

DEPARTMENT OF ANESTHESIOLOGY

VANDERBILT  UNIVERSITY

MEDICAL CENTER

Department Profile

2019/2020



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CLINICAL CARE EDUCATION RESEARCH

DEPARTMENT OF ANESTHESIOLOGY

VANDERBILT  UNIVERSITY
MEDICAL CENTER

Message from the Chair



Warren Sandberg, MD, PhD

Chair, Department of Anesthesiology

Vanderbilt University Medical Center

Chief of Staff, Perioperative and Critical Care Services

Vanderbilt University Adult Hospital

Professor of Anesthesiology, Surgery and Biomedical Informatics

Vanderbilt University School of Medicine

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 2018-2019, including more than \$3.8 million in awarded NIH grants—placing Vanderbilt Anesthesiology 14th among U.S. academic anesthesiology

departments for NIH funding. The department's research productivity, determined by publication in peer-reviewed journals, grant dollars and ongoing research studies, continues to be strong. Twenty-seven members of the department have been elected into the Association of University Anesthesiologists (AUA).

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

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

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

102,000+

patient encounters last year

85+

presentations, discussions, workshops, and refresher courses contributed by department members at the 2019 ASA annual meeting in Orlando

14th

place among United States academic anesthesiology departments for NIH funding

\$3.8million+

in NIH grants awarded to Vanderbilt Anesthesiology investigators

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



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



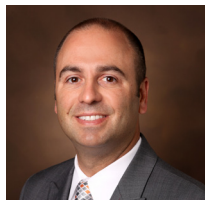
Jeanette Bauchat, MD, MS
Chief, Obstetric
Anesthesiology



Christopher Canlas, MD
Interim Chief,
Ambulatory
Anesthesiology



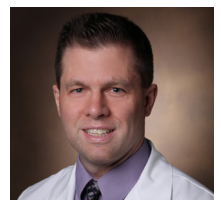
Eric Delpire, PhD
Director, Basic Science
Research
BH Robbins Director
in Anesthesiology
Research



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



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



Alexander Hughes, MD
Interim Chief, Pediatric
Cardiac Anesthesiology



Jill Kilkelly, MD
Chief, Pediatric
Anesthesiology



Letha Mathews, MBBS
Chief,
Neuroanesthesiology



Michael Pilla, MD
Chief, Multispecialty
Adult Anesthesiology



Mias Pretorius, MBChB, MSCI
Chief, Cardiothoracic
Anesthesiology



Ann Walia, MBBS
Chief, Veterans Affairs
Anesthesiology Service



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

Department History

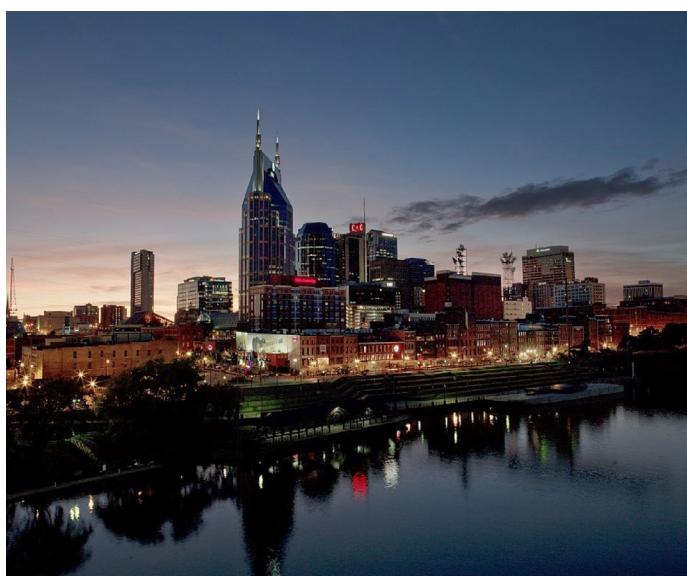
The Vanderbilt Department of Anesthesiology was one of the first independent departments of anesthesiology in the United States, established on December 12, 1945.

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.

1.8 million population

533 square miles



Previous Department Chairs



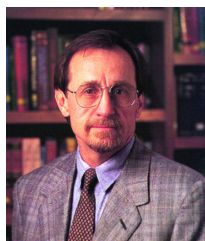
Dr. Benjamin H. Robbins
1946–1961



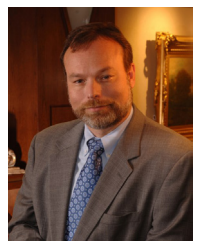
Dr. Charles B. Pittinger
1962–1969



Dr. Bradley E. Smith
1969–1993



Dr. Charles Beattie
1994–2001



Dr. Jeffrey R. Balsler
2001–2004



Dr. Michael S. Higgins
2004–2010

About Nashville

Nashville's history of country music has earned the city its fame as Music City, USA – but this metropolis is about more than tunes and twang. Visitors and residents enjoy great dining, entertainment and cultural life. Because Nashville International Airport is a Southwest Airlines hub, travel to Nashville is convenient and inexpensive. With a growing population of 1.8 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*.

About VUMC

- **US NEWS & WORLD REPORT: #1 HOSPITAL IN TENNESSEE, #1 HOSPITAL IN NASHVILLE, #17 IN THE NATION, NATIONALLY RANKED IN 10 ADULT CLINICAL SPECIALTIES AND 10 PEDIATRIC CLINICAL SPECIALTIES**
- **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 15 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.**



39,182

surgical
procedures

24,039

VUMC
employees

1,054+

residents
training
at VUMC

68

hospital
locations

Clinical Care

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, organ transplantation, robotic surgery, neurosurgery, and high-risk obstetrics.

Anesthetics are provided by one of our highly skilled trainees or CRNAs under the direction of an anesthesiologist. We deliver the highest quality care in a safe and effective manner according to the Anesthesia Care Team model, using the unique skills of all team members.

Members of our department actively participate in the multidisciplinary perioperative care of complex patient populations, including trauma and organ transplantation. Vanderbilt University Medical Center is a Level I Trauma Center, and one of the busiest in the nation, providing trauma care for patients within 65,000 square miles.

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. Performing more than 8,300 solid organ transplants since 1962, Vanderbilt is one of the largest and most experienced transplant centers in the Southeast.

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

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

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.

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



102,000+
adult and pediatric
encounters annually



2,000+
LifeFlight helicopter transports
annually



Level I
trauma facility



~100
anesthetizing locations







The Division of Ambulatory Anesthesiology provides anesthesia for roughly 23,000 procedures annually, including spine, surgical oncology, pain, GI, orthopedic, pediatric, ENT, urologic, neurosurgical, general surgery, ophthalmologic, uro-gynecology, gynecologic, and higher-acuity plastic surgery.

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

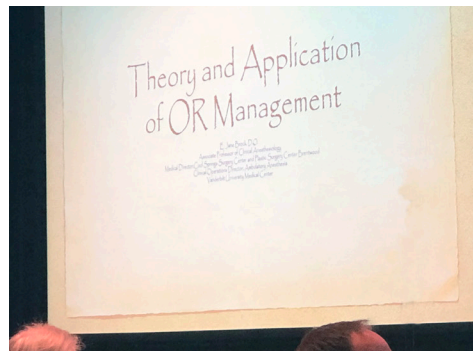
The Division is unique due to its high volume of patient encounters and its partnership with community practices within the Greater Nashville area.

