

DEPARTMENT PROFILE 2018-2019



DEPARTMENT OF ANESTHESIOLOGY

VANDERBILT  UNIVERSITY  
MEDICAL CENTER



CLINICAL CARE

EDUCATION

RESEARCH

## DEPARTMENT OF ANESTHESIOLOGY

VANDERBILT  UNIVERSITY  
MEDICAL CENTER

Compassionate | Creative | Committed | Collaborative

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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.

Our investigators brought in more than \$8 million in total extramural research funding in 2017-2018, including more than \$4.7 million in awarded NIH grants—placing Vanderbilt Anesthesiology 13th among U.S. academic anesthesiology departments for NIH funding. The department's research productivity, determined by publication in peer-reviewed journals, has more than doubled in the past five years. Twenty-three members of the department have been elected into the Association of University Anesthesiologists (AUA).

At the 2017 Annual Meeting of the American Society of Anesthesiologists in Boston, department members contributed and participated in more than 90 presentations, discussions, workshops, and refresher courses.

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



Warren S. 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

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.vandydreamteam.com](http://www.vandydreamteam.com) to learn more about our programs.

## EXECUTIVE COMMITTEE



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



Matthew McEvoy, MD  
 Vice Chair,  
 Educational Affairs



Pratik Pandharipande,  
 MD, MSCI  
 Associate Vice Chair,  
 Faculty Affairs  
 Chief, Anesthesiology  
 Critical Care Medicine



Mark Rice, MD  
 Executive Vice Chair,  
 Anesthesiology  
 Chief, Multispecialty  
 Adult Anesthesiology



Amy Robertson, MD  
 Vice Chair,  
 Clinical Affairs



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



Matthew Weinger, MD  
 Vice Chair, Faculty Affairs



Stephen Doherty, MMHC,  
 Department Administrator

## DIVISION CHIEFS



Jeanette Bauchat, MD, MS  
 Chief, Obstetric  
 Anesthesiology



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



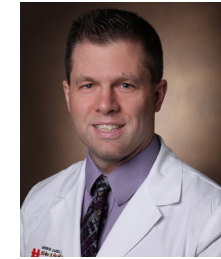
Katherine Dobie, MD  
 Chief, Ambulatory  
 Anesthesiology



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



David Edwards, MD, PhD  
 Chief,  
 Pain Management



Alexander Hughes, MD  
 Interim Chief, Pediatric  
 Cardiac Anesthesiology



Jill Kilkelly, MD  
 Chief, Pediatric  
 Anesthesiology



Letha Mathews, MBBS  
 Interim Chief,  
 Neuroanesthesiology



Michael Pilla, MD  
 Associate Chief,  
 Multispecialty Adult  
 Anesthesiology



Mias Pretorius, MBChB, MSCI  
 Chief, Cardiothoracic  
 Anesthesiology



Ann Walia, MBBS  
 Chief, Veterans Affairs  
 Anesthesiology Service



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

## PREVIOUS DEPARTMENT CHAIRS



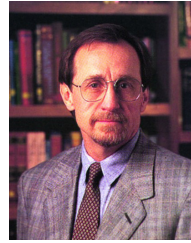
Dr. Benjamin H. Robbins  
1946-1961



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

## DEPARTMENT HISTORY

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, healthcare 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.

## ABOUT VUMC

*US News & World Report*: #1 Hospital in Tennessee, #1 Healthcare Provider in Nashville, #1 Audiology (Bill Wilkerson Center), 12 adult and 10 pediatric clinical specialties ranked among the nation's best, #15 Education and Training

Truven Health Analytics: among the top 50 cardiovascular hospitals in the U.S.

*Becker's Hospital Review*: one of the "100 Greatest Hospitals in America"

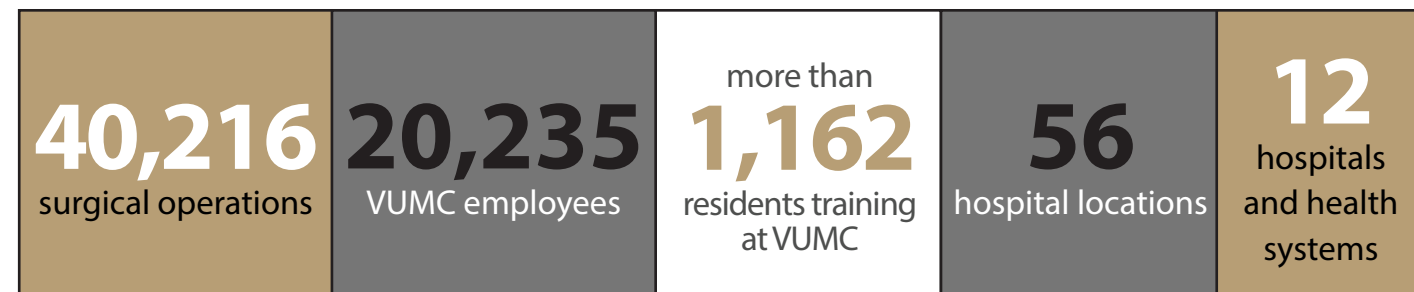
The Leapfrog Group: grade "A" in Hospital Safety Score

National Institutes of Health: among the top 10 grant awardees for medical research in the U.S.

Magnet Designated: Vanderbilt University Medical Center is the only organization designated Magnet in Middle Tennessee

*Nashville Business Journal*: Middle Tennessee's healthiest employer

American Hospital Association: among the 100 "Most Wired" medical systems in the U.S.



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 1.8 million people in the Metropolitan Statistical Area, Nashville has been nicknamed "Nowville" by GQ magazine and called the "It City" by *The New York Times*. It must be the southern hospitality that has this city growing, because Nashville has been named America's friendliest city for three years in a row. A hub for massive and rapid economic growth, Nashville was named by *Forbes* magazine as one of the 25 cities most likely to have the country's highest job growth over the next five years, named one of the best cities in the nation for work and family by *Fortune* magazine and ranked No. 1 most popular city in the United States for corporate relocations by *Expansion Management*.

**533**  
square miles

**1.8 million**  
population

Serving in one of the largest clinical programs in the nation, the Vanderbilt 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 and organ transplantation, abdominal

solid-organ transplantation, robotic surgery, neurosurgery, and high-risk obstetrics. Our clinical operating room staff practice anesthesia care according to the Anesthesia Care Team model. Anesthetics are provided by one of our highly skilled trainees or CRNAs under the direction of one of our medical faculty. We deliver the highest quality care in a safe and effective manner using the unique skills of all team members.

Vanderbilt's trauma service, which includes the orthopedic trauma program, is among the busiest in the nation, and Vanderbilt University Medical Center is ranked as a Level One trauma facility. The LifeFlight helicopter provides rapid access to the tertiary care facilities for trauma patients within a 140-mile radius of Nashville and performs more than 2,000 transports annually.

The Vanderbilt Preoperative Evaluation Center (VPEC) offers preoperative evaluation before patients un-

dergo 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.

Perioperative medicine is built on full engagement in patient care, from diagnosis to operative recovery. It includes a full-time teaching service with 24/7 consultative availability and extensive use of 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. Vanderbilt is one of the few medical training centers with a 3D transesophageal echocardiography (TEE) simulator, used to teach the essential skill of cardiac ultrasound.

Services provided by the department's clinical divisions are highlighted on the following pages.



Chief: Katherine Dobie, MD

**The Division of Ambulatory Anesthesiology consists of 10 faculty members and 34 nurse anesthetists who practice in five locations:** Cool Springs Surgery Center, Spring Hill Surgery Center, Vanderbilt Bone and Joint, Medical Center East and Vanderbilt Outpatient Surgery. Expansion to a sixth location, Cool Springs Plastic Surgery Center, is planned for November 2018.

**The division provides anesthesia for approximately 23,000 procedures annually,** including spine, surgical oncology, pain, GI, orthopedic, pediatric, ENT, urologic, neurosurgical, general surgery and higher-acuity plastic surgery. The division administers approximately 4,000 peripheral nerve blocks each year and has an in-home peripheral nerve catheter program.

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

Ambulatory Anesthesiology is unique compared to other academic departments, with its high volume of patient encounters and its partnership with community practices in two joint ventures within the greater Nashville area.

The Ambulatory faculty members continue to be actively involved in the Society for Ambu-

latory 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.

**Jane Brock, DO,** serves on SAMBA's SCOR (SAMBA Clinical Outcomes Registry) committee, the committee for Office Based Anesthesia and the Clinical Outcomes committee. Brock presented two abstracts at SAMBA in 2018.

**Vikram Bansal, MD,** has been asked to serve as first author for a chapter in *Anesthesiology Clinics*, which will be published in fall of 2018.

**Kelly McQueen, MD, MPH,** presented a TED Talk, "Solving the Global Anesthesia Crisis," in August 2017. At the 2017 ASA meeting she received the Nicholas M Greene, MD, Award for Outstanding Humanitarian Contribution.

**Uma Shastri, MD, FRCPC,** published an article in *Pain* and co-authored a book chapter in Hadzic's *Textbook of Regional Anesthesia and Acute Pain Management*. Shastri served as teaching faculty in 2017 at ASA and ASRA and at SAMBA in 2018.

procedures annually  
approximately  
**23,000**

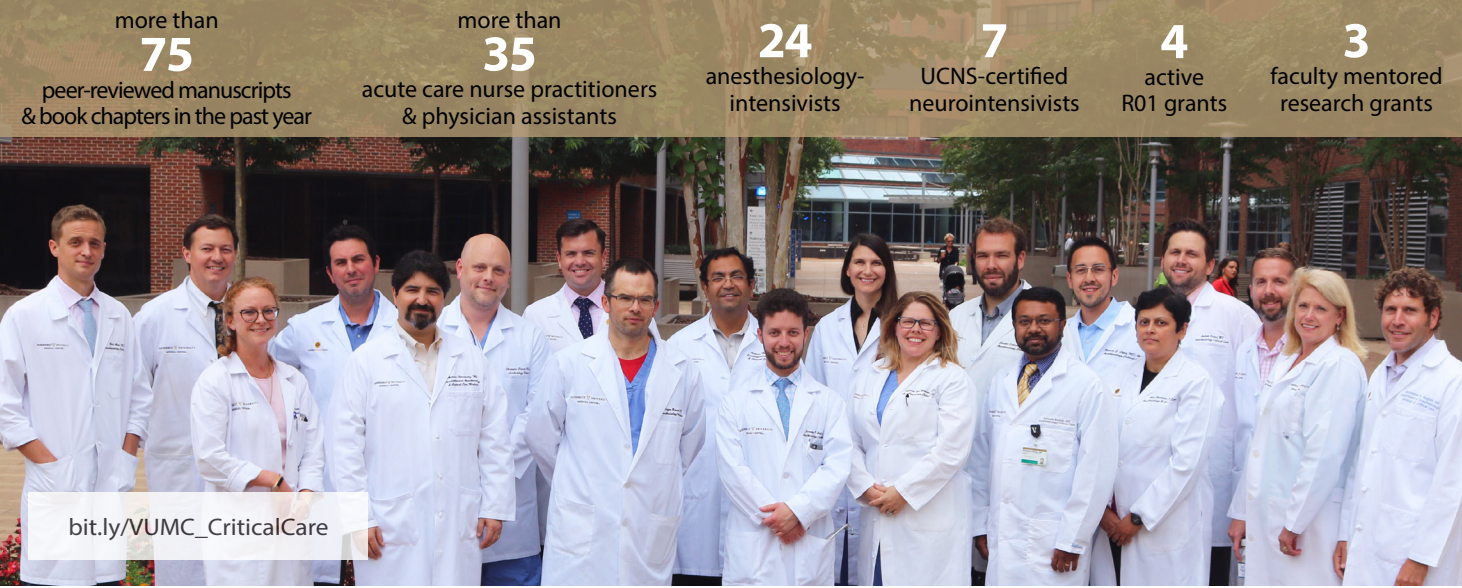
peripheral nerve blocks  
administered annually  
approximately  
**4,000**

nurse anesthetists  
**34**

faculty  
**10**

committee seats held  
at SAMBA  
**7**

locations  
**5**



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. Additionally, division members provide perioperative anesthetic care for patients undergoing major surgery, and some participate in the perioperative consult service both at Vanderbilt and at the TVHS, Nashville. An ongoing alliance between the ACCM Division and the School of Nursing supports acute care nurse practitioner intensivist training.

