecting children's health outcomes. Under the T32 training grant, she is currently investigating predictors of opioid use for postoperative pain following tonsillectomy procedures. Recently, Stone has developed several collaborations related to leftover opioids following surgical procedures and opioid disposal practices. Ultimately Stone's research aims to optimize pediatric pain management and prevent negative opioid-related outcomes, such as opioid misuse or unintentional opioid overdose. Stone is mentored by Stephen Bruehl, PhD.

OFFICE OF ANESTHESIOLOGY FACULTY AFFAIRS

PROFESSIONAL DEVELOPMENT CYCLE



The Office of Anesthesiology Faculty Affairs (OFA) in the Department of Anesthesiology seeks to facilitate the professional and academic development of its faculty, improve career satisfaction and instill a sense of meaning in our faculty from the practice of their vocation. The major pillars of the OFA are:

- Academic appointments
- Promotions
- Career Development Award (CDA) program [Allocation of academic and administrative time]
- Mentorship program
- Academic Achievement Award (AAA) program
- Wellness and Support initiatives
- Communications skills program (CLARITY)

Our Mission

The mission of the OFA is to encourage professional development and advancement while supporting service to the department, institution, specialty and society.

Our Vision

The vision of the OFA is that all faculty members in the department will attain their full potential in their professional careers.

To achieve this vision, all faculty members would know and be empowered to contribute to excellence according to their unique interests and roles across the tripartite mission of clinical, academic and educational practice. All faculty members will maintain a sense of meaning and purpose, be connected to their calling and be part of a professional community.

Our Team



Pratik Pandharipande,
MD, MSCI
Vice Chair,
Faculty Affairs



Matthew Weinger, MD
Associate Vice Chair,
Faculty Affairs



Catherine Clark
Senior Program
Manager



Alexandria (Lexi) Tittor
Associate Program
Manager



Sharae Shipp
Associate Program
Manager



Martha Tanner
Editorial Assistant III



Yvonne Poindexter
Editor

Our Key Functions

The Oafa evolved, starting in 2008 under the leadership of Dr. Weinger, to encompass a broad range of functions in support of the department's faculty. As shown in the Professional Development Cycle figure, some of Oafa's major functions occur at specific times each academic year while other functions are ongoing.

Appointments and Promotions

The Oafa oversees the critical function of evaluating and approving initial faculty appointments as well as subsequent promotions and career track changes. This Oafa function is executed by the department's Appointments and Promotions Committee (APC), which annually assesses each faculty member's academic and career progress. The APC votes to recommend faculty to enter the promotion process that leads to the submission of a promotion packet to the School of Medicine for consideration. All full professors in the Educator or Scientist tracks are eligible to serve on the APC. The APC generally has 12 members who are selected by the Faculty Affairs Vice Chair to serve staggered three-year terms, which ensures fair representation across divisions.

Career Development Award (CDA) Program

The objective of the CDA Program is to provide clinical faculty with academic and administrative days to be able to dedicate time to advance their own careers, to achieve success in any administrative roles and to contribute to the missions of the department and institution beyond direct patient care. Each year, faculty submit CDA applications based on their planned administrative, educational, scholarship and academic service goals. The CDA Committee, consisting of members of the APC and the department's division chiefs, uses an NIH-style grant review process to evaluate the applications. After an initial review, the CDA Committee meets together to discuss all applications via a transparent process based on published guidelines, prior success of faculty and alignment with departmental missions. The resulting CDA allocation recommendations are reviewed and approved by the department chair.

Academic Achievement Award (AAA) Program

The objective of the AAA Program is to encourage professional development and academic achievement by recognizing with an annual merit-based financial incentive faculty contributions to the department's numerous missions beyond direct patient

care, including in the areas of education, scholarship and professional service.

Annual Faculty Reviews

The Oafa coordinates annual faculty reviews, a time to celebrate faculty successes, identify challenges and provide faculty an opportunity to meet with senior departmental leadership to discuss career goals. An individual letter is generated based on the meeting that includes summative feedback and specific recommendations. The objective is to create individualized career development plans aligned with each faculty member's unique career goals.

Mentoring Program

A new departmental mentorship program was introduced by the Oafa in FY21 to pair faculty with mentors aligned with their desired career development path. The mentorship program is based on approximately 50 scholarly hubs within the department, which are arranged thematically into affinity groups that cover broad areas of basic science, education, quality improvement, clinical research, systems engineering, informatics, clinical operations, genomics and clinical and administrative service. Senior mentors serve as a resource and as mentors for the hub mentors.

Wellness and Support Initiatives

Faculty in an academic medical center have extremely demanding jobs with associated stressors that can degrade well-being and disrupt work-life integration. To address these pressures, the Oafa has collaborated with two of the department's clinical psychologists to design wellness initiatives that include strategies to address burnout, a peer support program and, most recently, in response to the COVID 19 pandemic, a webpage of wellness resources and opportunities for more social support (e.g., remote academic happy hours).

CLARITY

CLARITY is a departmental program designed to enhance the written and oral communication skills of clinicians, researchers, and staff—from faculty and fellows to managers and administrative staff. The program has three components: training to improve written and oral communication, structured editorial support, and resources and support for publication and other scholarly processes.

2019-2020 SELECTED PUBLICATIONS

PEER-REVIEWED PUBLICATIONS

202

PEER-REVIEWED
PUBLICATIONS

102

ORIGINAL RESEARCH
PUBLICATIONS

28

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ADVANCED PRACTICE
NURSE PRACTITIONERS/CRNAs



The Department of Anesthesiology places a strong emphasis on faculty, trainee and staff career development in academic anesthesiology. Active mentoring programs pair junior and mid-level investigators with experienced scientists in both basic and clinical research. Research productivity, determined by publication in peer-reviewed journals, grant dollars and ongoing research studies, continues to be strong. Selected publications, highlighting the breadth of research conducted, publication type and contributing authors, are provided on the next few pages. A complete list of departmental publications can be found at: vumc.org/anesthesiology/communications or by scanning the QR code provided here.