Ambulatory Anesthesiology

Interim Division Chief: Christopher Canlas, MD

The faculty members and nurse anesthetists who make up the Division of Ambulatory Anesthesiology practice in six locations: Cool Springs Surgery Center, Cool Springs Plastic Surgery Center, Spring Hill Surgery Center, Medical Center East OR, Vanderbilt Outpatient Surgery, and Vanderbilt Surgery Center. The Ambulatory faculty members are actively involved in the Society for Ambulatory Anesthesia (SAMBA) through committee service and presentation of abstracts at the society's annual meetings. The Ambulatory faculty are also currently enrolling patients in six randomized controlled clinical trials.

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



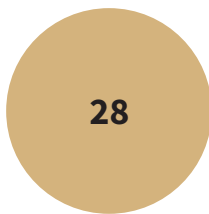
~23,000

procedures annually



~4,000

peripheral nerve blocks administered annually



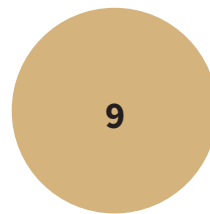
28

nurse anesthetists



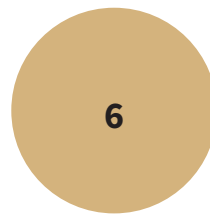
7

committee seats held at SAMBA



9

faculty



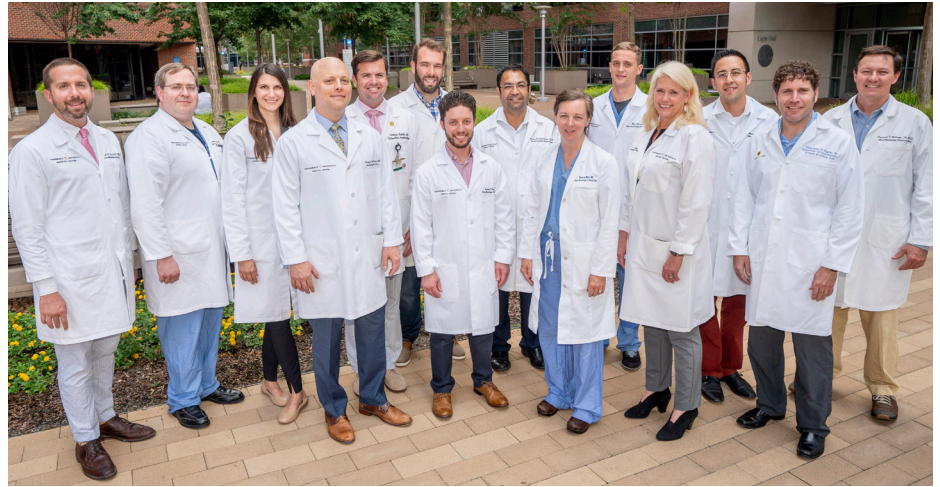
6

locations

The Division strives to provide excellent patient care, promote education and engage in scholarly activity.

Active research programs encompass clinical, translational and bench research.

An ongoing alliance between the ACCM Division and the School of Nursing supports acute care nurse practitioner intensivist training.



Anesthesiology Critical Care Medicine

Division Chief: Pratik Pandharipande, MD, MSCI | Associate Division Chief: Liza Weavind, MBBCh, MMHC



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.

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.

Division faculty frequently participate in regional, national and international educational 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.

75+
peer-reviewed manuscripts & book chapters in the past year

12+
areas of research focus

30+
acute care nurse practitioners and physician assistants

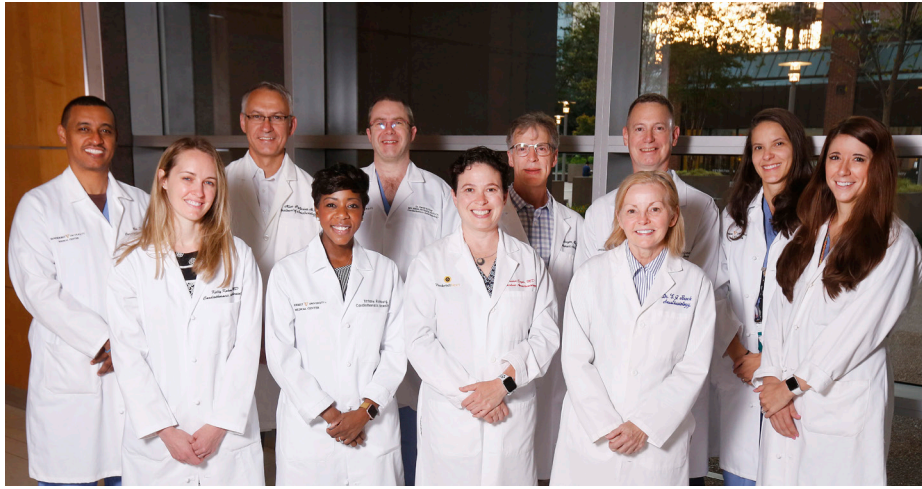
4
faculty mentored research grants

26
anesthesiology intensivists

4
active R01 grants

FELLOWSHIP DETAILS

- **ACGME-ACCREDITED PROGRAM**
- **10 POSITIONS AVAILABLE EACH YEAR**
- **CORE ROTATIONS INCLUDE CVICU, SICU, NCU, TRAUMA ICU, BURN ICU, VA-SICU, ECHO/ULTRASOUND**
- **ELECTIVES INCLUDE INTRAOPERATIVE TEE, MICU, PICU, PERIOPERATIVE MEDICINE, INTERNATIONAL ROTATIONS, PALLIATIVE CARE, MEDICAL SUBSPECIALTIES AND RESEARCH**



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 provides approximately 1,400 adult cardiac procedures per year.

Some department members participate in ambulatory anesthesia and the Perioperative Consult Service.

Cardiothoracic Anesthesiology

Division Chief; Mias Pretorius, MBChB, MSCI

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

Procedures provided include coronary artery bypass graft (on- and off-pump) surgery, valvular surgery, heart and lung transplantation, 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 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.



FELLOWSHIP DETAILS

- **ACGME-ACCREDITED PROGRAM**
- **FIVE POSITIONS AVAILABLE EACH YEAR**
- **CORE ROTATIONS INCLUDE ADULT CARDIAC, THORACIC, PEDIATRIC CARDIAC, TEE AND ICU**
- **ELECTIVES INCLUDE HEART FAILURE, TTE, CT SURGERY AND RESEARCH**

2,200+

TEE exams performed annually

28

peer-reviewed publications & book chapters

15

cardiac anesthesiologists

12

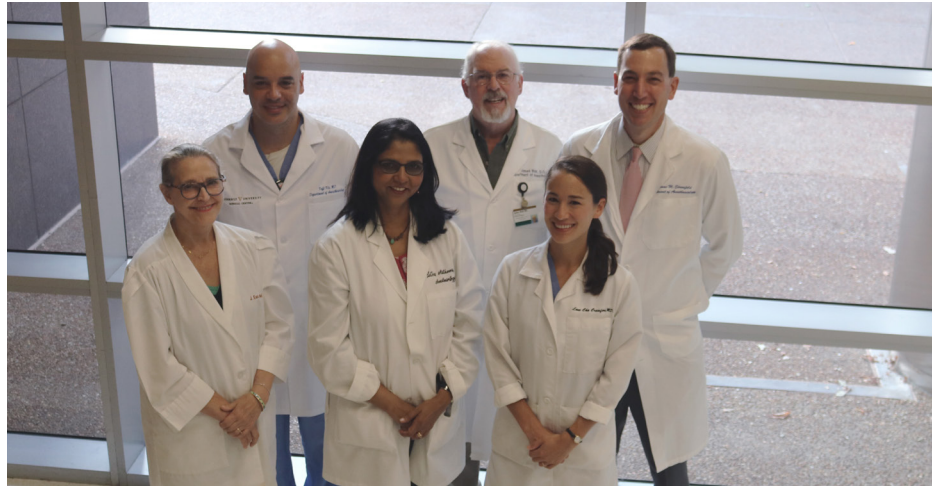
certified registered nurse anesthetists

The Vanderbilt Department of Neurological Surgery has one of the highest volumes of deep brain stimulator implantations in North America.