**Awards and Recognition:** Fredric T. (Josh) Billings IV, MD, MSCI, was awarded the VUMC Biomedical Science Impact Award for his publication "High-Dose Perioperative Atorvastatin and Acute Kidney Injury Following Cardiac Surgery: A Randomized Clinical Trial" in *JAMA*; Stuart McGrane, MBChB, MSCI, was awarded the Mildred T. Stahlman, MD, Award for Extraordinary Performance of Clinical Service for his development and leadership of the ECMO Transport/Referral Program; Joseph Schlesinger, MD, was interviewed by Michael Nedelman of CNN for his innovative work on hospital medical alarms.

**New Research Grants:** Mentored research grants for Marcos Lopez, MD, MS, (K23), Antonio Hernandez, MD, (K08) and Robert Freundlich, MD, MS, (CTSA K2 Chair award); R01 (co-investigator, Billings); AUA seed

The division strives to provide excellent patient care, promote education and engage in scholarly activity. Faculty and fellows keep abreast of modern technology and the changing spectrum of caring for the critically ill. This includes proficiency in ultrasound, echocardiography and management of patients with ventricular assist devices or who are on ECMO.

The ACGME-accredited ACCM fellowship provides fellows with a diverse clinical experience through the division's subspecialty ICUs and an innovative didactic program.

Division faculty frequently participate in regional, national and international educational

grant to conduct a multicenter pragmatic clinical trial (Billings); AUDACE grant focusing on sonification of the EEG signals of non-communicative patients in the ICU (Schlesinger).

**BH Robbins Scholars:** Kimberly Rengel, MD, (Anesthesiology Critical Care Medicine fellow) and Christina Boncyk, MD, (faculty on a T32 fellowship) competed for and were accepted into the BH Robbins Program. Rengel and Boncyk are mentored by Christopher Hughes, MD, and will be working on the effects of prehabilitation prior to critical illness, and the effects of inappropriate medications continued after critical illness, respectively.

**Quality Improvement Projects:** Collaborative projects to improve outcomes after cardiac transplants, valves and VADs (Hernandez); neurosurgical patients (Sheena Weaver, MD).

activities and have taken on leadership roles in national organizations such as SCCM, ASA, SOCCA and the American Delirium Society; in VUH and VUMC administration, including the directorship of the BICU, NCU, CVICU, Adult ECMO and CELA; in the medical school curriculum redesign, via innovative immersion programs; and in the IRB.

Active research programs encompass clinical, translational and bench research that focuses on perioperative risk factors and mechanisms of cognitive impairment, kidney injury, sepsis and its monitoring, perioperative informatics, education and implementation science, health resource utilization, multisensory training, music in medicine, device development and quality improvement projects.

## CRITICAL CARE FELLOWSHIP

ACGME-accredited program.

Nine 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, tele-ICU, international rotations, palliative care, medical subspecialties, research.

Learn more at:  
[bit.ly/VUMC\\_ACCM\\_Fellowship](http://bit.ly/VUMC_ACCM_Fellowship)



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. Also, some members participate in ambulatory anesthesia and the perioperative consult service.

The division provides perioperative care for approximately 1,400 adult cardiac procedures per year. These include coronary artery bypass graft (on- and off-pump) surgery, valvular surgery, heart and lung transplantation, adult congenital procedures, hybrid procedures, aortic surgery and ventricular assist device (VAD) insertions.

The VAD program at Vanderbilt currently places about 50 devices per year. The heart transplant program recently achieved the major milestone of its 1,000th heart transplantation, making it the second busiest program in the country. 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 industry.

15 cardiac anesthesiologists	10 certified registered nurse anesthetists
More than <b>2,000</b> TEE exams performed annually	
45 peer-reviewed publications & book chapters in 2018	

## CARDIOTHORACIC FELLOWSHIP

ACGME-accredited program.

Five positions available each year.

Core rotations include adult cardiac, thoracic, pediatric cardiac, TEE and ICU.

Electives include heart failure, TTE, CT surgery and research.

Learn more at:  
[bit.ly/Cardiothoracic\\_Fellowship](http://bit.ly/Cardiothoracic_Fellowship)

**Ban Sileshi, MD**, is supported by the ImPACT Africa grant from the GE Foundation that supports our education capacity building efforts in Kenya. He is the director of curriculum development and manages perioperative anesthesia outcomes data collection in Kenya.

**Miklos Kertai, MD, PhD**, is an elected member of the Society of Cardiovascular Anesthesiologists quality and safety leadership committee and chair of the SCA/STS database sub-committee.

**Mias Pretorius, MBChB, MSCI**, serves on the National Board of Echocardiography Advanced PTE Exam question writing committee and is a member of the Society of Cardiovascular Anesthesiologists research committee.

**Susan Eagle, MD**, has received research funding from the American Heart Association, the National Collegiate Inventors & Innovators Alliance, Discovery Grant, industry-funded investigator-initiated research grants, Google for Entrepreneurs and the National Science Foundation.



bit.ly/VUMC\_MSA

### REGIONAL ANESTHESIA & ACUTE PAIN MEDICINE FELLOWSHIP

ACGME-accredited program.

One of only nine programs of its type in the United States to receive initial ACGME accreditation.

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.

Electives include research, obstetric anesthesia.

Learn more at:  
bit.ly/VUMC\_Regional\_Fellowship

perioperative consult patients

approximately  
**1,600**

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. As Vanderbilt University Medical Center is a Level One Trauma Center, MSA faculty and staff provide 24-hour coverage for emergency and trauma surgery for the region. **Our trauma center covers 65,000 square miles and has about 3,000 admissions per year.**

Since 2014, our Perioperative Consult Service has provided co-management of surgical patients, beginning with the decision to operate and continuing throughout the period after hospital

regional blocks performed

more than  
**7,000**

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.

bed days saved

approximately  
**800**



bit.ly/VUMC\_Periop

### PERIOPERATIVE MEDICINE FELLOWSHIP

One year program  
(ACGME accreditation not offered).

Four positions available.

Core rotations include perioperative consult service, high-risk preoperative evaluation clinic, echocardiography and cardiac device management, geriatrics and research.

Learn more at:  
bit.ly/VUMC\_Periop\_Fellowship

The Vanderbilt Department of Anesthesiology provides both Acute Pain (APS) and Perioperative Consult Services (PCS). Together these services perform 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 >80% reduction of in-hospital opioid use and a >50% 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 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 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. In 2017, faculty published

more than a dozen papers on this topic and, in 2018, have published numerous additional ERAS papers.

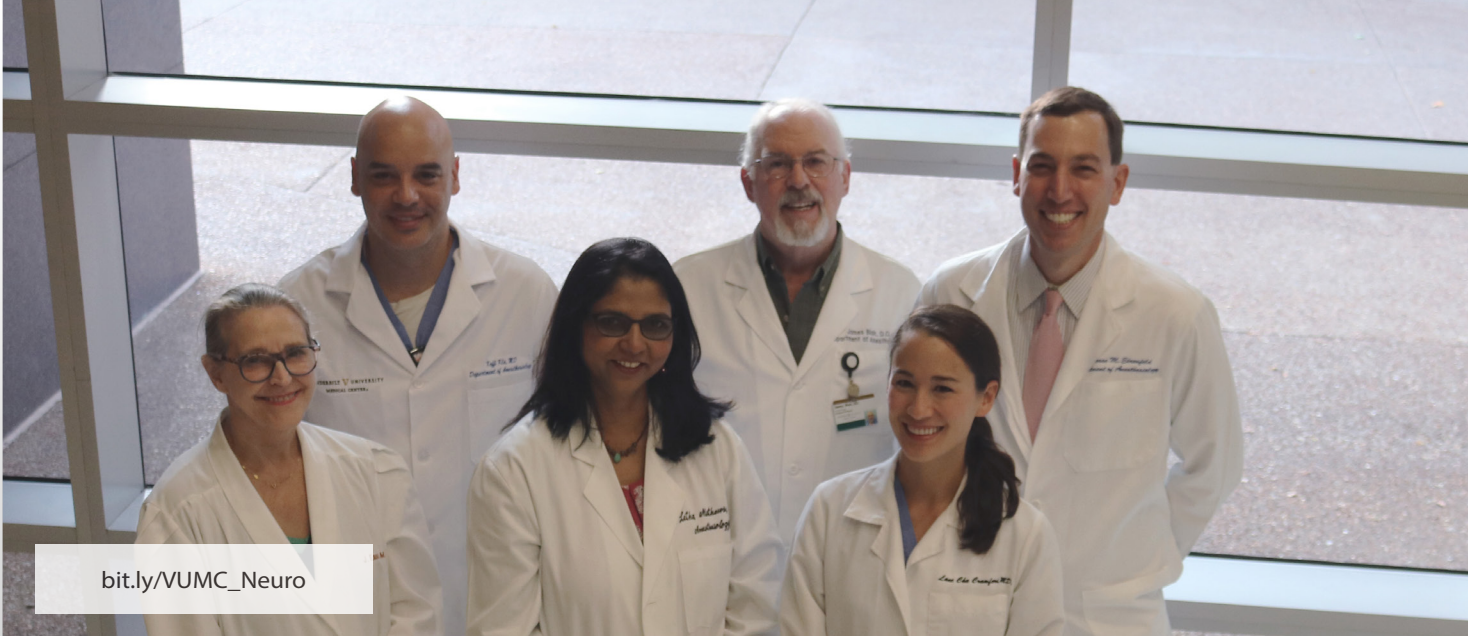
APS and PCS at VUMC are staffed by 12 anesthesiologists, with representation from multiple divisions. APS and PCS also include five nurse practitioners, residents at all levels of training and clinical fellows.