BASIC SCIENCE

Afzal A, Figueroa EE, Kharade SV, Bittman K, Matlock BK, Flaherty DK, **Denton JS**: The LRRC8 volume-regulated anion channel inhibitor, DCPIB, inhibits mitochondrial respiration independently of the channel. *Physiol Rep*. 2019; 7:e14303

Balzer C, **Cleveland WJ**, Jinka TR, **Riess ML**: Video laryngoscopic oral intubation in rats: a simple and effective method. *Am J Physiol Lung Cell Mol Physiol* 2020; 318:L1032-L1035

Figueroa EE, Kramer M, **Strange K**, **Denton JS**: CysLT1 receptor antagonists pranlukast and zafirlukast inhibit LRRC8-mediated volume regulated anion channels independently of the receptor. *Am J Physiol Cell Physiol* 2019; 317:C857-C866

Flores B, **Delpire E**: Osmotic Response of Dorsal Root Ganglion Neurons Expressing Wild-Type and Mutant KCC3 Transporters. *Cell Physiol Biochem* 2020; 54:577-590

Folkes OM, Baldi R, Kondev V, Marcus DJ, Hartley ND, Turner BD, Ayers JK, Baechle JJ, Misra MP, Altemus M, **Grueter CA**, **Grueter BA**, Patel S: An endocannabinoid-regulated basolateral amygdala-nucleus accumbens circuit modulates sociability. *J Clin Invest* 2020; 130:1728-1742

Koumangoye R, Omer S, Kabeer MH, **Delpire E**: Novel Human NKCC1 Mutations Cause Defects in Goblet Cell Mucus Secretion and Chronic Inflammation. *Cell Mol Gastroenterol Hepatol*. 2020; 9:239-255

Liu S, Chang S, Han B, Xu L, Zhang M, Zhao C, Yang W, Wang F, Li J, **Delpire E**, Ye S, Bai XC, Guo J: Cryo-EM structures of the human cation-chloride cotransporter KCC1. *Science* 2019; 366:505-508

Manz KM, Baxley AG, Zurawski Z, Hamm HE, **Grueter BA**: Heterosynaptic GABAB Receptor Function within Feedforward Microcircuits Gates Glutamatergic Transmission in the Nucleus Accumbens Core. *J Neurosci* 2019; 39:9277-9293

Marcus DJ, Bedse G, Gaulden AD, Ryan JD, Kondev V, Winters ND, Rosas-Vidal LE, Altemus M, Mackie K, Lee FS, **Delpire E**, Patel S: Endocannabinoid Signaling Collapse Mediates Stress-Induced Amygdalo-Cortical Strengthening. *Neuron* 2020; 105:1062-1076 e6

Perry JSA, Morioka S, Medina CB, Iker Etchegaray J, Barron B, Raymond MH, Lucas CD, Onengut-Gumuscu S, **Delpire E**, Ravichandran KS: Interpreting an apoptotic corpse as anti-inflammatory involves a chloride sensing pathway. *Nat Cell Biol* 2019; 21:1532-1543

CLINICAL AND TRANSLATIONAL SCIENCE

Alvis BD, McCallister R, Polcz M, Lima JLO, **Sobey JH**, Brophy DR, **Miles M**, Brophy C, Hocking K: Non-Invasive Venous waveform Analysis (NIVA) for monitoring blood loss in human blood donors and validation in a porcine hemorrhage model. *J Clin Anesth* 2020; 61:109664

Alvis BD, Polcz M, Huston JH, Hopper TS, **Leisy P**, **Mishra K**, **Eagle SS**, Brophy CM, Lindenfeld J, Hocking KM: Observational Study of Noninvasive Venous Waveform Analysis to Assess Intracardiac Filling Pressures During Right Heart Catheterization. *J Card Fail* 2020; 26:136-141

Aubron C, McQuilten Z, Bailey M, Board J, Buhr H, Cartwright B, Dennis M, Hodgson C, Forrest P, **McIlroy D**, Murphy D, Murray L, Pellegrino V, Pilcher D, Sheldrake J, Tran H, Vallance S, Cooper DJ, endorsed by the International ECMO Network: Low-Dose Versus Therapeutic Anticoagulation in Patients on Extracorporeal Membrane Oxygenation: A Pilot Randomized Trial. *Crit Care Med* 2019; 47:e563-e571

Bai Y, Xu Z, **Chandrashekar M**, **St Jacques PJ**, Liang Y, Jiang Y, **Kla K**: Comparison of a simplified nasal continuous positive airways pressure device with nasal cannula in obese patients undergoing colonoscopy during deep sedation: A randomised clinical trial. *Eur J Anaesthesiol* 2019; 36:633-640

Brown RM, Wang L, Coston TD, Krishnan NI, Casey JD, **Wanderer JP**, **Ehrenfeld JM**, Byrne DW, Stollings JL, Siew ED, Bernard GR, Self WH, Rice TW, Semler MW; SMART Investigators and the Pragmatic Critical Care Research Group: Balanced Crystalloids versus Saline in Sepsis. A Secondary Analysis of the SMART Clinical Trial. *Am J Respir Crit Care Med* 2019; 200:1487-1495

Bruehl S, Burns JW, Koltyn K, **Gupta R**, Buvanendran A, **Edwards D**, **Chont M**, Wu YH, Qu'd D, **Stone A**: Are endogenous opioid mechanisms involved in the effects of aerobic exercise training on chronic low back pain? A randomized controlled trial. *Pain* 2020 Jun [Epub]

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 [Epub]

Cui Y, **Li G**, Cao R, Luan L, **Kla KM**: The effect of perioperative anesthetics for prevention of postoperative delirium on general anesthesia: A network meta-analysis. *J Clin Anesth* 2020; 59:89-98

de Castro REV, Prata-Barbosa A, de Magalhaes-Barbosa MC, Cunha A, Cheniaux E, **Smith HAB**: Validity and Reliability of the Brazilian Portuguese Version of the Pediatric Confusion Assessment Method for the ICU. *Pediatr Crit Care Med* 2020; 21:e39-e46

Dikalova AE, Pandey A, Xiao L, Arslanbaeva L, Sidorova T, **Lopez MG**, **Billings FT 4th**, Verdin E, Auwerx J, Harrison DG, Dikalov SI: Mitochondrial Deacetylase Sirt3 Reduces Vascular Dysfunction and Hypertension While Sirt3 Depletion in Essential Hypertension Is Linked to Vascular Inflammation and Oxidative Stress. *Circ Res* 2020; 126:439-452

Donahue BS: Red Cell Transfusion and Thrombotic Risk in Children. *Pediatrics* 2020; 145

Gollapudy S, Gashkoff DA, Poetker DM, Loehrl TA, **Riess ML**: Surgical Field Visualization during Functional Endoscopic Sinus Surgery: Comparison of Propofol- vs Desflurane-Based Anesthesia. *Otolaryngol Head Neck Surg* 2020;194599820921863

Hayhurst CJ, Marra A, Han JH, Patel MB, Brummel NE, Thompson JL, Jackson JC, Chandrasekhar R, Ely EW, **Pandharipande PP**, **Hughes CG**: Association of Hypoactive and Hyperactive Delirium With Cognitive Function After Critical Illness. *Crit Care Med* 2020; 48:e480-e488

Hernandez A, Luan L, Stothers CL, **Patil NK**, Fults JB, Fensterheim BA, Guo Y, Wang J, **Sherwood ER**, **Bohannon JK**: Phosphorylated Hexa-Acyl Disaccharides Augment Host Resistance Against Common Nosocomial Pathogens. *Crit Care Med* 2019; 47:e930-e938

Jeschke MG, **Sherwood ER**: The Shock Society 2019-2021 Strategic Plan. *Shock* 2019; 52:557-565