The Joint Commission designated VUMC as an Advanced Certification Comprehensive Stroke Center, where the most complex of stroke patients are treated.

Division members published multiple book chapters and peer-reviewed articles in the past year.

Enhanced Recovery After Spine (ERAS) protocol was launched in May 2019.



FELLOWSHIP DETAILS

- **ONE YEAR PROGRAM (ACCREDITATION NOT OFFERED BY ACGME)**
- **ONE POSITION AVAILABLE EACH YEAR**
- **CORE ROTATIONS INCLUDE INTRAOPERATIVE CLINICAL CARE, NEUROSURGICAL AND NEUROLOGY ICUs, NEUROMONITORING, AND NEUROIMAGING**
- **ELECTIVES INCLUDE PEDIATRIC CARE, PERIOPERATIVE MEDICINE AND CONSULT SERVICE, EPILEPSY CARE, STROKE SERVICE, OR ADDITIONAL MONTHS OF RESEARCH OR ICU**

4,000+
cases per year

~1,300
patients undergoing spine surgery were cared for by the Ortho/Neuro Spine team

~400
major brain tumor operations performed annually

Neuroanesthesiology

Division Chief: Letha Mathews, MBBS

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 9 to 12 operating rooms. Faculty members specializing in neuroanesthesiology are providing care for increasingly complex patients.

Three neurointerventionalists run a busy neurovascular service in state-of-the-art interventional hybrid operating rooms dedicated solely to neurosurgical procedures.

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 kept under sedation rather than general anesthesia to facilitate speech and motor mapping during surgery in order to preserve the most vital areas of the brain.

Development and practice of evidence-based perioperative pathways and guidelines have improved patient outcomes and re-

duced 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.

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



In 2017, faculty published more than a dozen papers on this topic and, in 2018, published numerous additional Enhanced Recovery After Surgery papers.

Veterans Affairs Perioperative Care Service manages the epidural, nerve block catheters and pain consults at TVHS.

The department has an approved fellowship in Perioperative Medicine. Faculty instructors in the program come from the Departments of Anesthesiology, Surgery and Medicine, which mirrors the collaboration inherent in the concept of perioperative medicine.

Acute Pain Service & Anesthesiology Perioperative Consult Service

Director, Acute Pain Service: Brian Allen, MD | Clinical Chief, Perioperative Consult Service: Ryan Smith, MD

The Vanderbilt Department of Anesthesiology provides both an Acute Pain Service (APS) and a 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. 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.



PERIOPERATIVE MEDICINE FELLOWSHIP DETAILS

- ONE YEAR PROGRAM (ACCREDITATION NOT OFFERED BY ACGME)
- FOUR POSITIONS AVAILABLE
- CORE ROTATIONS INCLUDE PERIOPERATIVE CONSULT SERVICE, HIGH-RISK PREOPERATIVE EVALUATION CLINIC, ECHOCARDIOGRAPHY AND CARDIAC DEVICE MANAGEMENT, GERIATRICS AND RESEARCH

VUMC is a Level I Trauma Center. MSA faculty and staff provide 24-hour coverage for emergency and trauma surgery in the region.

VUMC's trauma center covers 65,000 square miles and has approximately 3,000 admissions per year.

Division faculty members pursue a wide range of academic interests, with a common goal of providing safer and more efficient perioperative care and throughput.



Multispecialty Adult Anesthesiology

Division Chief: Michael Pilla, MD

7,000+ regional blocks performed
~1,600 perioperative consult patients
~800 bed days saved

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

Since 2014, our Perioperative Consult Service has provided co-management of surgical patients, beginning with the decision to operate and continuing throughout the period after hospital discharge. Starting from a pilot program involving colorectal surgical patients, the PCS has quickly grown to include care of orthopedic trauma, abdominal wall re-

construction, 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.



REGIONAL ANESTHESIA & ACUTE PAIN MEDICINE FELLOWSHIP DETAILS

- ACGME-ACCREDITED PROGRAM
- TWO POSITIONS AVAILABLE EACH YEAR
- CORE ROTATIONS INCLUDE ANESTHESIOLOGY PERIOPERATIVE CONSULT SERVICE, OR ANESTHESIA, OROMAXILLOFACIAL SURGERY, ADDICTION PSYCHIATRY, AMBULATORY REGIONAL ANESTHESIA, PEDIATRIC PAIN MANAGEMENT, INPATIENT CHRONIC PAIN, & INTERNATIONAL ANESTHESIA
- ELECTIVES INCLUDE RESEARCH, OBSTETRIC ANESTHESIA



Obstetric Anesthesiology

Division Chief: Jeanette Bauchat, MD, MS

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. The division provides a full complement of techniques for labor analgesia and operative deliveries. The faculty are consultants and critical care specialists for high-risk obstetric patients, as well as for abnormal placentation cases and intrauterine fetal surgery. The division performs anesthesia services for gynecological surgeries in a suite of three operating rooms adjacent to the labor and delivery unit. The division faculty also assume leadership roles in quality initiatives to improve maternal health, including the use of multidisciplinary simulation training for obstetric emergencies.

The division works collaboratively with other medical specialties to ensure women in the

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

The division sponsors a highly regarded, ACGME-accredited obstetric anesthesia fellowship led by experienced Fellowship Director Jeanette Bauchat, MD, MS, and Associate Fellowship Director Holly Ende, MD. Recent clinical research projects include an award-winning research

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 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.

The division is taking a leadership role in the use of *in situ* simulation training for obstetric emergencies.

project using customized opioid prescription practices to reduce overall use and excess opioid tablet availability after cesarean delivery. Ongoing research investigations include the genomics of uterine atony, respiratory depression in pre-eclampsia and patient-centered outcomes following postpartum hemorrhage.

FELLOWSHIP DETAILS

- **ACGME-ACCREDITED PROGRAM**
- **TWO POSITIONS AVAILABLE EACH YEAR**
- **CORE ROTATIONS INCLUDE EXPERIENCES IN MATERNAL-FETAL MEDICINE AND NEONATOLOGY, WITH ABUNDANT TIME FOR RESEARCH AND TRAINING**

4,500+

obstetric deliveries

20+

chapters, editorials, & other media publications

12

peer-reviewed articles

10

faculty



The Division has five current clinical research trials.