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. VA-PCS also manages the epidural, nerve block catheters and pain consults at TVHS.

In addition to providing ongoing improvements in perioperative care through ERAS, the department is fully invested in applying perioperative medicine principles throughout the entire care spectrum, resulting in improved, individualized care for the sickest patients. Along these lines, the department has an approved fellowship in Perioperative Medicine that is offering four positions. Faculty instructors in the fellowship program come from the VUMC Departments of Anesthesiology, Surgery and Medicine, making this a truly cross-departmental educational effort that mirrors the collaboration inherent in the concept of perioperative medicine.



[bit.ly/VUMC\\_Neuro](http://bit.ly/VUMC_Neuro)

Neurosurgery and other neurologic services continue to expand at VUMC. The Neuroanesthesiology Division provides perioperative care for over **4,000 cases per year and covers nine operating rooms**. Faculty members specializing in neuroanesthesiology are providing increasingly complex anesthesia and sedation services.

The Vanderbilt Department of Neurological Surgery currently has one of the highest volumes of deep brain stimulator implantations in North America. The Vanderbilt Brain Tumor Center provides comprehensive care for patients with brain tumors, and about **500 major brain tumor operations, including about 85 skull base tumors, are performed annually**.

Three neurointerventionalists run a busy neurovascular service in state-of-the-art interventional hybrid operating rooms dedicated solely to neurosurgical procedures. The Joint Commission designated VUMC as an Advanced Certification Comprehensive Stroke Center, where the most complex of stroke patients are treated.

**VUMC has seven 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 intermittently awake to facilitate speech and motor mapping during surgery in order to preserve the most vital areas of the brain.

As of November 2016, Neuroanesthesiology provides perioperative care for ortho-spine patients. Development and practice of evidence-based perioperative pathways and guidelines have improved patient outcomes and reduced length of ICU stay and overall hospital length of stay after certain neurologic and spine procedures.

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**. Dedicated CRNAs and faculty work as a team along with the neurosurgeons, ortho-spine surgeons and perioperative nurses in providing outstanding clinical care for patients. Faculty are actively engaged in resident and medical student education. Faculty also make significant contributions at national and international meetings, such as SNACC, SEA, AMA, AACD and NCCS, and provide leadership in these organizations.

Faculty members have been actively engaged in research, and Jesse Ehrenfeld, MD, MPH, is the recipient of over \$2 million in grant funding. Like their surgical colleagues, neuroanesthesiologists face many unique challenges, including the length of 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.

**4,000**  
cases per year

**500**  
major brain tumor operations performed annually

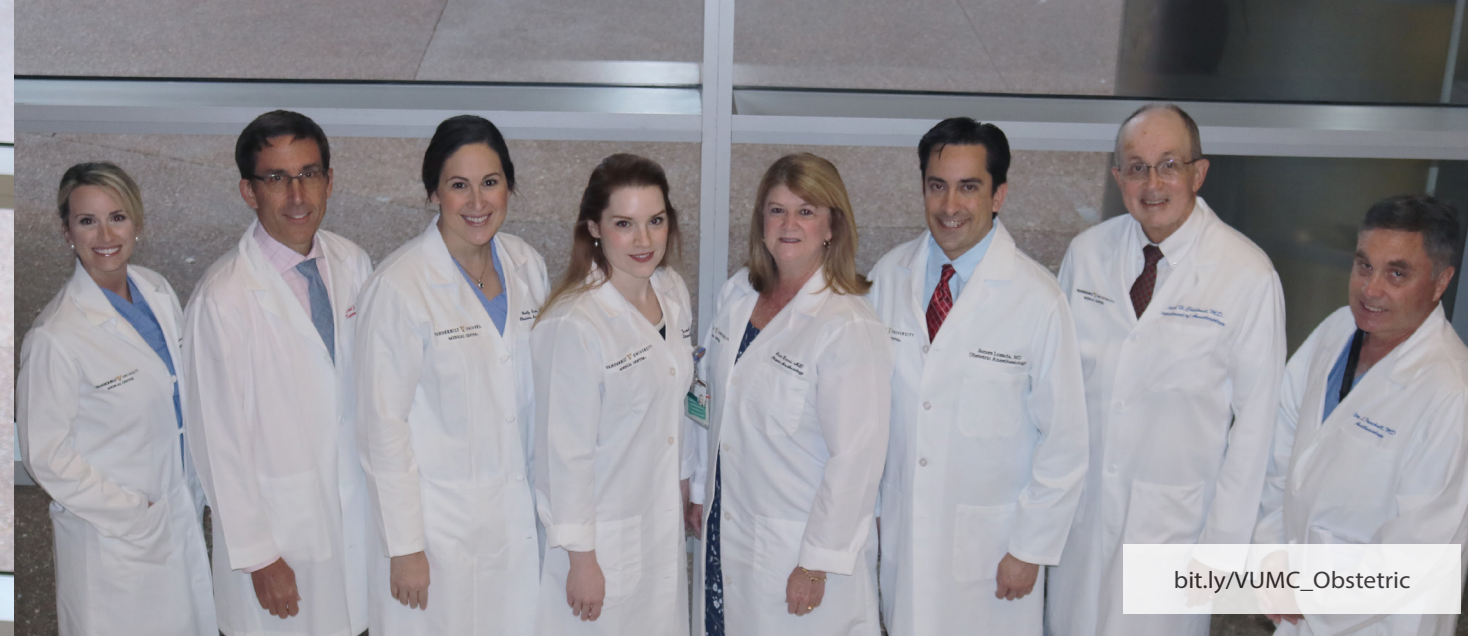
**70**  
book chapters and peer-reviewed articles published in the past year

**Jesse Ehrenfeld, MD, MPH**, serves as chair-elect on the Board of Trustees of the American Medical Association.

**Jane Easdown, MD**, serves as treasurer and chair of the finances committee on the Board of Directors of the Society for Education in Anesthesia. She also serves on the ASA Anesthesia Patient Safety Program Editorial Board.

**Letha Mathews, MBBS**, serves on the education committee of the Society for Neuroscience in Anesthesiology and Critical Care (SNACC).

**John Barwise, MB, ChB**, is a course consultant for Fundamentals of Critical Care Support and a member of the National Veterans Affairs Simulation Center.



[bit.ly/VUMC\\_Obstetric](http://bit.ly/VUMC_Obstetric)

**David Chestnut, MD**, received the Distinguished Service Award at the annual meeting of the Society for Obstetric Anesthesia and Perinatology (SOAP) for his innumerable contributions to the subspecialty of obstetric anesthesiology and was the keynote lecturer at the Society for Education in Anesthesia annual meeting.

**Holly Ende, MD**, won the SOAP Young Investigator Award for her proposal to investigate the use of gabapentin in obstetric patients on buprenorphine.

**Britany Raymond, MD**, won the prestigious Gertie Marx Award with Michael Richardson, MD, for their collaboration with MFM physicians on research customizing opioid prescription practices to combat the opioid epidemic.

**James Lozada, MD**, won the SOAP Safety Award with Dr. Jeanette Bauchat, MD, MS, for their research reporting member composition of state-run Maternal Mortality Review Committees.

Division Chief Jeanette Bauchat, MD, MS, is an associate professor of Anesthesiology, with fellowship training in obstetric anesthesiology and a master's degree in healthcare quality and safety. Medical Director Susan Dumas, MD, has practiced as an obstetric anesthesiologist for over 20 years, with extensive experience in systems and process improvement.

**The Division of Obstetric Anesthesiology provides dedicated, 24-hour, in-house obstetric anesthesia care for over 4,500 deliveries at Vanderbilt University Medical Center (VUMC) annually**—over half of the deliveries are considered high risk. In addition to offering the full complement of techniques for labor analgesia, the division provides consultation and critical care management services for high-

risk obstetric patients, as well as specialized anesthesia care for intrauterine fetal surgery. 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 collaborate with the MFM, gynecologic oncology, urology and emergency general surgery physicians in an innovative approach to the care of patients with abnormal placentation.

**The division also provides anesthesia services for approximately 2,500 gynecologic surgical procedures in a suite of three operating rooms adjacent to the labor and delivery unit.** Division faculty and staff collaborate with the department's perioperative consult service to provide anesthesia care us-

**12**  
peer-reviewed articles

**over 20**  
chapters, editorials and other media publications

**more than 4,500**  
obstetric deliveries

**10**  
faculty

## OBSTETRIC FELLOWSHIP

ACGME-accredited program.

Two positions available each year.

Core rotations include experiences in maternal-fetal medicine and neonatology, with abundant time for research and teaching.

Learn more at:  
[bit.ly/VUMC\\_Obstetric\\_Fellowship](http://bit.ly/VUMC_Obstetric_Fellowship)

ing multimodal, enhanced recovery after surgery (ERAS) protocols for gynecologic cases. The division sponsors a highly regarded, ACGME-accredited obstetric anesthesia fellowship led by experienced Program Director Jeanette Bauchat, MD, MS, and Associate Program Director Holly Ende, MD. The division is also taking a leadership role in the use of *in situ* simulation training for obstetric emergencies.

**Recent clinical research projects include an award-winning research project using customized opioid prescription practices to reduce overall use of opioids after cesarean delivery and to reduce unused opioid tablets that could be diverted in the community.** Future research will assess the use of gabapentin in pregnant women with chronic pain.





[bit.ly/VUMC\\_Peds](http://bit.ly/VUMC_Peds)

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.

New construction is now underway at the Children's Hospital to add four additional floors (150 beds) by the summer of 2019. This expansion will significantly enhance the division's ability to provide the best care for all pediatric patients.

Academic interests of the division include safe transfusion practices, 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. In 2017, the division and the Cumberland Pediatric Foun-

ation co-hosted the first Annual Southeast Regional Pediatric Pain Management Symposium.

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, and our pediatric spine fusion team led by Brian Emerson, MD.

Monroe Carell Jr. Children's Hospital at Vanderbilt recently successfully obtained American College of Surgeons (ACS) Level 1 Verification for Pediatric Trauma Care, a widely recognized distinction that less than 50 pediatric hospitals across the nation have achieved.

Many pediatric division faculty are major leaders in international outreach work. Specifically, in 2016 and 2017, respectively, Mark Newton,

MD, and Kelly McQueen, MD, MPH, each received the prestigious award for Outstanding Humanitarian Contribution from the ASA.

To provide the safest, best care practices for patients in the postoperative 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.

**PEDIATRIC FELLOWSHIP**

ACGME-accredited program.