Jin SC, Furey CG, Zeng X, Allocco A, Nelson-Williams C, Dong W, Karimy JK, Wang K, Ma S, **Delpire E**, Kahle KT: SLC12A ion transporter mutations in sporadic and familial human congenital hydrocephalus. *Mol Genet Genomic Med* 2019; 7:e892

Karlon CW, Delozier AM, Seals SR, Britt AB, **Stone AL**, Reneker JC, Jackson EA, McNaull MM, Credeur DP, Welsch MA: Physical Activity and Pain in Youth With Sickle Cell Disease. *Fam Community Health* 2020; 43:1-9

Kynes JM, Shotwell MS, **Walters CB**, Bichell DP, Christensen JT, Hays SR: Epidurals for Coarctation Repair in Children Are Associated with Decreased Postoperative Anti-Hypertensive Infusion Requirement as Measured by a Novel Parameter, the Anti-Hypertensive Dosing Index (ADI). *Children-Basel* 2019; 6:112

Lopez MG, **Hughes CG**, DeMatteo A, O'Neal JB, McNeil JB, Shotwell MS, Morse J, Petracek MR, Shah AS, Brown NJ, **Billings FT 4th**: Intraoperative Oxidative Damage and Delirium after Cardiac Surgery. *Anesthesiology* 2020; 132:551-561

Mathis MR, Naik BI, **Freundlich RE**, Shanks AM, Heung M, Kim M, Burns ML, Colquhoun DA, Rangrass G, Janda A, Engoren MC, Saager L, Tremper KK, Kheterpal S, Aziz MF, Coffman T, Durieux ME, Levy WJ, Schonberger RB, Soto R, Wilczak J, Berman MF, Berris J, Biggs DA, Coles P, Craft RM, Cummings KC, Ellis TA, 2nd, Fleishut PM, Helsten DL, Jameson LC, van Klei WA, Kooij F, LaGorio J, Lins S, Miller SA, Molina S, Nair B, Paganelli WC, Peterson W, Tom S, **Wanderer JP**, Wedeven C; Multicenter Perioperative Outcomes Group Investigators: Preoperative Risk and the Association between Hypotension and Postoperative Acute Kidney Injury. *Anesthesiology* 2020; 132:461-475

McBride MA, **Owen AM**, Stothers CL, **Hernandez A**, Luan L, **Burelbach KR**, **Patil TK**, **Bohannon JK**, **Sherwood ER**, **Patil NK**: The Metabolic Basis of Immune Dysfunction Following Sepsis and Trauma. *Front Immunol* 2020; 11:1043

Miles M, **Mueller D**, Gay-Betton D, Baum Miller SH, Massa S, Shi Y, Shotwell MS, Lane-Fall M, **Schlesinger JJ**: Observational Study of Clinician Attentional Reserves (OSCAR): Acuity-Based Rounds Help Preserve Clinicians' Attention. *Crit Care Med* 2020; 48:507-514

Poppert Cordts KM, **Stone AL**, Beveridge JK, Wilson AC, Noel M: The (Parental) Whole Is Greater Than the Sum of Its Parts: A Multifactorial Model of Parent Factors in Pediatric Chronic Pain. *J Pain* 2019; 20:786-795

Riess ML, Elorbany R, Weihrauch D, Stowe DF, Camara AKS: PPARgamma-Independent Side Effects of Thiazolidinediones on Mitochondrial Redox State in Rat Isolated Hearts. *Cells* 2020; 9

Rodriguez-Buitrago A, Basem A, Okwumabua E, Enata N, Evans A, Pennings J, Karacay B, **Rice MJ**, Obremskey W: Hyperglycemia as a risk factor for postoperative early wound infection after bicondylar tibial plateau fractures: Determining a predictive model based on four methods. *Injury* 2019; 50:2097-2102

Samuels DC, Hulgán T, Fessel JP, **Billings FT 4th**, Thompson JL, Chandrasekhar R, Girard TD: Mitochondrial DNA Haplogroups and Delirium During Sepsis. *Crit Care Med* 2019; 47:1065-1071

Scheunemann LP, Leland NE, Perera S, Skidmore ER, Reynolds CF, **Pandharipande PP**, Jackson JC, Ely EW, Girard TD: Sex Disparities and Functional Outcomes after a Critical Illness. *Am J Respir Crit Care Med* 2020; 201:869-872

Smith LE: High-Density Lipoproteins and Acute Kidney Injury. *Semin Nephrol* 2020; 40:232-242

Watts BA, 3rd, Tamayo E, **Sherwood ER**, Good DW: Monophosphoryl lipid A induces protection against LPS in medullary thick ascending limb through induction of Tollip and negative regulation of IRAK-1. *Am J Physiol Renal Physiol* 2019; 317:F705-F719

Zapf MAC, **McEvoy MD**, Brumley MT, Hamm J, **Wanderer JP**: Patients able to complete an online preoperative screening tool are younger, but have similar comorbid status and health literacy. *J Clin Anesth* 2020; 64:109802

EDUCATION

Beutler S, **McEvoy MD**, Ferrari L, Vetter TR, Bader AM: The Future of Anesthesia Education: Developing Frameworks for Perioperative Medicine and Population Health. *Anesth Analg* 2020; 130:1103-1108

Martinelli SM, Isaak RS, Schell RM, Mitchell JD, **McEvoy MD**, Chen F: Learners and Luddites in the Twenty-first Century: Bringing Evidence-based Education to Anesthesiology. *Anesthesiology* 2019; 131:908-928

GLOBAL HEALTH

Crockett CJ, Zeigler LN, **Kynes JM**, **Lawson KC**, Figueroa LI, Hayes CB, Samen CDK, McQueen KA: A prospective observational study of postoperative follow-ups and outcomes at a nonprofit, internationally supported pediatric surgery center in Guatemala. *Paediatr Anaesth* 2020; 30:469-479

Newton MW, Hurt SE, **McEvoy MD**, Shi Y, Shotwell MS, Kamau J, Nabalindo S, Ngumi ZWW, **Sandberg WS**, **Sileshi B**: Pediatric Perioperative Mortality in Kenya: A Prospective Cohort Study from 24 Hospitals. *Anesthesiology* 2020; 132:452-460

HEALTH SERVICES

Banerjee A, Burden A, **Slagle JM**, Gaba DM, Boulet JR, Torsher L, DeMaria S, Levine AI, Steadman RH, Sinz EH, Park C, McIvor WR, Shotwell MS, Cooper J, **Weinger MB**, Rask JP: Key performance gaps of practicing anesthesiologists: how they contribute to hazards in anesthesiology and proposals for addressing them. *Int Anesthesiol Clin* 2020; 58:13-20

Chen Y, Lehmann CU, Hatch LD, Schreppe E, Malin BA, **France DJ**: Modeling Care Team Structures in the Neonatal Intensive Care Unit through Network Analysis of EHR Audit Logs. *Methods Inf Med* 2019; 58:109-123