Division faculty participate locally, nationally and internationally to develop guidelines, policies and laws to safeguard evidence-based treatment for patients in pain.

Active divisional and collaborative grants include two NIDA contracts, three R01s, two investigator initiated sponsored trials, a PCORI grant, a CDC grant, university-sponsored grants for drug reformulation and support for ongoing fellowship research programs.

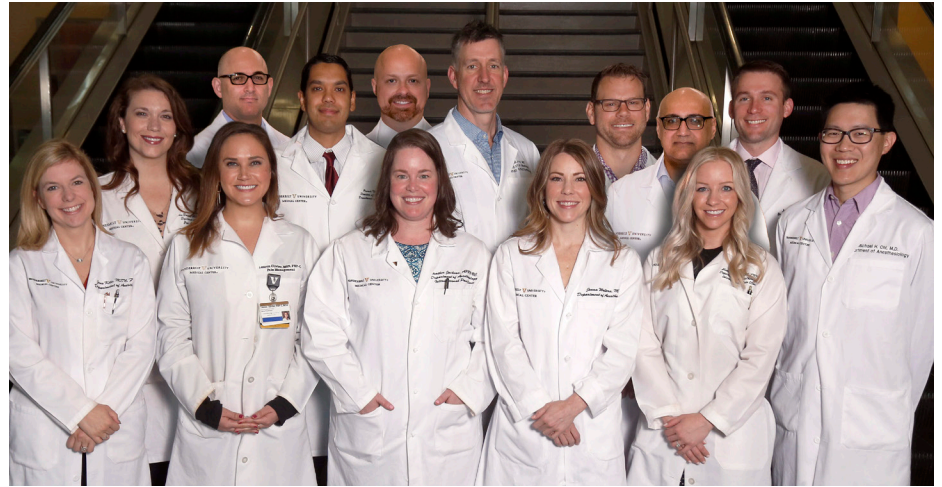
Clinicians from the Division of Pain Medicine use a multidisciplinary approach to pain care, offering thorough evaluations, consultations and referrals in order to employ the most effective evidence-based treatments.

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

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

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

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



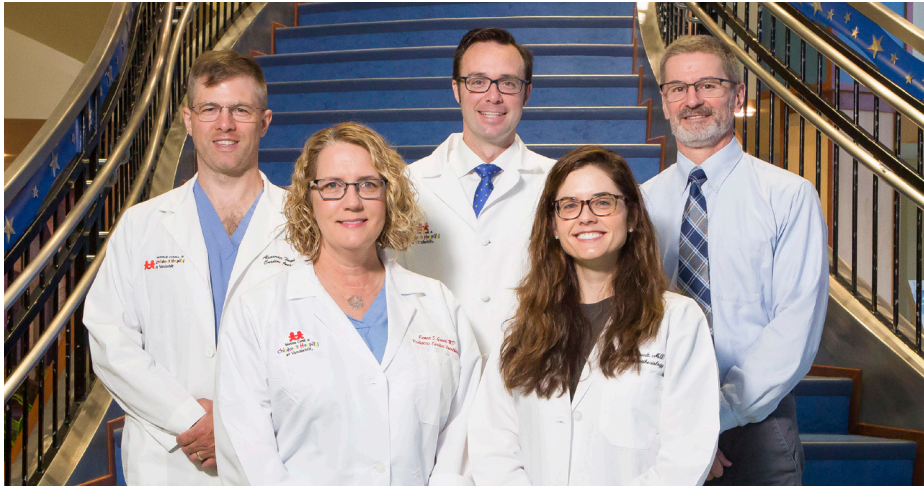
Pain Medicine

Division Chief: David A. Edwards, MD. PhD

FELLOWSHIP DETAILS

- **ACGME-ACCREDITED PROGRAM**
- **FOUR POSITIONS AVAILABLE EACH YEAR**
- **FOCUS ON COMPREHENSIVE, MULTIDISCIPLINARY TREATMENT OF ACUTE, SUB-ACUTE AND CHRONIC PAIN**
- **ROTATIONS IN INTERVENTIONAL PAIN, PSYCHIATRY, ADDICTION MEDICINE, NEUROLOGY, RADIOLOGY, PHYSICAL THERAPY, CANCER PAIN, INTEGRATIVE MEDICINE, AND INTERNATIONAL PAIN DELIVERY**
- **HIGH VOLUME TRAINING EXPOSURE WITH STATE OF THE ART THERAPIES SUCH AS IMPLANTABLE SPINAL AND PERIPHERAL STIMULATORS, ABLATIVE/LYTIC THERAPIES, FLUOROSCOPIC AND ULTRASOUND-GUIDED PROCEDURES, NEUROSURGICAL TREATMENTS, INTRATHECAL DRUG-DELIVERY SYSTEMS**
- **COMPLETION OF PUBLISHABLE ACADEMIC PROJECTS**





The Pediatric Heart Institute ranks as one of the nation's busiest in both heart transplants and adult congenital electrophysiologic procedures.

The division provides educational observation experiences to both pediatric cardiology fellows and pediatric intensive care fellows.

For procedures outside of the cardiac operating rooms 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.

Pediatric Cardiac Anesthesiology

Interim Chief: Alexander Hughes, MD

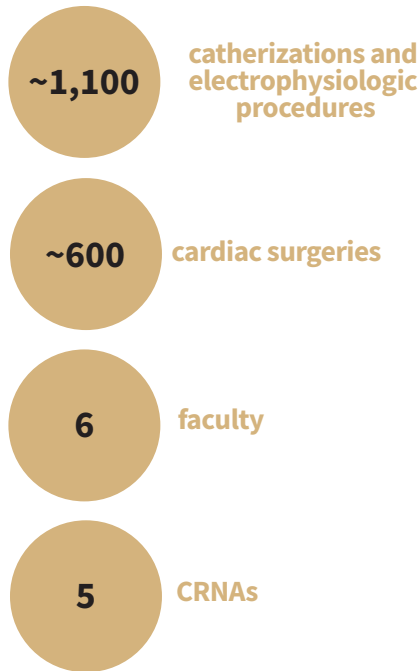
The Division of Pediatric Cardiac Anesthesiology is made up of six faculty members and six certified registered nurse anesthetists whose primary practice sites are the two cardiac operating rooms and two catheterization laboratories at the Monroe Carell Jr. Children's Hospital at Vanderbilt. The division's average yearly case volume is approximately 600 cardiac surgeries and 1,100 catheterizations and 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.

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.

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.