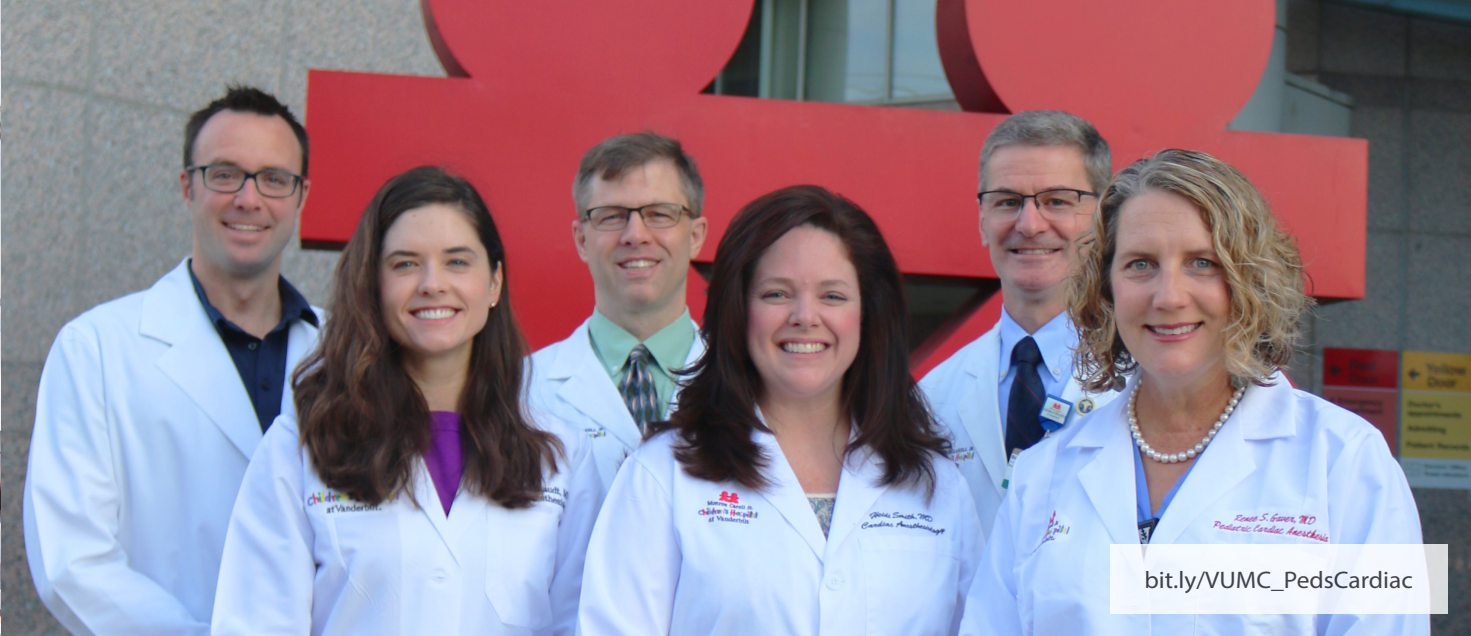
Four positions available.

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 Management Services, recovery room (PACU) management/pediatric preoperative clinic.

Final month dedicated to 'supervisory' role to foster transition to the attending role.

Learn more: [bit.ly/VUMC\\_Peds\\_Fellowship](http://bit.ly/VUMC_Peds_Fellowship)



[bit.ly/VUMC\\_PedsCardiac](http://bit.ly/VUMC_PedsCardiac)

The Division of Pediatric Cardiac Anesthesiology is made up of six faculty members and six 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 600 cardiac surgeries and 900 catheterizations and electrophysiologic procedures. Specifically, the Pediatric Heart Institute ranks as one of the nation's busiest in both heart transplants and adult congenital electrophysiologic procedures.

The division is also involved in the care of the congenital cardiac population having procedures outside of the cardiac ORs and catheterization labs. The division functions in a consultative fashion for the majority of patients but provides direct care for those with more complex anatomy/physiology.

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 are also permitted to do so as an elective rotation. The division provide educational observation experiences to both pediatric cardiology fellows and pediatric intensive care fellows.

Division faculty members are extensively involved in simulation and delirium research, with Brian Donahue, MD, PhD, serving as research mentor for both the Pediatric Anesthesiology and the Pediatric Cardiac Anesthesiology Divisions.

<b>600</b> cardiac surgeries	<b>6</b> faculty members
<b>900</b> catherizations and electrophysiologic procedures	<b>6</b> certified registered nurse anesthetists



Since 2006, the Dr. James Phythyon Endowed Lectureship in Pediatric Anesthesiology has brought renowned experts in the field to Vanderbilt's campus as visiting professors. In 2018, Joseph P. Cravero, MD, presented "The Changing Paradigms of Clinical Research and Data Analysis in Anesthesiology." Pictured here left to right: Warren Sandberg, MD, PhD, Phythyon daughter Sarah Miller, Joseph P. Cravero, MD, Phythyon daughters Mary Neal Meador and Elizabeth Donner, and Jill Kilkelly, MD.

faculty  
**22**

pediatric CRNAs  
**38**

perioperative  
nurse practitioners  
**17**

anesthesia  
technicians  
**17**



bit.ly/VUMC\_PainManagement

Clinicians at Vanderbilt Pain Management use a multidisciplinary approach to pain care, offering thorough evaluations, consultations and referrals in order to employ the most effective evidence-based treatments.

**Vanderbilt Pain Management offers care at five centers and at Monroe Carell Jr. Children's Hospital at Vanderbilt:**

- Vanderbilt Pain Management: One Hundred Oaks Clinic
- Vanderbilt Pain Management: Clarksville Clinic
- Vanderbilt Pain Management: Franklin Clinic
- Vanderbilt Pain Management: Springhill (Telemedicine)
- Vanderbilt Pain Management: Ingram Cancer Center Clinic
- Children's Hospital Pain Clinic: Monroe Carell Jr. Children's Hospital at Vanderbilt

**Vanderbilt Pain Management sees 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.

**Multidisciplinary Pain Consultation Team includes specialists from:**

- Anesthesiology
- Psychology
- Psychiatry
- Neurology
- Neurosurgery

- Orthopedics
- Physical Medicine and Rehabilitation
- Physical Therapy

**The Pain Division includes eight anesthesiology faculty, one functional neurosurgeon, four advanced practice nurse practitioners (APRNs), five registered nurses (RNs), radiology technologists and medical assistants.** Division faculty are leaders in the American Academy of Pain Medicine and the Tennessee Pain Society and participate locally, nationally and internationally to develop guidelines, policies and laws to safeguard evidence-based treatment for patients in pain.

The division is active in research encompassing clinical trials to develop new treatment modalities in peripheral ablation and neuromodulation, treatments for CRPS, safety with intrathecal drug delivery devices, acupuncture and acupressure, population health, drug development, international delivery of pain treatment and more. Active grants include two CDC contracts, R01s, three industry-sponsored trials, university-sponsored trials for acupressure and drug development, and support for ongoing fellowship research programs.

**Current Clinical Research Trials:**

- Camila Walters, MD: Mindfulness to Improve Functional Outcomes in Patients with Fibromyalgia
- Puneet Mishra, MD, Chris Sobey, MD, John Corey, MD, and Daniel Lonergan, MD: Genicular Radiofrequency Ablation Efficacy in Achieving Total Knee Postsurgical Pain Reduction Trial

- David Edwards, MD, PhD, Hamid Shah, MD, Chris Sobey, MD: Resting State fMRI as a Biomarker of Functional Integrity of Spinal Cord
- Heather Jackson, MSN, RN, APRN-BC: A Randomized Controlled Trial of Auricular Acupuncture to Facilitate Outpatient Opioid Weaning

## PAIN MANAGEMENT FELLOWSHIP

ACGME-accredited program.

Four positions available.

Training leaders in Academic and Community Pain Practice.

Focus on comprehensive, multidisciplinary treatment of acute, subacute, and chronic pain diagnoses.

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 cord stimulators, radio-frequency ablation, fluoroscopic and ultra-sound-guided procedures, and intrathecal drug-delivery systems.

Completion of publishable academic projects including original research, review articles, and book chapters.

Learn more:  
bit.ly/VUMC\_Pain\_Fellowship



bit.ly/VUMC\_VA

The Veterans Affairs Anesthesiology Service at the Tennessee Valley Healthcare System (TVHS) provides a variety of anesthesia services for over 96,000 patients every year across its two main campuses in Nashville and Murfreesboro. The TVHS Anesthesiology Service is 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 stimulator, suboxone implants and inpatient ketamine infusions for unremitting pain and detoxification. With over 14,000 encounters per year, TVHS pain management will be part of 18 centers selected nationally to establish an integrated whole health program, which comes with an \$8.5 million grant over three years.

Across the two campuses, TVHS provides care to over 6,500 surgical patients in the operating room and nearly 6,000 non-operating room procedures per year. These activities are supported by a very active preoperative evaluation clinic that is responsible for over 9,000 patient encounters per year. TVHS is among the first in the nation to offer a 24/7/365 comprehensive, integrated perioperative care service, which was established in 2016 and has been instrumental

in decreasing hospital and ICU length of stay, and perioperative and long term opioid use, well below national standards, and improving patient satisfaction. The VA Anesthesiology Service also provides 24/7/365 coverage to our 13-bed surgical intensive care unit that provides care to a complex mix of patients, including but not limited to cardiothoracic, vascular, transplant, orthopedics, neurosurgery and general surgery.

**The service includes 15 full-time anesthesiologists, 10 part-time anesthesiologists, 19 CRNAs, 17 nurse practitioners, 1 physician's assistant, 6 medical instrument technicians and 4 administrative support staff.** The service is heavily engaged in the administrative and educational activities within TVHS as well as nationally. Faculty provides oversight of the facility and moderates sedation program and resuscitation and airway management activities. Faculty is involved with teaching at national conferences and the national simulation center, along with serving as a resource to several other facilities in key areas such as the Ketamine Infusion program for complex chronic pain and opioid detoxification.

John Barwise, MBChB, has been appointed as instructor for the VHA national simulation center.

Bret Alvis, MD, presented the impact and results of the perioperative care service at the second annual DOD-AVAA meeting in October, 2016.

Randall Malchow, MD, presented at the annual Association of VA Anesthesiologists meeting in October 2016. Nine anesthesiologists from TVHS were part of the teaching faculty at the second annual DOD-AVAA meeting in October 2016.

**In October 2017, Ann Walia, MBBS, received the honorific recognition by the ASA for special contribution toward Safe VA Care.** She is the immediate past president of the Association of VA Anesthesiologists and has been appointed to the National Surgical Field Advisory Board. She established the Annual DOD-AVAA meetings starting in 2015 and was the director of the 2015 and 2016 meetings. She serves on the national advisory panel for new chiefs and is the VISN 9 lead for Anesthesiology. She has been appointed as a site reviewer for many other VAs across the country. She was an invited speaker at the National VA Anesthesiology Chiefs meeting in 2017 and gave a presentation on workload capture and productivity in the VA. She also gave a presentation on establishing the preoperative service and the ketamine initiative at the VA.