DiIulio J, Militello LG, Andraka-Christou BT, Cook RL, Hurley RW, Downs SM, **Anders S**, Mamlin BW, Danielson EC, Harle CA: Factors That Influence Changes to Existing Chronic Pain Management Plans. *J Am Board Fam Med* 2020; 33:42-50

Dunham WC, **Weinger MB**, **Slagle J**, **Pretorius M**, Shah AS, Absi TS, Shotwell MS, Beller M, Thomas E, Vnencak-Jones CL, **Freundlich RE**, **Wanderer JP**, **Sandberg WS**, **Kertai MD**: CYP2D6 Genotype-guided Metoprolol Therapy in Cardiac Surgery Patients: Rationale and Design of the Pharmacogenetic-guided Metoprolol Management for Postoperative Atrial Fibrillation in Cardiac Surgery (PREEMPTIVE) Pilot Study. *J Cardiothorac Vasc Anesth* 2020; 34:20-28

Garvin JH, Ducom J, Matheny M, **Miller A**, Westerman D, **Reale C**, **Slagle J**, Kelly N, **Beebe R**, Koola J, Groessl EJ, Patterson ES, **Weinger M**, Perkins AM, Ho SB: Descriptive Usability Study of CirrODS: Clinical Decision and Workflow Support Tool for Management of Patients With Cirrhosis. *JMIR Med Inform* 2019; 7:e13627

Harle CA, DiIulio J, Downs SM, Danielson EC, **Anders S**, Cook RL, Hurley RW, Mamlin BW, Militello LG: Decision-Centered Design of Patient Information Visualizations to Support Chronic Pain Care. *Appl Clin Inform* 2019; 10:719-728

Schulthess D, Gassull D, Makady A, Ludlow A, **Rothman B**, Have PT, Wu Y, Ekstrom L, Minnema M, Jagasia M: Are CAR-T therapies living up to their hype? A study using real-world data in two cohorts to determine how well they are actually working in practice compared with bone marrow transplants. *BMJ Evid Based Med* 2019 Jul [Epub]

Virani SS, Akeroyd JM, Ahmed ST, Krittanawong C, Martin LA, **Slagle J**, Gobbel GT, Matheny ME, Ballantyne CM, Petersen LA: The use of structured data elements to identify ASCVD patients with statin-associated side effects: Insights from the Department of Veterans Affairs. *J Clin Lipidol* 2019; 13:797-803 e1

INFORMATICS

Boncyk CS, Jelly CA, Freundlich RE: The Blessing and the Curse of the Administrative Database. *Ann Am Thorac Soc* 2020; 17:174-175

Hernandez A, Patil NK, Stothers CL, Luan L, McBride MA, **Owen AM, Burelbach KR**, Williams DL, **Sherwood ER, Bohannon JK**: Immunobiology and application of toll-like receptor 4 agonists to augment host resistance to infection. *Pharmacol Res* 2019; 150:104502

Nassiri AM, Garrett CG, Dail TL, **Tiwari V**, Haynes DS, Rivas A, Langerman AJ: Should I Buy This? A Decision-Making Tool for Surgical Value-Based Purchasing. *Otolaryngol Head Neck Surg* 2020:194599820915194

SAFETY AND QUALITY

Chan MTV, Hedrick TL, Egan TD, Garcia PS, Koch S, Purdon PL, Ramsay MA, Miller TE, **McEvoy MD**, Gan TJ; Perioperative Quality Initiative (POQI) 6 Workgroup: American Society for Enhanced Recovery and Perioperative Quality Initiative Joint Consensus Statement on the Role of Neuromonitoring in Perioperative Outcomes: Electroencephalography. *Anesth Analg* 2020; 130:1278-1291 (Note: **CS Boncyk and CG Hughes** are members of the Perioperative Quality Initiative [POQI] 6 Workgroup.)

France DJ, Levin S, Ding R, Hemphill R, Han J, Russ S, Aronsky D, **Weinger M**: Factors Influencing Time-Dependent Quality Indicators for Patients With Suspected Acute Coronary Syndrome. *J Patient Saf* 2020; 16:e1-e10

France DJ, Slagle J, Schremp E, Moroz S, Hatch LD, Grubb P, Vogus TJ, Shotwell MS, **Lorinc A**, Lehmann CU, Robinson J, Crankshaw M, Sullivan M, Newman TA, Wallace T, **Weinger MB**, Blakely ML: Defining the Epidemiology of Safety Risks in Neonatal Intensive Care Unit Patients Requiring Surgery. *J Patient Saf* 2020 Mar [Epub]

Han J, Heinemann L, Ginsberg BH, Alva S, Appel M, Bess S, Chen KY, Freckmann G, Harris DR, Hartwig M, Hinzmann R, Kerr D, Krouwer J, Morrow L, Nichols J, Pfutzner A, Pleus S, **Rice M**, Sacks DB, Schlueter K, Vesper HW, Klonoff DC: The YSI 2300 Analyzer Replacement Meeting Report. *J Diabetes Sci Technol* 2020; 14:679-686

Kapu AN, Borg Card E, **Jackson H**, Kleinpell R, Kendall J, Lupear BK, LeBar K, Dietrich MS, Araya WA, Delle J, Payne K, Ford J, Dubree M: Assessing and addressing practitioner burnout: Results from an advanced practice registered nurse health and well-being study. *J Am Assoc Nurse Pract* 2019 Nov [Epub]

Liberman JS, **Slagle JM**, Whitney G, Shotwell MS, Lorinc A, Porterfield E, **Weinger MB**: Incidence and Classification of Nonroutine Events during Anesthesia Care. *Anesthesiology* 2020; 133:41-52

Romman AN, Hsu CM, Chou LN, Kuo YF, Przkora R, **Gupta RK, Lozada MJ**: Opioid Prescribing to Medicare Part D Enrollees, 2013-2017: Shifting Responsibility to Pain Management Providers. *Pain Med* 2020 Jan [Epub]

CLINICAL PRACTICE

Allen BFS, Jablonski PM, **McEvoy MD, Ehrenfeld JM**, Shi H, King AB, **Wanderer JP**: Implementation of an Enhanced Recovery Protocol (ERP) is associated with an increase in the perioperative use of non-opioid multimodal analgesia for non-ERP patients. *J Clin Anesth* 2020; 62:109694

Brunker L, Hirst P, **Schlesinger JJ**: New-Onset Refractory Status Epilepticus with Underlying Autoimmune Etiology: A Case Report. *SN Compr Clin Med* 2020; 2:103-107

Chung CP, Callahan ST, Cooper WO, Dupont WD, Murray KT, **Franklin AD**, Hall K, Dudley JA, Stein CM, Ray WA: Individual short-acting opioids and the risk of opioid-related adverse events in adolescents. *Pharmacoepidemiol Drug Saf* 2019; 28:1448-1456