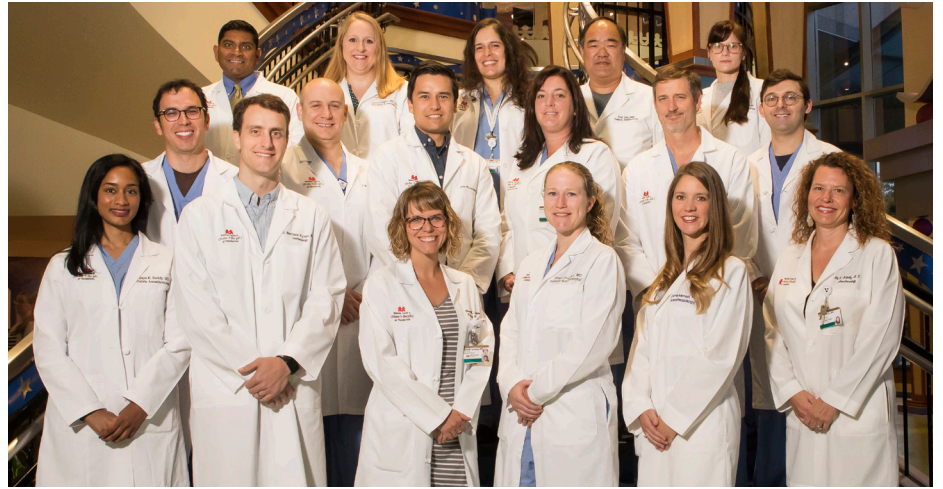


Since 2006, the Dr. James Phythyon Endowed Lectureship in Pediatric Anesthesiology has brought renowned experts in the field to Vanderbilt's campus as visiting professors. In 2019, Randall Flick, MD, MPH, presented "Anesthetic Related Neurotoxicity in Young Children: GAS, PANDA, & MASK." Pictured here left to right: Warren Sandberg, MD, PhD, Phythyon daughters Sarah Miller and Elizabeth Donner, Randall Flick, MD, MPH, and Jill Kilkelly, MD.

New construction, completed in the summer of 2019, added four additional floors (150 beds) to the Monroe Carell Jr. Children's Hospital at Vanderbilt.

Many pediatric division faculty are major leaders in international outreach work.

Monroe Carell Jr. Children's Hospital at Vanderbilt successfully obtained American College of Surgeons Level I Verification for Pediatric Trauma Care, a distinction that fewer than 50 pediatric hospitals across the nation have achieved.



Pediatric Anesthesiology

Division Chief: Jill Kilkelly, MD

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

Academic interests of the division include 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.

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.

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.

23
faculty

40
pediatric CRNAs

17
perioperative nurse practitioners

17
anesthesia technicians



FELLOWSHIP DETAILS

- **ACGME-ACCREDITED PROGRAM**
- **FOUR POSITIONS AVAILABLE EACH YEAR**
- **ELECTIVES INCLUDE ABILITY TO TRAVEL TO GUATEMALA AND/OR KENYA FOR INTERNATIONAL CARE EXPERIENCES**
- **CORE ROTATIONS INCLUDE PEDIATRIC OR & PEDIATRIC CARDIAC OR, PICU, NICU, PEDIATRIC PAIN SERVICE, PREOPERATIVE EVALUATION CLINIC, & RECOVERY ROOM MANAGEMENT**
- **FINAL MONTH DEDICATED TO 'SUPERVISORY' ROLE TO FOSTER TRANSITION TO THE ATTENDING ROLE**



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 and opioid detox, both recognized as National Best Practice.

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.

This year, the VA Anesthesiology Service has expanded pain management services to Nashville and Clarksville facilities in addition to the comprehensive pain clinic in Murfreesboro.

Veterans Affairs Anesthesiology Service

Chief: Ann Walia, MBBS

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

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.

The service includes 17 full-time anesthesiologists, 7 part-time anesthesiologists, 20 CRNAs, 9 nurse practitioners, 2 anesthesiology residents, 1 fellow, 6 medical instrument technicians and 4 administrative support staff. The service is heavily engaged in educational activities within TVHS as well as nationally.

Faculty provides oversight of the facility, moderates sedation program and resuscitation and airway management activities.

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

45,000+ encounters per year

11,000+ preoperative patient encounters per year

6,000+ surgical patients in the OR per year

11,000+ non-OR procedures per year



Between the Vanderbilt University Hospital and the Monroe Carell Jr. Children's Hospital at Vanderbilt, 172 CRNAs deliver anesthesia for all procedures spanning all divisions of the department.

CRNAs are full partners in department clinical practice initiatives and frequently contribute to the development of quality improvement and efficiency initiatives.

Of the 172 CRNAs, 40 practice within Children's Hospital.



Certified Registered Nurse Anesthetists

Chief: Brent Dunworth, DNP, MBA, APRN, CRNA

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 172 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.

Over 25 CRNAs are actively pursuing doctoral education. Five CRNAs serve within the divisional leadership to facilitate practice evolution, education and professional development of their respective teams. Thus, the CRNAs are essential to many core endeavors, with a sharp focus on

patient experience and outcomes. In terms of personnel, the CRNA Division is the largest within the Department of Anesthesiology.

Vanderbilt is 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.



Cool Springs Surgery Center CRNAs.



Vanderbilt Surgery Center CRNAs.

172
CRNAs

55
student registered
nurse anesthetists
on monthly
rotations

6
specialty divisions



39

anesthesia
technicians and
technologists





EDUCATION

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, advanced practice providers 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, Neuroanesthesiology and Global Anesthesiology.

Residents and fellows benefit from in-depth training in all subspecialty disciplines of clinical anesthesiology, critical 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;
- BH Robbins 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.

Introducing Global LEAP

The mission of the Global Leadership in Anesthesia Pathway (Global LEAP) is to support and develop anesthesia trainees and faculty committed to improving anesthesia access and safety in under-resourced settings. From short-term mission team members to future leaders in the field, participants will utilize the exceptional academic resources of the VUMC Department of Anesthesiology and Vanderbilt University School of Medicine to hone the cognitive and technical skills necessary for sustainable impact in underserved populations around the world. The program started in 2018 and has residents at multiple levels involved in longitudinal learning, faculty mentorship, research and international clinical rotations throughout residency.



75th-80th percentile
the average score of VUMC anesthesiology residents on in-training exams is in the 75th-80th percentile when compared to the nation



2 per year
Mock Oral Board Exams are given to CA1, CA2 and CA3 residents twice a year to prepare them for the oral board portion of the ABA APPLIED exam







Educational Affairs handles education for residents, fellows, nurse anesthetists, and advanced practice nurses.

CELA participants get hands-on training in anesthesiology airway management, critical care, perioperative management and transesophageal echocardiogram procedures.

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.

Office of Educational Affairs

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 2019 National Residency Match, the department received 1,236 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. Peer-reviewed publications and the presentation of research by residents at national meetings are clear indications that the department's educational programs are creating physician-scholars who are prepared for medical practice, peer-education and scientific investigation.

The educational program for residents and fellows consists of a combination of comprehensive didactic conferences, 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 goal of ongoing curriculum development and revision in the Milestones era is to continue to reach the highest level of educational achievement using modern learning techniques. Accordingly, Leslie Fowler, MEd, Director of Educational Develop-

ment and Research, 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. 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, 10 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

- Anesthesiology Critical Care Medicine***

10 fellows

- Clinical Informatics***

1-2 fellows

- Global Anesthesiology****

1-2 fellows

- Neuroanesthesiology****

1 fellow

- Obstetric Anesthesiology***

2 fellows

- Pain Medicine***

4 fellows

- Pediatric Anesthesiology***

4 fellows

- Regional Anesthesia and Acute Pain Medicine***

2 fellows

- Perioperative Medicine****

4 fellows

*ACGME Accredited

**Accreditation not offered by ACGME

Nurse Anesthetists

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

Advanced Practice Nurses

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

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

The Center for Experiential Learning and Assessment

Under the leadership of Arna Banerjee, MBBS, CELA offers medical learners at all levels a simulation education on computerized, life-like mannequins. CELA was endorsed by the American Society of Anesthesiologists (ASA) as one of approximately 40 centers in the nation officially approved to deliver certified educational programs. Anesthesiologists can receive continuing medical education (CME) simulation training at CELA that qualifies for American Board of Anesthesiology Maintenance

of Certification in Anesthesiology (MOCA®) credit. To achieve the ASA endorsement, the CELA program met strict criteria, including having strong leadership and the necessary equipment, facilities and personnel to provide consistent, effective training.