Among the first in the VA to offer a 24/7/365 in-house perioperative care team and to offer ketamine infusions for complex pain, both recognized as National Best Practice. Initiating the Fundamentals of Critical Care Support for TVHS and VISN 9.



[bit.ly/VUMC\\_CRNAs](http://bit.ly/VUMC_CRNAs)

Between the Vanderbilt University Hospital and the Monroe Carell Jr. Children's Hospital at Vanderbilt, 160 certified registered nurse anesthetists deliver anesthesia for all procedures spanning all divisions of the Anesthesiology Department. Of the 160 CRNAs, 38 practice within Children's Hospital.

The Vanderbilt University Medical Center Department of Anesthesiology continues to set the nationwide standard for 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, DNP, MBA, APRN, CRNA, leads the division.

The 160 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 CRNAs are full partners in department clinical practice initiatives and frequently contribute to the development of quality improvement and efficiency initiatives. Over 25 CRNAs are actively pursuing doctoral education. Five CRNAs serve within the divisional leadership to facilitate prac-

tice 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 the primary clinical teaching affiliate of the Middle Tennessee School of Anesthesia (MTSA). Based in Madison, Tennessee, MTSA is the second largest nurse anesthesia program in the country. Vanderbilt is also a clinical affiliate for the Union University Nurse Anesthesia program in Jackson, Tennessee, and the Emory University Nurse Anesthesia Program in Atlanta, Georgia. Student nurse anesthetists participate in approximately 7,000 anesthetics per year while on Vanderbilt rotations. CRNAs provide expert clinical teaching to these learners. Internally, we continue to offer robust continuing education opportunities that are coordinated by our two dedicated CRNA Educators.

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.

160  
certified registered nurse anesthetists

6  
specialty divisions

55  
student registered nurse anesthetists on monthly rotation

39  
anesthesia technicians and technologists

For more information on career opportunities, please contact the Division Administrative Assistant at (615)-343-6336.



VUMC's Bone and Joint Surgery Center CRNAs.



VUMC's Cool Springs Surgery Center CRNAs.



VUMC has 39 Anesthesia Technicians and Technologists.



Photo Credits to Patty Durchsprung, CRNA

The Office of Educational Affairs supports and oversees undergraduate medical education, graduate medical education for residents and fellows, and continuing education for faculty and advanced practice nurses. The extensive education and training programs offered by the Department of Anesthesiology prepare medical students, residents, fellows, nurses and faculty for productive careers as clinicians, academicians and scientists.

In addition to the four-year anesthesiology residency program, ACGME-accredited fellowships are offered in Adult Cardiothoracic Anesthesiology, Anesthesiology Critical Care Medicine, Pain Management, Pediatric Anesthesiology, Obstetric Anesthesiology, Regional Anesthesia and Acute Pain Medicine, and Clinical Informatics. We also offer fellowships in Perioperative Medicine and Global Anesthesiology.

Residents and fellows benefit from in-depth training in all subspecialty disciplines of clinical anesthesiology, crit-

ical care, and pain medicine. A full calendar of continuing medical education opportunities for faculty, residents, fellows, nurse anesthetists and nurse practitioners is in place, including:

- Grand Rounds, which features leading experts from around the world;
- Mortality, Morbidity & Improvement (MM&I) Conferences, which focus on recent cases, with the goal of improving patient care;
- ABA BASIC and ADVANCED EXAM Prep Series, which are designed to prepare CA1, CA2 and CA3 residents, respectively, for their high-stakes exams as part of the sequence of board certification;
- Mock Oral Board Exams, which are given twice a year to CA1, CA2 and CA3 residents in order to prepare them for the oral board portion of the ABA APPLIED exam;
- Simulation Training Program, which includes Milestone-based assessment

in order to give residents training in rare, high-stakes events, as well as to prepare them for the OSCE portion of the APPLIED Exam;

- BHRobbins Scholar Program, which offers one-on-one mentorship and collaboration for aspiring physician-scientists preparing for careers as academic anesthesiologists;
- Faculty Development Seminars, providing targeted training for professional development;
- Combined Integrative Health and Pain Medicine Quarterly Rounds, which focus on issues related to the management and treatment of pain.

The Educational Affairs Office at the VUMC Department of Anesthesiology offers a wide-range of learning opportunities that parallel our excellent clinical training and development. As a result, the average score of VUMC anesthesiology residents on in-training exams is in the 75th–80th percentile when compared to the nation.



## Residents

The Anesthesiology Department's residency program is highly sought after by the nation's top medical students. **Proof of this is in the numbers: in the 2018 National Residency Match, the department received 1,113 applications for 18 positions.**

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. **Every year, the department typically has 25-30 residents who present original research and overviews of challenging cases at national meetings,** a clear indication that the depart-

ment's educational programs are creating physician-scholars who are prepared for medical practice, peer-education and scientific investigation.

The department's educational program for residents and fellows consists of a combination of comprehensive didactic conferences, 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 is a nationally renowned, on-campus resource for this training. The education team is constantly updating and improving the curriculum to assure its alignment with the evolving ACGME Milestones

system as well as the recent changes to the ABA Certification process, such as the inclusion of OSCEs in the APPLIED Exam.

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, MD, Director of Educational Research and Curriculum Development, is overseeing the department's curriculum improvements 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 to develop a "flipped classroom" model of learning for anesthesiology education. Spark is the

school's IT platform for learning management. The flipped classroom is a learning environment in which course content is accessed by learners outside of the classroom, and classroom time is used for interactive projects and discussion. **Once the flipped classroom re-design is complete, anesthesiology residents at every level of training will have access to rotation-specific curriculum and learning modules 24 hours a day.** The faculty and residents are also developing the same concept for nurse anesthetist training in East Africa.

## Fellows

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

The following clinical fellowships are offered:

- **Adult Cardiothoracic Anesthesiology\***  
5 fellows
- **Clinical Informatics\***  
1-2 fellows
- **Anesthesiology Critical Care Medicine\*** –  
9 fellows
- **Global Anesthesiology\*\***  
1-2 fellows
- **Obstetric Anesthesiology\***  
2 fellows
- **Pain Management\***  
4 fellows
- **Pediatric Anesthesiology\***  
4 fellows
- **Regional Anesthesia and Acute Pain Medicine\***  
2 fellows
- **Perioperative Medicine\*\***  
4 fellows

\*ACGME Accredited

\*\*ACGME Accreditation not offered

### Nurse Anesthetists

The continuing education of more than 100 certified registered nurse anesthetists 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, the Union University Nurse Anesthesia Program and the Emory University Nurse Anesthesia Program. **Student nurse anesthetists participate in approximately 7,000 anesthetics per year while on Vanderbilt rotations**, and their on-campus training is coordinated by 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 (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 35 acute care nurse practitioners who work in intensive care settings. The Preoperative Evaluation Clinic and Perioperative Consult Service include another 17 advanced practice nurses 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. Participants get hands-on training in anesthesiology airway management, critical care, perioperative management and transesophageal echocardiogram procedures.

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, including having strong leadership and the necessary equipment, facilities and personnel to provide consistent, effective training.

### Maintenance of Certification in Anesthesiology (MOCA®)

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.

Pictured below is Arna Banerjee, MBBS, Assistant Dean for Simulation in Medical Education and Administration and Associate Professor of Anesthesiology, Surgery and Medical Education.



### Educational Research

The department is a national leader in rigorous educational research, and 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, Tiffany Richburg, MD, and Bantayehu Sileshi, MD, are the current education researchers.

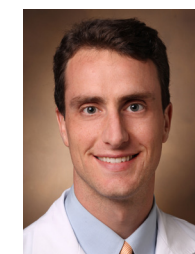
Kyne's research focuses on the impact of high-fidelity simulation workshops on clinical skills for providers involved in obstetric care in Kenya. He also studies the preparation and experience of anesthesiology residents participating in international rotations and their impact on improving clinical exposure and long-term engagement in humanitarian activities. Kynes's research includes the 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 applications, 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.



Leslie Fowler, MEd



J. Matthew Kynes, MD



Matthew McEvoy, MD



Mark Newton, MD



Tiffany Richburg, MD



Bantayehu Sileshi, MD



The Anesthesia Summer Internship Program provides an opportunity for undergraduate and medical students to participate in research projects with our faculty. Edward Sherwood, MD, PhD, and Jesse Ehrenfeld, MD, MPH, serve as directors. The program receives funding from FAER and NIH to support summer student interns and is a part of the NIH Short Term Training Program for Minority Students.



[bit.ly/VIA\\_GlobalHealth](http://bit.ly/VIA_GlobalHealth)

Photo Credit to Ryan Oosthuysen, MD

### Vanderbilt International Anesthesia

More than five billion people around the world do not have adequate access to safe surgical and anesthesia care. Through the Vanderbilt International Anesthesia (VIA) program, the Vanderbilt Department of Anesthesiology is committed to improving perioperative and anesthetic care in medically 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, residents, fellows and staff in a variety of innovative projects. From short-term trips for clinical care delivery to long-established partnerships of educational capacity-building to international advocacy, VIA efforts have been invested in improving safe surgical and anesthesia care to save lives, promote health and support economic growth. The map to the right illustrates our global impact as a department, with recent involvement in over 15 countries and including 12 faculty, 12 residents, 5 CRNAs and 3 fellows, impacting lives beyond VUMC's hospital walls in the past year.

Additionally, among these initiatives, the ImpACT Africa (Improving Perioperative & Anesthesia Care and Training in Africa) program continues to grow. This program is supported through grant funding (\$4 million) from the GE Foundation (Developing Health Globally), which has allowed for the creation of a sustainable training model that aims to improve perioperative outcomes through the ongoing training of skilled

anesthesia providers in Kenya. Mark Newton, MD, and Bantayehu Sileshi, MD, are key leaders in the ImpACT program, which also includes effort from numerous other faculty members, fellows, residents and CRNAs in the department. The ImpACT Africa program has a particular focus on improving maternal, infant and trauma-related morbidity and mortality in the perioperative period and has recently expanded into training programs in Ethiopia. A grant from the ELMA Foundations was recently provided to ImpACT Africa to support the training of additional anesthesia providers from rural coastal and western Kenya.

Beyond leading on-the-ground projects globally, faculty have been involved in international advocacy. Of special note Kelly McQueen, MD, MPH, contributed to the Lancet Commission on Global Surgery, and she was involved in creating the World Health Assembly resolution to achieve safe surgical and anesthesia care worldwide by 2030—a substantial step toward addressing the global anesthesia crisis. McQueen has also led efforts to develop research on the effectiveness of short-term missions in Guatemala, where faculty from pediatric anesthesia are involved on a continuing basis.

The VIA Annual Fundraiser was a great success again this year. The theme of the evening and of the VIA program throughout the year was “One Gives, One Goes, One Globe,” reflecting the variety of ways that faculty and staff have supported international efforts toward a common cause. Dyer Observatory was enjoyed by all, with excellent music, food and drinks. The attendees heard from a knowledgeable panel of leaders involved in

global health, including an interview by a local reporter. The generous donations from a multitude of people will be turned into future projects to continue advancing care across the globe.