Cui Y, Cao R, Wang Y, **Li G**: Lung Recruitment Maneuvers for ARDS Patients: A Systematic Review and Meta-Analysis. *Respiration* 2020; 99:264-276

Cummings JJ, Siegrist KK, Deegan RJ, Solorzano CC, Eagle SS: Robotic Adrenalectomy for Pheochromocytoma in a Patient with Fontan Physiology. *J Cardiothorac Vasc Anesth* 2020 May [Epub]

Jelly CA, Ende HB, Freundlich RE: Terminology, communication, and information systems in nonoperating room anaesthesia in the COVID-19 era. *Curr Opin Anaesthesiol* 2020; 33:548-553

Kazior MR, Streams JR, Dennis BM, King AB, **Henson CP**, Slinger P, McDonald S, Tong JL, Chaney MA: Pulmonary Complications After Trauma Pneumonecstomy. *J Cardiothorac Vasc Anesth* 2020; 34:1952-1961

Lorinc AN, Lawson KC, Niconchuk JA, Modes KB, Moore JD, Brenn BR: Residual Weakness and Recurarization After Sugammadex Administration in Pediatric Patients: A Case Series. *A A Pract* 2020; 14:e01225

Lowery AS, Dion G, Thompson C, **Weavind L**, Shinn J, McGrane S, Summitt B, Gelbard A: Incidence of Laryngotracheal Stenosis after Thermal Inhalation Airway Injury. *J Burn Care Res* 2019; 40:961-965

Lozada MJ, Goyal VK, Kiczek MP, Pacheco LD: Aspiration Pneumonitis Causing Respiratory Collapse in a Pregnant Patient Not in Labor. *Obstet Gynecol* 2020; 135:481

Lozada MJ, Raji MA, Goodwin JS, Kuo YF: Opioid Prescribing by Primary Care Providers: a Cross-Sectional Analysis of Nurse Practitioner, Physician Assistant, and Physician Prescribing Patterns. *J Gen Intern Med* 2020 Apr [Epub]

Miller BJ, Slota JM, **Ehrenfeld JM:** Redefining the Physician's Role in Cost-Conscious Care: The Potential Role of the Electronic Health Record. *JAMA* 2019 Jul [Epub]

Mishra P, Mishra KL, Palmer C, Robertson A: A Case Report Describing Three Cases of Challenging or Failed Intubation after Cervical Spine Surgery: A Peril of Early Extubation. *Surg J (N Y)* 2019; 5:e181-e183

Nelson JH, **Menser CC, Reddy SK:** Endoscopic Craniosynostosis Repair. *Int Anesthesiol Clin* 2019; 57:61-71

Oprea AD, Wang X, Sickeler R, **Kertai MD:** Contemporary personalized beta-blocker management in the perioperative setting. *J Anesth* 2020; 34:115-133

Panza J, Prescott L, **Sorabella L, Dumas S, Helou C, Adam R:** Compliance and outcomes after implementation of an enhanced recovery surgical protocol in older women undergoing pelvic reconstructive surgery. *J Perioper Pract* 2020;1750458920907885

Rajan S, Theard MA, **Easdown J, Goyal K, Pasternak JJ:** Perceived Benefits and Barriers to a Career in Neuroanesthesiology: A Pilot Survey of Anesthesiology Clinicians. *J Neurosurg Anesthesiol* 2019 Nov [Epub]

Reddy SK, Volpi-Abadie J, Gordish-Dressman H, Chao JW, Luban NLC, Deutsch N: Optimizing Perioperative Red Blood Cell Utilization and Wastage in Pediatric Craniofacial Surgery. *J Craniofac Surg* 2020 Jun [Epub]

Rengel KF, Pandharipande PP, Hughes CG: Special Considerations for the Aging Brain and Perioperative Neurocognitive Dysfunction. *Anesthesiol Clin* 2019; 37:521-536

Richardson MG, Raymond BL: Sugammadex Administration in Pregnant Women and in Women of Reproductive Potential: A Narrative Review. *Anesth Analg* 2020; 130:1628-1637

Shields JA, Gentry R: Effect of Simulation Training on Cognitive Performance Using Transesophageal Echocardiography. *AANA J* 2020; 88:59-65

Sobey JH, Menser CC, Reddy SK, Hughes EM: Successful utilisation of epidural analgesia for perioperative pain management in a child with sodium voltage-gated channel alpha subunit (SCN1A) gene mutation. *BMJ Case Rep* 2020; 13

Staudt GE, Shelton K: Development of a Rescue Echocardiography Protocol for Noncardiac Surgery Patients. *Anesth Analg* 2019; 129:e37-e40

Taenzer AH, Hoyt M, Krane EJ, Walker BJ, Flack S, Bosenberg A, Sethna NF, **Franklin AD, Polaner DM;** PRAN investigators: Variation Between and Within Hospitals in Single Injection Caudal Local Anesthetic Dose: A Report From the Pediatric Regional Anesthesia Network. *Anesth Analg* 2020; 130:1693-1701

Wanderer JP, Rathmell JP: A Tale of Different Populations: Disparities in Obstetric Anesthesia. *Anesthesiology* 2019; 131(4):A23

Williams RD, Foley NM, Vyas R, Huang S, **Kertai MD, Balsara KR, Petracek MR, Shah AS, Absi TS:** Predictors of Stroke After Minimally Invasive Mitral Valve Surgery Without the Cross-Clamp. *Semin Thorac Cardiovasc Surg* 2020; 32:47-56

Yengo-Kahn AM, **Plackis AC, Bonfield CM, Reddy SK:** Correction of a vertex encephalocele related to amniotic band syndrome. *BMJ Case Rep* 2020; 13

eStar Physician Builders develop creative workflows

By Paul Govern

From VUMC Reporter, March 19, 2020

Through its eStar Physician Builders Program, Vanderbilt University Medical Center supports physicians and other health care team members in devising new content and tools for VUMC's health information technology system.

To date, some 47 employees have undergone training and certification as physician builders or clinical content builders, and each has been paired with an eStar analyst from Health IT.

As an eStar Physician Builder, "You yourself have the technical ability to go into our system and configure it the way that you want it to work. You can then partner with our analysts and teams to get that configuration tested and into the production environment here at VUMC," said the director of the program, Jonathan Wanderer, MD, MPhil, associate professor of Anesthesiology and Biomedical Informatics.

"With this program, the big advantage is that you can get folks who already know the medicine really well and get them involved in designing and building new systems features, or changes to workflows that help with patient care."