Educational Research

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

Kynes's research focuses on the impact of high-fidelity simulation workshops on clinical skills for providers involved in obstetric care in Kenya. He also studies the preparation and experience of anesthesiology residents participating in international rotations and

their impact on improving clinical exposure and long-term engagement in humanitarian activities. Kynes's research includes the FAER grant impact of and utilization of online curricula in pediatric anesthesiology by providers in low- and middle-income countries.

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

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



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.



101
residents and fellows across core residency program and 10 fellowships

25-30
residents present original research and challenging cases at national meetings annually

10
faculty with active funding for educational research totaling over \$1 million

13
summer research interns

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



Vanderbilt International Anesthesia

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

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

In addition to this research, the department offers an ACGME/ABA-accredited elective rotation to Kenya. Since the rotation began nine years ago, VIA has sent 79 residents and fellows to our partner hospital, AIC Kijabe, to provide anesthesia care and teach anesthesia providers. This rotation is a highlight for many of the department's trainees and has helped pave the way for the new Global LEAP (Global Leadership in Anesthesia Pathway) program, an advanced track for residents interested in developing in-depth global health expertise and extensive international experience, led by J. Matthew Kynes, MD.

The department is also proud of the on-going global health contributions of our CRNA team members. Over the past several years, numerous CRNAs have traveled to underserved countries of the world, including Guatemala, Kenya, Nigeria, Uganda, and others, for teaching and service projects. In 2020, our CRNAs look forward to leading sessions at the first international nurse anesthesia conference to take place in Africa.

In 2019, VIA also supported a two-week Point-of-Care Ultrasound (POCUS) pilot course in Ethiopia. Department faculty Robert Deegan, MB, ChB, PhD, Antonio Hernandez, MD, and Bantayehu Sileshi, MD, traveled to Addis Ababa to facilitate the course, which taught local third-year

residents and faculty to use portable ultrasound for perioperative assessment.

Another highlight for VIA in 2019 was welcoming Mary Mungai, Head Kenyan Registered Nurse Anesthetist (KRNA) at AIC Kijabe Hospital, when she visited the department for two weeks in the spring. In addition to serving as the honored guest speaker at the 2019 Annual VIA Fundraiser Dinner, Ms. Mungai (pictured next page with Jordan Miller, CRNA, and Shawnee Brenkman, CRNA) met with and observed CRNAs across multiple divisions to learn about anesthesia care and education at VUMC.

Through VIA, the Department of Anesthesiology also offers the Vanderbilt Global Anesthesiology Fellowship, hosts visiting ASA Global Scholars and convenes the quarterly Vanderbilt International Journal Club. Several department members, including Jill Moore, CRNA, Jon Niconchuk, MD, Tiffany Richburg, MD, and Jenna Sobey, MD, lead multiple tele-education lecture series for anesthesia providers and trainees in East Africa.

The department looks forward to celebrating VIA's tenth anniversary in 2020 and continuing to expand efforts to improve anesthesia care across the globe.

VANDERBILT INTERNATIONAL ANESTHESIA

12 COUNTRIES

WHERE OUR TEAMS ARE INVOLVED
AROUND THE GLOBE



8 EDUCATION PROGRAMS

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

>\$5 MILLION

IN GRANT FUNDING FOR GLOBAL
HEALTH EDUCATION & RESEARCH

79 TRAINEES

COMPLETING INTERNATIONAL ROTATIONS SINCE 2010



ONE GIVES. ONE GOES. ONE GLOBE.





Special Lectureships and Awards

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

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

Dr. James Phythyon Endowed Lectureship in Pediatric Anesthesiology

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

The Sandidge Pediatric Pain Management Endowed Fund

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

The Dila Vuksanaj Memorial Fund for Resident Education

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

including her husband, Jacques Heibig, MD, founded the Dila Vuksanaj Memorial Fund for Resident Education.

Dr. Bradley E. Smith Endowed Lectureship on Medical Professionalism

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

Dr. Charles Beattie Endowed Lectureship

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.



RESEARCH



\$356 million+
in funding for the Vanderbilt
University School of Medicine



279
papers published by
department faculty in 2019



\$8 million+
in total extramural research
funding brought in by
anesthesia investigators



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 2018, the Vanderbilt University School of Medicine (VUSM) ranked 11th among U.S. medical schools for National Institutes of Health (NIH) funding, with more than \$356 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 \$3.8 million in awarded NIH grants, which placed Vanderbilt Anesthesiology 14th among U.S. academic anesthesiology departments in NIH funding.

Within the department, faculty published 279 papers in fiscal year 2019, up from 241 papers in fiscal year 2016, within the peer-reviewed literature.

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

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

VACRAC is composed of a panel of experienced investigators who review research protocols and discuss design and implementation

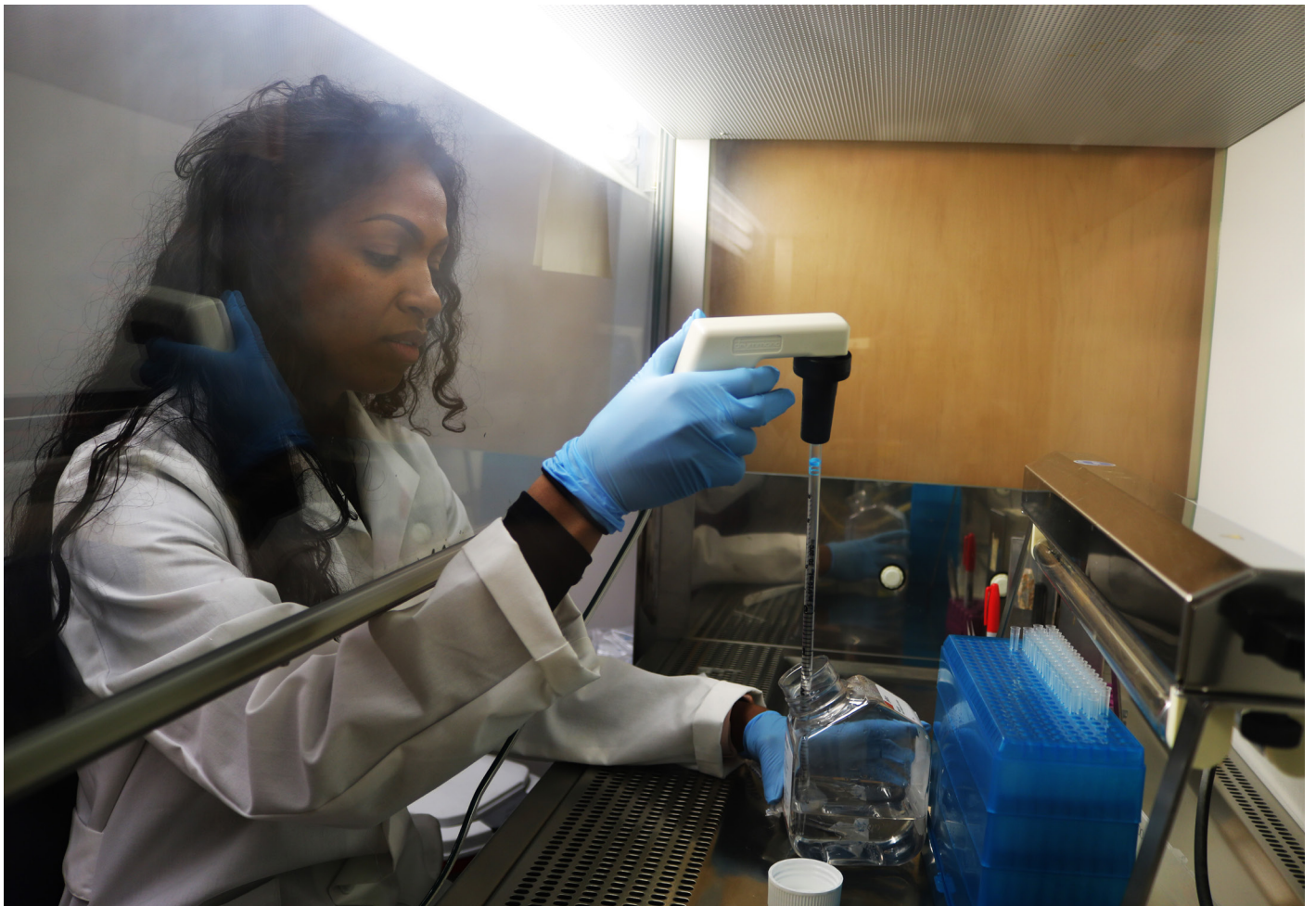
with investigators. This process improves the design and execution of clinical research projects, resulting in more rapid and effective study origination and completion.