### Vanderbilt Anesthesia Global Health and Development

The mission of Anesthesia Global Health and Development is support of all global endeavors within the Department of Anesthesiology, including sustained service activities, research and education. As such, the Global Anesthe-

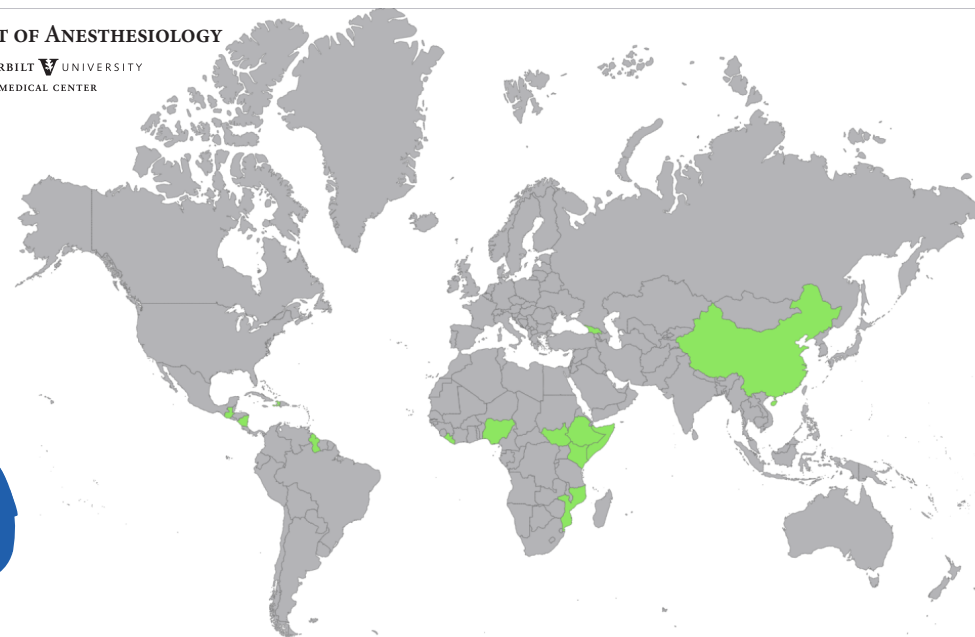
siology Fellowship, the Vanderbilt International Journal Club, the Global Surgery website (housed at Vanderbilt Institute for Global Health), and research and service provided in Ethiopia, Guatemala, Kenya and Mozambique are nurtured as part of this endeavor.

Kelly McQueen, MD, MPH, Professor of Anesthesiology and Surgery, is Director of Vanderbilt Anesthesia Global Health and Development and the Vanderbilt Global Anesthesiology Fellowship, and is a globally recognized expert in the field.

McQueen is currently leading research efforts as principal investigator for IRB approved projects in Ethiopia, Guatemala and Mozambique. These projects have the ability to expand into every low-income country over time.

In 2017, McQueen received the Nicholas M. Greene, MD, Award for Outstanding Humanitarian Contribution, given by the ASA's Committee on Global Humanitarian Outreach. Of note, Vanderbilt International Anesthesia Program Director Mark Newton, MD, received the Greene Award in 2016.

DEPARTMENT OF ANESTHESIOLOGY  
VANDERBILT UNIVERSITY  
MEDICAL CENTER



#### GUATEMALA

Christy Crockett, MD  
Matt Kynes, MD  
Jason Lane, MD  
Kelly McQueen, MD, MPH  
Jon Niconchuk, MD  
Veronica Nylander, CRNA  
Laura Zeigler, MD

#### GUYANA

Curtis Baysinger, MD

#### HAITI

Mariah Mannion, CRNA  
Jon Niconchuk, MD  
Laura Zeigler, MD

#### NICARAGUA

Mary Peters, CRNA

#### CHINA

Laura Zeigler, MD

#### GEORGIA

Curtis Baysinger, MD

#### ETHIOPIA

Susan Eagle, MD  
Kelly McQueen, MD, MPH  
Mark Newton, MD  
Ban Sileshi, MD

#### LIBERIA

Jill Moore, CRNA  
Camilia Walters, MD

#### SOUTH SUDAN

Matt Kynes, MD  
Mark Newton, MD

#### MOZAMBIQUE

Matt Kynes, MD  
Kelly McQueen, MD, MPH  
Camila Walters, MD

#### NIGERIA

Mariah Mannion, CRNA  
Mary Peters, CRNA  
Camilia Walters, MD

#### SOMALILAND

Mark Newton, MD

#### KENYA

Louise Alexander, MD  
Sandy An, MD  
Arna Banerjee, MBBS  
Melissa Bellomy, MD  
Jill Boyle, MD  
Nick Clark, MD  
Stephanie Clark, CRNA  
Geoff Crandall, MD  
Summer Fitts, RN, BSN  
Jenna Helmer-Sobey, MD  
Allison Janda, MD  
Matt Kynes, MD  
Eugene Leytin, MD  
Phil Leisy, MD  
Marriah Mannion, CRNA  
Matt McEvoy, MD  
John Meyer, MD  
Tony Montalto, MD  
Jill Moore, CRNA  
Marian Murphy, MD  
Mark Newton, MD  
Jon Niconchuk MD  
Obi Okwuchukwu, MD  
Ryan Oosthuysen, MD  
Britany Raymond, MD  
Joe Schlesinger, MD  
Ban Sileshi, MD  
Camila Walters, MD  
Scott Watkins, MD  
Alex Zajac, MD

ONE GIVES. ONE GOES. ONE GLOBE.

The vision of the Research Division is to advance the department's currently successful program by fostering excellence, collaboration and the development of young investigators in anesthesiology.

In federal fiscal year 2017, the Vanderbilt University School of Medicine (VUSM) ranked 10th among U.S. medical schools for National Institutes of Health (NIH) funding, with more than \$345 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 \$4.7 million in awarded NIH grants, which placed Vanderbilt Anesthesiology 13th among U.S. academic anesthesiology departments in NIH funding.

Within the department, faculty published 284 papers in fiscal year 2018, up from 241 papers in fiscal year 2016, within the peer-reviewed literature.

Anesthesia clinical research centers include 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 and financial oversight. The PCRI oversees more than 155 active clinical trials, with many more studies in development. The PCRI is directed by 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 six research nurses, four clinical trial coordinators, a regulatory specialist and a budget analyst.

VACRAC is composed of a panel of experienced 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.

VAPIR Director Jonathan Wanderer, MD, MPhil, has strengthened internal communication and plays a vital role in providing superior perioperative care. VAPIR creates innovative techniques for efficient communication with clinicians to improve patient care. 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. 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.

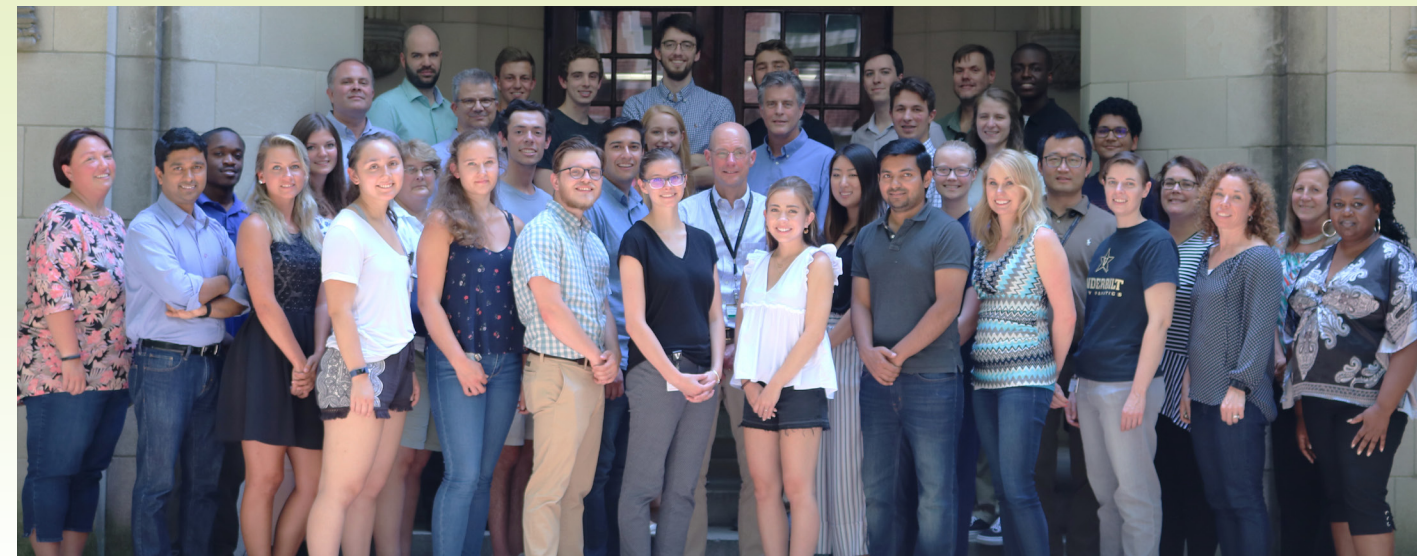
The Department's Clinical Research program focuses on improving healthcare through clinical research and education. The program includes both investigator-initiated and industry-sponsored clinical projects, including NIH-supported single center and multicenter clinical trials. The program is advancing medical practice in the fields of perioperative care, 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.

Investigators in the Basic Science Division conduct high quality and basic and translational research, with the goal of advancing current knowledge and improving patient care. Specific areas of interest include ion transport, cell signaling, 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.



[bit.ly/VUMC\\_BasicScience](https://bit.ly/VUMC_BasicScience)



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 follow.

**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<sup>-</sup> transporters modulate inhibitory synaptic transmission and how renal Na<sup>+</sup> 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,



**37**  
publications in the past year

**8**  
current NIH grants



The Vanderbilt Anesthesiology & Perioperative Informatics Research (VAPIR) Division and Perioperative Informatics work beyond the walls of the operating room, advancing patient care through innovations in patient safety and quality. **By integrating active research, state of the art technologies and clinical applications, VAPIR and Perioperative Informatics are advancing the frontiers of science and healthcare.** Both have achieved measurable outcomes of success in patient care, infrastructure and educational programs. Faculty members engage with students through mentorship and training programs, equipping the next generation of professionals.

**Perioperative Informatics, led by B. Randall Brenn, MD, director, and Jonathan Wanderer, MD, MPhil, associate director, designs, develops and implements system enhancements for the periprocedural and inpatient care areas.** The team supports vendor-based solutions and integrates solutions 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:

- Successful integration of our custom-built situational awareness tools into Epic.