Here are some examples of the work of eStar Physician Builders:

- Chetan Aher, MD, assistant professor of Surgery, and Teri Huff, RN, senior associate, Nursing Administration, created the eStar bariatric procedure pass, which allows teams to easily track surgical weight loss patients as they progress through psychiatric and medical evaluations, endoscopy, insurance approval, medical weight loss trials and so on.
- When a specialist provides a consult in the Emergency Department, patient disposition entails completion of a consult note. Wanderer designed the brief consult note process, which helps the ED avoid delays by ending the wait for full consult notes to be completed. The brief consult note is devoted solely to the consultant's disposition recommendation; it can be completed in a minute or two using an eStar smartphone app, at which point the information is flagged on the ED track board and the ED team gets a smartphone alert. When the consultant later begins the full consult note, the disposition recommendation gets inserted automatically. The brief consult note has been piloted by neurology, neurosurgery, orthopaedic surgery and urology.
- In the electronic health records (EHRs) of complex pediatric patients, it's less than ideal if documentation about matters like airway management or complex



Jonathan Wanderer, MD, MPhil, is the director of the eStar Physician Builders Program at VUMC. (Photo by Susan Urmy)

feeding regimens are dispersed among multiple notes. With input from his department's Complex Care Team, Barron Patterson, MD, associate professor of Pediatrics, devised a tool that supports consolidation of this EHR documentation. It's among several eStar features devised by Patterson.

- Wael Alrifai, MD, MS, assistant professor of Pediatrics and Biomedical Informatics, devised a comprehensive neonatal care dashboard in the EHR. Also, for babies who are expected to be born sick, he created a tool for preloading a care plan summary that appears automatically in the EHR upon documenting of the patient's birth.

Alrifai has worked on these and other new content features with input from the Neonatal Intensive Care Unit eStar Workgroup and the Pediatrics eStar Forum.

Physician builder training and, for non-physicians, clinical content builder training, each take six days to complete, with training provided in two courses by Epic Systems Corp., the Verona, Wisconsin-based health IT company that develops the platform on which eStar runs. Last spring, Epic trainers were on campus at VUMC and provided the first half of this training and will do so again in the future. The course is otherwise given in Wisconsin.

VUMC uses computerized mannequins to teach proper technique for caring for COVID patients

By **Wayne Wood**

From *VUMC's News and Communications*, April 13, 2020

The coronavirus that causes COVID-19 is spread by droplets. If a COVID patient is in the hospital and needs to be intubated, it is essential that the process be done properly and safely.

Vanderbilt's Center for Experiential Learning and Assessment (CELA), which allows the practice of critical care skills with computerized, lifelike mannequins during clinical scenarios, has prepared a video to educate clinicians about how to safely intubate COVID patients.

"The purpose of the training was to prepare the anesthesia attending faculty and residents for their service on the VUMC COVID airway team," said Arna Banerjee, MBBS, associate professor of Anesthesiology and director of CELA.

"Placing a breathing tube in these patients places the providers doing this at a high risk of exposure due to their proximity to the patient's mouth, therefore viral droplets."

The COVID airway team is a group of anesthesiologists who respond to calls to intubate COVID-positive patients or initiate life support from a respiratory status.



Arna Banerjee, MBBS

"The video being filmed was intended to educate and equip anyone currently serving on the team, or asked to serve in the future, to confidently, calmly, and expertly intubate and initiate mechanical ventilation while protecting themselves and staff," Banerjee said.

In the video, the training is provided by Louise Alexander, MD, instructor in Anesthesiology, and Melissa

McKittrick, MD, senior anesthesiology resident, who both wear as personal protective equipment (PPE) powered air purifying respirators (PAPR). The camera was operated by Matthew Zapf, MD, senior anesthesiology resident.

In addition to the production of the video, CELA has also worked to train and refresh the training of many physicians on mechanical ventilation, in case they are needed to step into patient care roles in the event of a surge of COVID patients.

"It's encouraging that our physicians see their own preparation and education as something that they can do right now for potential patients in the future," Banerjee said.

"CELA is able to help prepare this high stakes team for their role fighting COVID-19 by providing state-of-the-art mannequins to simulate the patients' clinical condition as well as re-creating the operating room or ICU environment and equipment available during these emergency intubations.

"The video of these simulated events will greatly enhance the team members' practical application and use of knowledge conveyed in the clinical environment. Along with patient safety right now, we need to protect the faculty and staff too."

Aliquots: Transporter mutation alters cell energy

By **Leigh MacMillan**

From *VUMC Reporter*, Feb. 20, 2020

The cotransporter NKCC1 moves sodium, potassium and chloride ions across the cell membrane and has roles regulating cell volume, epithelial transport and neuronal excitability.

Eric Delpire, PhD, and colleagues recently discovered that a patient suffering from multiorgan failure had a mutation in the gene encoding NKCC1. Increased mitochondrial

DNA in tissue biopsies suggested that the transporter may play a role in energy metabolism.

The researchers have now demonstrated that fibroblasts (connective tissue cells) from the patient have increased mitochondrial respiration — energy production — compared to healthy fibroblasts. They further found that fibroblasts from a mouse model of the mutated NKCC1 and cultured cells expressing the mutant cotransporter also have

elevated mitochondrial respiration and increased oxidative stress.

The findings, reported in the *Journal of Cellular Physiology*, establish that the disease-associated mutation in NKCC1 affects mitochondrial respiration. Cells expressing the defective cotransporter behave as if they are in a state of starvation, the authors note.

This research was supported by grants from the National Institutes of Health (GM118944, DK093501).

Rounding based on acuity helps preserve attention of clinicians

By Paul Govern

From VUMC Reporter, May 21, 2020

Multidisciplinary teams conducting daily rounds in intensive care units will typically work their way down hallways, going from one patient to the next based on spatial proximity.

According to a recent multi-center study led by researchers at Vanderbilt University Medical Center and published in *Critical Care Medicine*, if teams instead start with the sickest patient and proceed to others based on decreasing patient acuity, something good happens.

“Our study finds a significantly greater depletion of attention reserves with conventional rounding, compared to teams that adopted an acuity-based patient order for rounds,” said Merrick Miles, MD, assistant professor of Anesthesiology, who co-led the study with Joseph Schlesinger II, MD, associate professor of Anesthesiology at VUMC and adjunct professor of Electrical and Computer Engineering at McGill University in Montréal, Canada.

When ICU teams round, it’s been shown that they tend to spend a bit less time with each successive patient. One study showed an average eight minutes less time spent on the last patient compared to the first.

“That previous finding, and the prospect that attentional reserves might diminish as teams go from patient to patient, are reason alone to consider switching to patient acuity as a basis for rounding order,” Schlesinger said. “With this new study, using psychometrics, we begin to pin down the cognitive benefits for teams that adopt acuity-based rounding.”

Researchers followed ICU teams at VUMC and the University of Pennsylvania Medical Center in Philadelphia. They tested so-called reactive inhibition — considered as a proxy for cognitive control and

attentional reserves — in physicians and advanced practice nurses immediately before and after rounds using a standard method called a stop signal task.

Here’s how stop signal tasks work: a white arrow appears on a computer screen pointing left or right, and without delay the subject is to press the corresponding keyboard arrow. Repeated trials yield the subject’s average reaction time for accurate responses.