Through the development of automated email systems and dashboards, VAPIR has strengthened internal communication and plays a vital role in providing near real time feedback to clinicians to help them improve perioperative care. VAPIR is led by Director Jonathan Wanderer, MD, MPhil, and Associate Director Robert Freundlich, MD, MS. 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 basic and translational research, with the goal of advancing current knowledge and improving patient care. Specific areas of interest include ion transport, cell signaling, drug discovery, organ protection, pain management, the neurobiology of addiction, host response to infection and fetoplacental circulation.

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





41

publications in the past year

17

current NIH grants

Lab Research Advancing Medical Science

Director: Eric Delpire, PhD

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

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

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

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

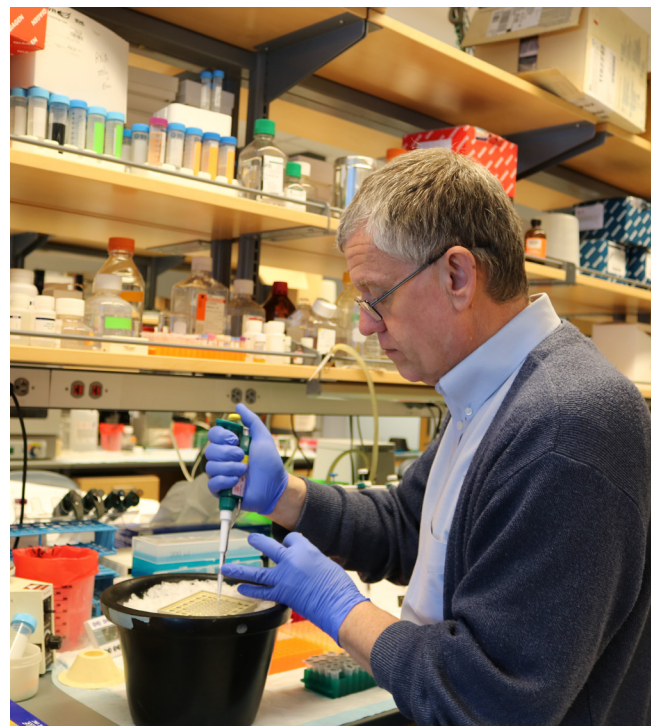
Brad Grueter, PhD, and Carrie Grueter, PhD, Assistant Professors, are researching the neurobiology of addiction and reward-related behaviors. They utilize state-of-the-art electrophysiology techniques, including optogenetics, as well as a battery of specialized neurobehavioral tests performed in genetically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

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

Edward Sherwood, MD, PhD, Professor of Anesthesiology, Pathology, Microbiology and Immunology, Cornelius Vanderbilt Chair in Anesthesiology and Vice Chair for Research, Julia Bohannon, PhD,

Assistant Professor of Anesthesiology, and Antonio Hernandez, MD, Associate Professor of Anesthesiology, are studying several aspects of sepsis and burn injury and the application of immunotherapy in critically ill patients.

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



1,000,000+

procedures contained
within the
Perioperative Data Warehouse,
which VAPIR manages



Advancing Technology & Improving Patient Care

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

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

- 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

VAPIR, led by Director Jonathan Wanderer, MD, MPhil, and Associate Director Robert Freundlich, MD, MS, 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 balanced 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 makes it feasible to analyze data seamlessly across our legacy VPIMS (Vanderbilt Perioperative Information Management System) and current eStar (Epic) system.



PCRI and VACRAC

The Perioperative Clinical Research Institute (PCRI) is led by Edward Sherwood, MD, PhD, David McIlroy, MB.BS, MD, 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 four research nurses, four clinical trial coordinators, a regulatory specialist and an administrative assistant.



Shaping Tomorrow's Leaders Through Mentorship

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

The mission of VACRAC is to:

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

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





48
peer-reviewed
publications
by CRISS
investigators

22
invited
presentations
last year

12
staff
members

7
part-time
faculty

4
full-time
faculty

Center for Research and Innovation in Systems Safety

Director: Matthew Weinger, MD

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

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

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

CRISS is particularly interested in designing and evaluating medical technologies with an emphasis on the effects of the introduction of new technologies on clinical care, and the use of electronically generated clinical data to identify evolving events and support decision-making.

CRISS explores the nature of expertise, clinician-clinician communication, situational awareness, the workload and stress of individual clinicians and of teams, individual and group performance-shaping factors, human-technology interactions and novel methods of information presentation to generate practical benefits in terms of improved clinical care processes and outcomes.

Two of the center's currently active funded research projects are in pediatrics: One is studying ways to improve the care and outcomes for neonatal safety; the other is developing decision support for diagnosis and treatment of children presenting to the emergency department with pneumonia. CRISS is also leading a federally funded multicenter study to assess and understand the decision-making and teamwork of board-certified anesthesiologists performing simulated medical emergencies. In another active project, the Cancer Patient Safety Learning Laboratory, we are partnering with surgeons, oncologists, nurses, staff and adult cancer patients and their lay caregivers to more reliably detect and respond more effectively to unexpected clinical deterioration in outpatients who are undergoing and/or recovering from cancer treatment. CRISS faculty collaborate with investigators outside Vanderbilt to apply human factors methods to many other domains, including chronic outpatient pain management, nursing home care, decision tools to enhance drug prescribing, and even nuclear power plant outage management.

CRISS's involvement with VUMC operational initiatives in quality improvement includes conducting formal usability testing of software applications and technology being considered for deployment. CRISS also studies alarms, handovers and clinician burnout.