- Extending and integrating our electronic OR status boards with Epic.
  - Participating in the VUMC/Epic Collaborative to extend notification and communication functionality within Epic.
- VAPIR, led by Jonathan Wanderer, MD, MPhil, director, and Jesse Ehrenfeld, MD, MPH, Robert Freundlich, MD, MS, and B. Randall Brenn, MD, associate directors, is responsible for managing the Perioperative Data Warehouse,** which contains full data from more than 1,000,000 procedures. The division collaborates internally and externally to strengthen its mission to improve patient care here and abroad. 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 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.
- Developed the informatics infrastructure that powered the data analysis for two large-scale pragmatic trials of crystalloid versus bal-

anced salt intravenous solutions; the research study resulted in dual *New England Journal of Medicine* publications.

- Worked closely with Perioperative Informatics to develop a common data structure that make it feasible to analyze data seamlessly across our legacy VPIMS (Vanderbilt Perioperative Information Management System) and current eStar (Epic) system.



## Shaping Tomorrow's Leaders Through Mentorship

The VACRAC (Vanderbilt Anesthesiology Clinical Research Advisory Committee), in partnership with the Perioperative Clinical Research Institute (PCRI), supports new investigators as they develop clinical research projects that will lead to publication and extramural funding. 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 committee:

- Mentors investigators throughout the research development process.
- Creates opportunities for ongoing learning about research methods, proposal writing, IRB applications, data management, statistical analysis and presentation/publication skills.
- Reviews new research proposals and regularly audits ongoing investigations for effectiveness and compliance with regulatory and safety guidelines.
- Optimizes resource utilization by assessing manpower and facilities availability and use.

VACRAC is co-chaired by Edward Sherwood, MD, PhD, Pratik Pandharipande, MD, MSCI, and Biostatistics Department member Matt Shotwell, PhD. The committee's membership comprises established researchers from the Department of Anesthesiology and PCRI.



## Perioperative Clinical Research Institute



The Perioperative Clinical Research Institute (PCRI) is led by Edward Sherwood, MD, PhD, and Debra Craven, MSN, MMHC. The mission of the PCRI is to support high quality clinical research as a means of advancing the practices of anesthesiology, pain management and critical care medicine. The team provides a full range of support services, including study initiation and execution, regulatory pain management, data management, contracts management, biostatistics, biomedical informatics and financial oversight.

The group, under the guidance of the Vanderbilt Anesthesiology Clinical Research Advisory Committee, supports the **development of projects by providing feedback on study design and budget development.** The end goal is execution of well-designed clinical research projects

that answer important questions, with an eye toward publication in leading journals

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, chronic pain and medical devices. **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 six research nurses, four clinical trial coordinators, a regulatory specialist and a budget analyst.







### BH Robbins Scholars

The Benjamin Howard Robbins Scholar Program began in 2007 to support the professional development of young clinician-scientists within the department. Building critical research skills under the mentorship of an established scientist helps prepare young investigators to eventually establish a vigorous, independently funded research program. The program is named in honor of the Anesthesiology Department's first chairman, himself a renowned physician-scientist. The BH Robbins Scholar Program is multidisciplinary, encouraging and supporting mentorships and collaborations that extend far beyond the traditional boundaries of anesthesia.

"This 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," said Department Chair Warren Sandberg, MD, PhD.

"Our Robbins scholars benefit from one-on-one mentorship, a wealth of research and educa-

tional resources, protected research time and a stipend during their residency and fellowship."

The BH Robbins Scholar Program is co-directed by Frederic T. (Josh) Billings IV, MD, MSCI, and Jerod Denton, PhD. The areas of research for our current scholars are described briefly here.

**Christina Boncyk, MD (Scholar 2018-2020)**, is currently investigating prescribing patterns of antipsychotic medications for the treatment of ICU delirium and their impact on patient outcomes under the T32 research training grant. Her long-term research interests include identification, management and de-escalation of potentially inappropriate medications administered during and after critical illness. Boncyk is mentored by Christopher Hughes, MD, and Pratik Pandharipande, MD, MSCI.

**Michael Chi, MD, (Scholar 2015-2018)**, is currently studying the application of reactive oxygen species (ROS)-responsive microspheres for targeted anti-inflammatory therapy of chronic neuro-

pathic pain. Chi is mentored by Jerod Denton, PhD, Craig Duvall, PhD, David Edwards, MD, PhD, Edward Sherwood, MD, PhD, and Ronald Wiley, MD, PhD.

**Robert Freundlich, MD, MS, (Scholar 2017-2020)**, is an anesthesiologist, a cardiovascular intensivist and a clinical information specialist. He is board certified in anesthesiology, critical care and transesophageal echocardiography. He is in the process of obtaining board certification in clinical informatics. He has an ongoing research interest in using informatics tools to improve patient care in the perioperative period and was recently awarded a Vanderbilt Faculty Research Scholars KL2 career development award to work on developing a model for predicting the need for postoperative assisted ventilation. Freundlich is mentored by Jesse Ehrenfeld, MD, MPH.

**Eric Kerchberger, MD, (Scholar 2017-2018)**, is a pulmonary critical care fellow in the Department of Medicine studying genetic risk factors for organ dysfunction in critical illness and following major

cardiovascular surgery using the Vanderbilt BioVU DNA biobank. Kerchberger is mentored by Julie Bastarache, MD, and Lorraine Ware, MD.

**Marcos Lopez, MD, MS, (Scholar 2014-2019)**, is investigating the impact of intraoperative oxidative stress on postoperative endothelial function and associations with clinical outcomes in patients randomized to hyperoxia or normoxia during cardiac surgery. He was awarded a Foundation for Anesthesia Education and Research Mentored Research Training Grant to support this research. Lopez is mentored by Josh Billings, MD, MSCI, Pratik Pandharipande MD, MSCI, and David Harrison, MD.

**Puneet Mishra, MD, (Scholar 2016-2019)**, is currently the principal investigator for 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. Over the course of this year, Mishra plans to conduct a second randomized control trial investigat-

ing the effectiveness of preoperative transforaminal epidural injections with clonidine as well as dexamethasone in reducing back and radiculopathic pain in patients undergoing a single level lumbar discectomy. Mishra is mentored by Stephen Bruehl, PhD.

**Kimberly Rengel, MD, (Scholar 2017-2020)**, is interested in improving functional outcomes for patients after major surgery or critical illness. She is currently investigating the effects of cognitive and physical therapy completed before a major operation (known as pre-habilitation) on postoperative short- and long-term functional and cognitive outcomes. Rengel is mentored by Christopher Hughes, MD, and Pratik Pandharipande, MD, MSCI.

**Loren Smith, MD, PhD, (Scholar 2016-2018)**, has identified an association between preoperative high density lipoprotein (HDL) levels and a decreased risk of acute kidney injury (AKI) after cardiac surgery. She is currently characterizing cardiac surgery patients' HDL

with respect to size distribution and anti-inflammatory, anti-oxidant and cholesterol efflux activities to elucidate a possible AKI-protective mechanism for HDL. Smith is mentored by Josh Billings, MD, MSCI, and MacRae Linton, MD.

**Courtney Zola, MD, (Scholar 2017-2019)**, is an infectious disease fellow in the Department of Medicine and is studying the prevalence and prognostic impact of pulmonary hypertension among HIV- and HCV-infected individuals. She has two cohorts of HIV-infected individuals under study: one in the Vanderbilt University Medical Center Synthetic Derivative, the other in the Veterans Aging Cohort Study, a national cohort of HIV-infected veterans. Her ultimate goal is to identify immunologic or genetic factors contributing to the increased associated mortality that has been identified in preliminary cross-sectional analysis. She also has an interest in HIV-associated metabolic dysfunction. Zola's primary mentor is Evan Brittain, MD, MSCI.

## 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.

**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**  
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.

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, has more than doubled in the past five years. Selected publications, highlighting the breadth of research conducted, publication type and contributing authors, are provided below. A complete list of Departmental publications can be found at [bit.ly/VUMC\\_Anesthesiology\\_Publications\\_2017-2018](http://bit.ly/VUMC_Anesthesiology_Publications_2017-2018) or by scanning the QR code below.



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## PEER-REVIEWED PUBLICATIONS

240  
peer-reviewed publications

110  
original research publications

42  
editorials/commentaries

30  
reviews

23  
infographics

26  
letters to the editor

## AUTHORS

74  
faculty

13  
trainees

9  
research staff

5  
advanced nurse practitioners

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### Association of University Anesthesiologists

The mission of the AUA is the advancement of the Art & Science of Anesthesiology by the encouragement of its members to pursue original investigations in the clinic and in the laboratory; the development of the method of teaching (anesthesia); and free and informal interchange of ideas.

### 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 mission of the ABA is to advance the highest standards of the practice of anesthesiology. As the certifying body for anesthesiologists since 1938, the ABA is committed to partnering with physicians to advance lifelong learning and exceptional patient care. The Board administers primary and subspecialty certification exams as well as the Maintenance of Certification in Anesthesiology™ (MOCA®) program, which is designed to promote lifelong learning, a commitment to quality clinical outcomes and patient safety. Based in Raleigh, N.C., the ABA is a nonprofit organization and a member board of the American Board of Medical Specialties.



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## VAPIR contributes to major VUMC study



The Vanderbilt Anesthesiology & Perioperative Informatics Research (VAPIR) Division is a multi-disciplinary group of physicians, biomedical engineers, software developers, database analysts and research staff who focus on understanding how the utilization of information technology can improve perioperative, anesthetic and surgical outcomes. **Photo originally published in the Spring 2018 issue of the *Anesthesia Monitor* (department newsletter).**

On Feb. 27, 2018, the *New England Journal of Medicine* published a research study conducted by a team at Vanderbilt University Medical Center which found that patients who receive a balanced fluid that closely resembles the liquid part of the blood have better outcomes than patients who receive a saline solution containing only sodium chloride. The team examined more than 15,000 intensive care patients and more than 13,000 emergency department patients who were assigned to receive saline or balanced fluids if they required intravenous fluids. If that sounds to you like it would be a lot of data to analyze, you would be correct. Thankfully, the Vanderbilt Anesthesiology & Perioperative Informatics Research (VAPIR) Division were a part of this study. Led by Jonathan Wanderer, MD, MPhil, the team took on the task of writing the code that extracted the data needed for the study.

According to Wanderer, the code generated a massive data set on a weekly basis and it required a lot of work to make sure the output was correct, comprehensive and formatted in a way that would allow for statistical analysis in an easy way.

Senior Database Administrator Karen McCarthy explained that the unique challenge of this project was the amount of time it spanned. The project started in 2015 and grew, requiring multiple code revisions. “Even though we keep all our code and documentation with it, when somebody leaves, some knowledge leaves as well. When somebody

new picks it up, it takes some time for them to get into the project,” she said. Other challenges included pulling information from multiple sources and reaching out to different areas for information.

Business Intelligence Analyst Frank Aline revealed that the team collaborated to check the integrity of the data upon export. His role specifically was to review the revision needs, make changes to the code accordingly and ensure the data were exported correctly.