A second round of trials resembles the first, except that in a subset of instances the white arrow turns blue within milliseconds and the subject is to halt his or her go reaction and refrain from pressing the keyboard.

The more depleted a subject’s cognitive control and attentional resources have become, the more time he or she will need to successfully exert reactive inhibition and stop a go reaction.

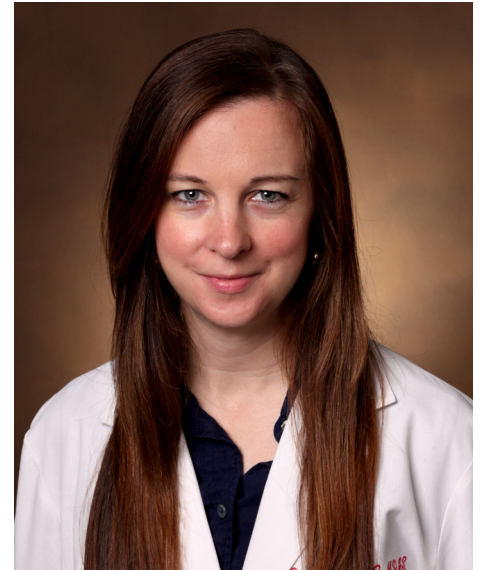
To measure the subject’s best performance, the computer continually resets the timing of the stop signal.

A two-day testing protocol was repeated 10 times at VUMC, 12 times at Penn, with conventional rounding on day one and acuity-based rounding on day two.

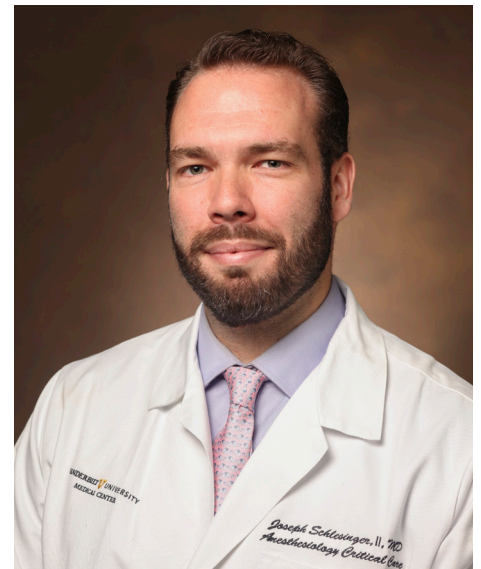
Compared to conventional rounds, after undertaking acuity-based rounds, stop signal reaction times were 39 milliseconds quicker in VUMC subjects and 16 milliseconds quicker in subjects at Penn.

“These sub-second changes may sound small, but they’re significant in the neuroscience domain. In the stop signal task, a difference of 15 to 40 milliseconds is considered appreciable,” Miles said.

“It stands to reason that the more we can do to preserve the cognitive reserves of clinicians, the better the care and greater the safety will be for patients.”



Merrick Miles, MD



Joseph Schlesinger II, MD

Joining the study at Penn was Meghan Lane-Fall, MD, MSHP, assistant professor of Anesthesiology and Critical Care at the Perelman School of Medicine.

Other VUMC researchers on the study include Dorothee Mueller, MD, Daniel Gay-Betton, Yaping Shi, MS, and Matthew Shotwell, PhD.

The study was supported in part by the National Institutes of Health (DC005361).

Damage, disruption, delirium

By Paul Govern

From VUMC Reporter, April 20, 2020

Postoperative delirium occurs in up to 30% of cardiac surgery patients and is associated with longer hospital stays, long-term cognitive decline and increased mortality. Mechanisms underlying postoperative delirium are poorly understood.

According to an observational study of 400 cardiac surgery patients by Marcos Lopez, MD, MS, Frederic (Josh) Billings IV, MD, MSc, and colleagues, oxidative stress during cardiac surgery is associated with neuronal injury and postoperative delirium.

The study finds that disruption of the blood-brain barrier modifies the association between oxidative damage and neuronal injury and may thus also play a part in the development of postoperative delirium. The study, which appears in *Anesthesiology*, hinges on concentrations of various biomarkers in blood samples gathered before, during and after surgery.

The authors note that previous studies of postoperative delirium have focused on the potential role of anesthetics and sedatives. Their study

suggests that treatments that decrease oxidative damage might help with postoperative delirium.

Lopez and Billings were joined by Vanderbilt University Medical Center colleagues Christopher Hughes, MD, Anthony DeMatteo, Jason O'Neal, MD, Brennan McNeil, Matthew Shotwell, PhD, Jennifer Morse, MS, Michael Petracek, MD, Ashish Shah, MD, and Nancy Brown, MD. Funding was provided in part by the National Institutes of Health (GM129662, GM102676, TR000445).

Alvis Awarded R01 Grant for Study Regarding Non-invasive Ways to Capture Venous Waveforms

By Jenelle Grewell

From Department Blog, Nov. 25, 2019

A team of researchers at VUMC who are developing a non-invasive way to capture venous waveforms to assess and monitor volume status was awarded a five-year R01 grant. Bret Alvis, MD, the principal investigator, leads a team of physicians from both the Department of Anesthesiology and the Department of Surgery and engineers from the Department of Engineering. "This is the first grant I am the principal investigator on. It's extremely exciting and a testament to the great team I am lucky enough to be a part of," he said.

Alvis explained that it wasn't until recently that technology was good enough to amplify the peripheral signals to non-invasively capture venous waveforms. "We have been trying to make sense of these waveforms in various clinical volumes states," he said.

The grant will provide funding for them to study and better understand how the venous waveforms change specifically in patients with volume overload. "We are trying to better understand fluid status both in the vasculature and outside the

vasculature. We hypothesize we can use the amplitudes of these venous waveforms to quantify the volume status in and outside blood vessels," he said.

He explained that there isn't currently a great way to monitor how much blood is in the bloodstream. "We use a lot of data points like blood pressure, heart rate and central venous pressures to make our best clinical 'guess.' But research has shown these are quite poor in detecting someone's volume status, despite the fact that knowing how much volume a patient requires is very important in a multitude of clinical scenarios. Whether it is determining if a patient is hemorrhaging, requiring volume resuscitation, or is in a volume overloaded state, knowing if they need more or less fluid is extremely important because all of it can affect organ function."

Alvis said his experience as an anesthesiologist helps him with this research because he interacts with patients with a multitude of disease processes and gets to collaborate with a multitude of people in his clinical work. "It was an easy transition to collaborate in my research work. I have a baseline understanding that is



Bret Alvis, MD

helpful in studying venous waveforms. At the heart of all of this, we are trying to better understand volume status, which is the focus of any anesthesiologist or critical care doctor. Every anesthesiologist wants to know a patient's volume state and we can't do that very well right now," he said.

He explained that this is a new, novel concept, developed here at VUMC, that requires a team and the collaborative nature of VUMC. "It is a lot of work and a lot of fun because we get to discover together and teach each other."

VUMC Obstetric Anesthesiology named a Center of Excellence by SOAP

By Jenelle Grewell

From VUMC Reporter, June, 9, 2020

Vanderbilt University Medical Center's Division of Obstetric Anesthesiology has been designated as a Center of Excellence (COE) by the Society for Obstetric Anesthesia and Perinatology (SOAP).

The designation is for institutions and programs that demonstrate excellence in obstetric anesthesia care and to set a benchmark of superior care that adheres to evidence-based practices and national and international guidelines for maternal care.

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 and is also indicative of the Obstetrical Division's commitment to interdisciplinary practice excellence," said Warren Sandberg, MD, PhD, chair of the Department of Anesthesiology.

Obstetric Anesthesiology Division Chief Jeanette Bauchat, MD, MS, said being designated a COE was a team effort between obstetric anesthesiologists and their



SOCIETY FOR OBSTETRIC
ANESTHESIA AND PERINATOLOGY

CENTER of
EXCELLENCE

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.

The designation reflects the 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.

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.

Crawford Presented with Candle Award

By Jenelle Grewell

From Department Blog, Feb. 27, 2020

Anesthesiology Department faculty member Lane Crawford, MD, who also serves as a Vanderbilt University School of Medicine (VUSM) Robinson College Faculty Affiliate Advisor, was presented with the Candle Award during Anesthesiology Grand Rounds on Friday, Jan. 24, 2020. The Candle Award is presented to Faculty Affiliate Advisors who strongly demonstrate leadership, mentorship, and accessibility in their interactions with students.

Students have described Crawford as being a pillar in

the Robinson community and a dedicated participant in a variety of Robinson College events. Crawford said Vanderbilt's medical students are an amazing group of physicians in training. "It's a privilege to get to spend time with them as an FAA, and I feel very honored to receive an award from a group that I admire so much," she said.

The VUSM advisory college system provides the opportunity for students and faculty to interact in an informal setting. Crawford explained that this means faculty and students really get to know each other as people. "I think the important thing as an FAA

is to show up and not take yourself too seriously."

Crawford explained that she was a medical student at Vanderbilt when the advisory college system was getting started, so she got to experience firsthand the positive effects on student wellness, camaraderie, and mentoring. She said when she returned to VUMC as faculty in 2017, she knew she wanted to be involved with the advisory colleges to help create those same experiences for students. She said that being an FAA helps her as a clinical anesthesiologist because spending time with students is energizing.

"Medical school is a transformative experience, and also incredibly stressful at times," she said. "I hope to do anything I can to contribute to the positive, supportive environment that the advisory colleges create for students as they navigate that journey."



Lane Crawford, MD

Groundbreaking study establishes pediatric perioperative mortality rate in East Africa

By **Jenelle Grewell**

From *Anesthesia Monitor*, Winter 2020
(department newsletter)

Two billion of the world's children lack access to safe surgery and anesthesia, and the need for pediatric surgery in low- and middle-income countries is growing. In these countries, where children make up more than 50 percent of the population, it is estimated that 85 percent of children will require surgery before their 15th birthday, and these countries have a severe shortage of pediatric surgeons and anesthesiologists.

Mark Newton, MD, author of a new study published last week by *Anesthesiology*, explained, "We know from practical experience that pediatric surgical mortality in these settings is high, but we have never been able to prospectively capture the data until now."

In the new study, "Perioperative Mortality in Kenya: A Prospective Cohort Study from 24 Hospitals," Newton and his co-authors establish a baseline pediatric perioperative mortality rate for the first time in East Africa and discuss factors associated with mortality. Newton said the authors hope this study will demonstrate the feasibility of collecting perioperative mortality data at scale and illustrate how the data can be used to improve pediatric surgical care systems in these settings.

This groundbreaking study establishes a pediatric perioperative mortality rate for low- and middle-income countries which is 100 to 200 times higher than in high-income countries—further documenting the global surgery imbalance and its dramatic impact on the world's growing population of children.

The study also illustrates how such data can direct quality improvements. For example, another of the study's key findings shows a link between mortality and failure to use the Safe Surgery

Checklist. Of this finding, Newton said, "This represents a significant finding to be useful for advocacy, education and enforcement of the use of this patient safety tool."

Newton said he and his colleagues working in Kenya have long known that developing a safe surgery culture within a team model is key to improving outcomes. Therefore, Newton and James O'Neill, MD, established a fellowship program at AIC Kijabe Hospital that trains teams of pediatric surgeons and anesthesiologists. The program has trained 10 pediatric surgeons and 16 pediatric anesthesiologists, in partnership with the University of Nairobi, from eight different African countries.

Many of those trained have gone on to practice as the first pediatric surgeon or pediatric anesthesiologist in their home country. O'Neill explained that the graduates will then be supported to establish specialty training programs in their own countries. "These newly trained pediatric surgeons and anesthesiologists will work as leaders to increase access to surgery for their countries' children and improve surgical outcomes," O'Neill said.

Newton said he and colleagues are grateful to the General Electric Foundation, which funded this study and has supported many capacity-building efforts for safe surgery and anesthesia throughout East Africa.



At the AIC Kijabe Hospital in Kenya, Mark Newton, MD, trains a pediatric surgeon from Cameroon and a pediatric anesthesiologist from Zimbabwe. (Photo by David Shirik)

Leadership in the Profession



Association of University of Anesthesiologists

The mission of the AUA is to promote excellence in academic anesthesiology through mentorship of academics in anesthesiology; promotion of diversity and inclusivity in academic anesthesiology; professional growth throughout the careers of educators, academic leaders, and researchers in anesthesiology; and organization of an outstanding annual meeting and provision of networking opportunities to academics in anesthesiology.

* indicates associate member



Foundation for Anesthesia Education and Research

Foundation for Anesthesia Education and Research

For over 30 years, FAER has been dedicated to developing the next generation of physician-scientists in anesthesiology. Charitable contributions and support to FAER help fuel the future of anesthesiology through scientific discovery. Funding priorities include research, education, and training.



The American Board of Anesthesiology

The American Board of Anesthesiology® is committed to advancing excellence in the practice of anesthesiology. Since 1938, the ABA has defined practice standards that instill confidence that board-certified anesthesiologists have the knowledge and skills to provide high-quality patient care. As the certifying body for anesthesiologists since 1938, their team of dedicated anesthesiologist volunteers and staff administer initial and subspecialty certification assessments as well as their continuing certification program, which promotes lifelong learning, a commitment to quality clinical outcomes and patient safety. Based in Raleigh, NC, the ABA is a nonprofit organization and a member board of the American Board of Medical Specialties.

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Achieving Balance



DEPARTMENT OF ANESTHESIOLOGY

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