The team had to perform a lot of data analysis and understand where data are missing or potentially erroneous and, according to Wanderer, the team needed to have confidence in the data that were collected.

As for why VAPIR was picked for this project, Wanderer explained that while there are many teams across the organization that work with large data sets, VAPIR has a particular expertise in acute care, as well as perioperative areas, and the team was familiar with these types of data. “I think we have a good reputation for doing this sort of detailed, high quality work that you need to do to get a data set of this size together,” he said.

The project has received a lot of attention, from being published in the *New England Journal of Medicine* to being featured on National Public Radio. As a result, VUMC encouraged its medical providers to stop using saline as intravenous fluid therapy for most patients. Aline explained that the

work done on a daily basis by the VAPIR team, whether big or small, is pleasing and satisfying when they can see improvements to patient care.

“It’s really cool to see a project that has taken the number of years it has taken to have that outcome at the end where you are seeing the benefits of it or reading about the benefits of it,” McCarthy said.

Wanderer further expressed that it’s great to see what VUMC can do as a community. This project required different skill sets from a lot of different people across the whole organization. “We can really accomplish a lot working together, and it’s exciting that the trajectory in the future is really embracing this approach to pragmatic clinical trials and helping to fulfill the vision in becoming a learning healthcare system,” he elaborates.

As for the future of VAPIR and how it relates to this project, Wanderer said the team is in the process of trying to take some of the new things developed for this group of patients and generalize them to ICU patients at large for future retrospective work.

Wanderer revealed that VAPIR has already started on another project and is in the grant proposal period. It will also use large data sets. “We are already plugged into what might be the next big thing,” he explains.

**Story originally published in the Spring 2018 issue of the *Anesthesia Monitor* (department newsletter).**



(Pictured from left to right: Laura Wayman, MD, Eric Delpire, PhD, Ashish Shah, MD, Richard Miller, MD, Wonder Puryear Drake, MD, Madan Jagasia, MBBS, Jennifer Pientenpol, PhD, and Stephen Heckers, MD, MSc.) Holders of the new directorships lined up for a photo during the first Directorship Celebration.

**Photo Credit to Anne Rayner and Vanderbilt University Medical Center. Photo originally published in the Jan. 28, 2018 issue of *The Reporter*.**

## Delpire appointed the B.H. Robbins Directorship

Eric Delpire, PhD, director of Basic Science Research in the Department of Anesthesiology, has been appointed the first B.H. Robbins Director in Anesthesiology Research, one of the newly formed endowed directorships at Vanderbilt University Medical Center. His endowment was celebrated on Monday, Jan. 22, 2018.

He explained the appointment means the Anesthesiology Department and the Medical Center acknowledge his success and want to give recognition. He described the endowment, in its own way, as a promotion.

“Endowed directorship is basically the highest academic honor that VUMC has to bestow upon an accomplished member of the faculty,” said Warren Sandberg, MD, PhD, chair of the Department of the Anesthesiology.

The endowment gives extra money for Delpire’s research, which allows him flexibility to do different things that might not otherwise be done with grant money. This might include hiring a new person, creating novel models or helping fill gaps between grants. “It is a relief to have additional money like the endowment,” Delpire said.

He said he believes he got this endowment because he has been successful in the past 20

years at VUMC pursuing independent research and fulfilling his other academic duties.

Delpire has been studying the transport of inorganic ions across cell membranes for the past 30 years. He explained that ions need specialized proteins to move through cell membranes and he studies those transporter proteins.

One of his research projects involves the nervous system and inhibitory signals. Delpire explained that neurons communicate using electric signals which are generated from the movements of ions across neuronal membranes. In the nervous system, there is constant balance between excitation and inhibition. Excitatory signals lead the brain to do things while inhibitory signals tend to stop them.

“I am interested in the inhibition part. When you increase too much the inhibitory part, you get sedation or even anesthesia,” he said.

His other research project relates to the kidney and the regulation of blood pressure. Delpire explained the kidney filters salt from the blood into the urine and then reclaims it. When too much salt is reclaimed, the result is high blood pressure. There are specialized transporters that take the salt back into the blood. In particular, Delpire said he studies how these transporters are regulated and how

too little function leads to salt wasting while too much of it leads to high blood pressure.

“If transporters are not there or not functioning, people will pee their salt - but if they function too well, blood pressure suffers” he said.

Delpire explained these two research projects are related because the same family of transporters that filters salt in the kidneys also modulates inhibitory synaptic transmission in the nervous system.

“Delpire is one the most influential and dynamic scientists in his field,” Sandberg said. “He works at a foundational level that creates systems allowing other investigators to advance science using tools that Delpire developed, certainly for his own use, but also for others.”

“The generosity of Delpire’s research is a big part of why we as a department thought it was really important to recognize him with this honor. He got the first endowed directorship this department has ever created and one of the first ever created by VUMC, and I think he is highly deserving of that special recognition.”

**Story originally published in the Spring 2018 issue of the *Anesthesia Monitor* (department newsletter).**

# Department assists with EpicLeap



Jon Wanderer, MD, MPhil, goes over eStar training with department members in a packed auditorium. Photo originally published in the Winter 2018 issue of the *Anesthesia Monitor* (department newsletter).

Vanderbilt University Medical Center launched a new computer system called eStar on Thursday, Nov. 2, 2017. This launch was called EpicLeap, and VUMC, including the Department of Anesthesiology, worked for over a year to ensure the transition would be as seamless as possible.

“I think we can say across the entire department that we’re just so proud of how people saw this as a challenge,” said Brent Dunworth, DNP, MBA, APRN, CRNA, Chief CRNA and Director of Advanced Practice, Anesthesiology.

Dunworth said there was a lot to prepare for. He said nurse anesthetists took on a big task, as six were selected to be clinical trainers based on interest, leadership and teaching skills.

Dunworth explained a lot of training fell on the department’s clinical team. “We wanted to make sure the first impression of Epic to our providers was a good one,” he said.

Dunworth said anesthesiology had 35 super-users assigned to the department at the launch, but the department was catching on so quickly that

by Monday, Nov. 20, 2017, only eight super-users were needed to cover the whole department.

Dunworth explained the department has reached a point where people are getting comfortable and have begun exploring, sharing what they have found to be the best practices, enhancing workflow and asking questions. “We are moving quicker along the timeline of accepting our new system than we expected to,” he said.

In terms of how eStar has affected patient care, Dunworth said, “What we do is take great care of patients, and that hasn’t changed at all. It’s just how we document that.”

The key point to the success of eStar is that everything is in one place, Dunworth explained. When patient history gets introduced into the patient’s record, everyone is able to share that and it doesn’t have to be reentered.

As for the next steps after the launch of eStar, Dunworth said it is time for polishing. He explained that within one week all the major

issues were gone or fixed, so now it is time to start looking at wants and needs for the future.

Brian Rothman, MD, and Jon Wanderer, MD, MPhil, are leading what is called optimization, which is gathering feedback from providers and prioritizing what needs to be worked on first. Dunworth explained that making patient care better is a top priority.

“Our success in anesthesiology was directly attributed to the attitudes of our department members and providers,” Dunworth said. He elaborated that people knew this was going to be a mountain to climb over and everybody had the right mindset to figure this out together.

“It is really a testament to who we are as a department. We are a group of folks who are ready for the challenge of solving a problem. I think we are problem solvers by nature, as shown by what we do. EpicLeap tested that, and we certainly came out on top.”

Story originally published in the Winter 2018 issue of the *Anesthesia Monitor* (department newsletter).



US Surgeon General Dr. Jerome Adams speaks to a small group prior to speaking at Langford Auditorium. Photo Credit to Joe Howell and Vanderbilt University Medical Center.

## Department participates in Surgeon General Visit

Several members of the Department of Anesthesiology participated in the visit United States Surgeon General Jerome Adams, MD, MPH, paid to VUMC on Friday, May 18, 2018. His visit consisted of a Health Policy Grand Rounds titled “Combatting America’s Opioid Crisis” as well as several meetings to discuss key programs at VUMC and the School of Medicine.

Jesse Ehrenfeld, MD, MPH, served as Special Advisor to the Surgeon General as well as the site lead for the visit. To prepare, Ehrenfeld said he worked with his team to arrange opportunities for Adams to learn about VUMC and “included our strategies around population health, advancing health equity, and responding to the nation’s opioid crisis. I also worked closely with the Department of Health Policy to coordinate his public talk on combatting the opioid crisis.”

David Edwards, MD, PhD, and Leslie Fowler, MEd, attended a meeting titled “Opioid Abuse Research, Public Policy, and Provider Education,” which discussed the ongoing efforts, projects, and initiatives VUMC is working on surrounding the opioid crisis in Middle Tennessee and the United States. Edwards said he shared some of VUMC’s strategies for treating perioperative pain and addictions and how patients are screened for risk of poor outcomes related to opioid addiction. Fowler discussed a project called “Function First, Opioids Last” using the QuizTime appli-

cation. This program delivers Continuing Medical Education credit to physicians for interacting with questions and content surrounding important clinical topics like opioid prescribing. One important outcome is that retention of the content may result in clinician behavior changes and better prescribing practices.

Fowler explained the project targeted opioid prescribing practices of specifically Obstetric/Gynecologists and Hospitalists. “If we have enough interest and resources, it could be scaled to larger physician groups in Middle Tennessee. One result of our pilot showed an increase in the prescribing of non-opioids for our learner group from 17 percent pre-intervention to 34 percent post intervention,” she said.

Ehrenfeld said working with a highly visible senior official is both an incredible privilege and a learning experience. He said he received tremendous feedback on how positive the visit with Adams and his team went. “It was a terrific opportunity to showcase some of the extraordinary work happening on campus and continue to develop partnerships with the federal government to advance the health of the nation.

One of the things Fowler learned during the visit is that Adams is committed to battling the opioid crisis and has advised the public to be trained and have access to naloxone, an opioid overdose reversal drug. “Not only is he extremely knowledgeable

about the facts and statistics concerning opioid abuse, misuse and addiction, he genuinely seems to care about the effects this epidemic has had on the people in the United States,” she elaborated.

The passion Adams has for turning off the tap of excess opioids while at the same time expanding treatment options was something Edwards said he learned about Adams during the visit. “He would like to enable primary care doctors to more easily treat addiction by expanding the number of providers getting their DEAx license. I feel that is a great idea,” he said.

Edwards said the Surgeon General’s visit was helpful. “It informed us of the vision and strategy that is occurring at the national level, and this will help us locally align and support this strategy,” Edwards said. “VUMC will benefit from a cohesive treatment strategy for addiction.”

Chair of the department Warren Sandberg, MD, PhD, said the opportunity for members of the department to present to Adams was a great opportunity to highlight what not only the department is going to contribute to the opioid crisis strategy but to VUMC as a whole. “It is not every day your institution and department get the chance to have a discussion with the United States Surgeon General.”

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