CRISS continues to be involved in projects that re-engineer medical processes, improve clinician decision-making and enhance the usability and usefulness of clinical informatics tools. CRISS has been instrumental in assisting the Department of Veterans Affairs to develop, test and implement decision support modules in the national EHR system and produce visual devices designed to facilitate their human factors group's operations.



Key Clinical Research Studies

Brian Allen, MD: A Randomized Controlled Trial of Regional Versus General Anesthesia for Promoting Independence After Hip Fracture (REGAIN Trial) [PCOR1]

Bret Alvis, MD: Wireless Point-of-Care Sensor for Continuous Fluid Status Monitoring of Patients with Congestive Heart Failure

Non-Invasive Venous waveform Analysis (NIVA)—A Proof of Concept Study. NIH SBIR/STTR Phase I & II (NIH)

Shilo Anders, PhD: Site PI: SMART-COM—Scalable Multi-Agent Adaptive Resolution Tools for Collaborative Outage Management (DOE)

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

Curtis Baysinger, MD: A Study Using the In Vitro Dual Perfused, Human Placental Model to Compare: I.) Changes in Feto-placental Perfusion Pressure Induced by Altered Fetal Flow Rates in Single Isolated Cotyledons Harvested from Healthy Versus Preeclamptic Mothers. II.) Slope of the Increase in FAP Induced by Hypoxemia in Single Isolated Cotyledons Harvested from Healthy Versus Preeclamptic Mothers

Frederic T. (Josh) Billings IV, MD, MSCI: The Effect of Maintaining Physiologic Oxygenation on Oxidative Stress During Cardiac Surgery

Intraoperative Fraction of Inspired Oxygen and Postoperative Organ Injury

A Phase 2 Proof of Concept, Double-blind, Randomized, Placebo-controlled Study to Evaluate the Efficacy of ASP1128 (MA-0217) in Subjects at Risk for Acute Kidney Injury Following Coronary Artery Bypass Graft (CABG) and/or Valve Surgery (Astellas)

B. Randall Brenn, MD: An Evaluation of Two Videolaryngoscope Techniques in a Simulated Difficult Airway Model

Stephen Bruehl, PhD: Evaluating Specific and Non-Specific Mechanisms in Two Distinct Complementary/Integrative Interventions for Chronic Pain

Reduced Opioid Analgesic Requirements Via Improved Endogenous Opioid Function

Psychosocial and Oxidative Stress Mechanisms of Post-Surgical Chronic Pain

Lucille Brunker, MD: Effect of a Post-Intensive Care Unit Clinic Intervention on Post-ICU Syndrome Awareness and Health Related Quality of Life

David A. Edwards, MD, PhD: Evaluation of State-Mandated Acute and Post-Surgical Pain-Specific Opioid Prescribing Guidelines

TN Together and Opioid Prescribing at VUMC. A Retrospective Interrupted Time Series Analysis of Opioid Prescribing Data

Perioperative Quantitative Measurement of Pain Thresholds in Thoracotomy Patients

Holly Ende, MD: Effect of Multimodal Analgesia on Postoperative Pain Control and Opioid Use Following Cesarean Delivery in Patients Receiving Buprenorphine

Dan France, PhD, MPH: Cancer Patient Safety Learning Laboratory (CaPSLL): Preventing Clinical Deterioration in Outpatients (France and Weinger, Co-PIs) [AHRQ]

The Impact of Non-Routine Events on Neonatal Safety in the Perioperative Environment (NIH/NICHD)

The Role of Collective Mindfulness in Delivering Reliable and Safe Perioperative Care to Neonates (AHRQ)

Robert Freundlich, MD, MS: Impact of Baseline Functional Status on Post-operative Resiliency

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

Assessment of the Accuracy of the ASA Physical Status Classification in Adult Patients

Incidence and Risk Factors for Discretionary Postoperative Mechanical Ventilation

Antonio Hernandez, MD: A Study Analyzing Human Blood Monocytes and Macrophages Upon Stimulation of Cells with TLR Ligands

Heather Jackson, MSN, RN, APRN-BC: Feasibility of Auricular Acupressure as an Adjunct Treatment for Neonatal Abstinence Syndrome (NAS)

Miklos Kertai, MD, PhD: Inflammation and Postoperative Atrial Fibrillation After Cardiac Surgery

Intraoperative and Postoperative Dexmedetomidine and Delirium, Severity of Postoperative Pain and Outcomes After Cardiac Surgery

Platelet Counts, Mean Platelet Volume and Acute Kidney Injury After Transcatheter Aortic Valve Replacement (TAVR)

Preemptive Pharmacogenetic-guided Metoprolol Management for Post-operative Atrial Fibrillation in Cardiac Surgery: The PREEMPTIVE-Pilot Trial

Thoracic ERAS for Perioperative and Long Term Pain Management

Intraoperative Processed EEG and Delirium, Neurologic Complications and Mortality After Cardiac Surgery

J. Matthew Kynes, MD: Evaluation of Two Forms of Booster Training on Long-Term Retention of Clinical Skills for Cesarean Delivery in a Low-Resource Setting

Impact of a Global Health Simulation Course and Global Health Elective on Anesthesia Learning and Competency in Low-Resource Settings by Anesthesia Residents

Riley Landreth, DO: Intrapartum Transcutaneous Carbon Dioxide Measurements Following Initiation and Infusion of Intravenous Magnesium in Preeclamptic Women

Marcos Lopez, MD: Perioperative Vascular Reactivity

Matthew McEvoy, MD: Effect of an Enhanced Recovery Program on Discharge Prescriptions

The Safety of Perioperative Lidocaine Infusions in an Enhanced Recovery Program

Association of QuizTime Use with Opioid Prescribing Practices by Clinicians in an Inpatient Setting

Kelly Mishra, MD: Peripheral Intravenous Analysis (PIVA) for Predicting Volume Responsiveness and Fluid Status: An Observational Study

Puneet Mishra, MD: GREAT Knee Pain Reduction Trial, Genicular Radiofrequency Ablation Efficacy in Achieving Total Knee Pain Reduction Trial

Pratik Pandharipande, MD, MSCI: The MENDSII Study, Maximizing the Efficacy of Sedation and Reducing Neurological Dysfunction and Mortality in Septic Patients with Acute Respiratory Failure (MENDSII)

Human Factors Formative Study of Clarity-IA® Gas Delivery System (First Wave Technologies)

Srijaya Reddy, MD: Pediatric Craniofacial Surgery Perioperative Registry (PCSPR)

Michael Richardson, MD: Evaluation of Maternal-Fetal Trans-Placental Transfer of Sugammadex and Other Drugs Using the Dual-Perfused Placental Model

Joseph Schlesinger, MD: A Prospective, Single Center Study of the Effects of Modulating Music in the Operating Room

Assessing the Impact of Live Music in the Intensive Care Unit (ICU) to Improve Care for Critically Ill Patients—A Pilot, Prospective, Single-Center Study of Therapeutic Music

Bantayehu Sileshi, MD: Defining Perioperative Morbidity and Mortality in Western Kenya: A Quality Improvement Project

The Use of Portable Ultrasound in Low Resource Settings to Aid in Perioperative Assessment of Patients

An Evaluation of the KRNA Learning Management System (Kijabe Hospital, Kenya)

Loren Smith, MD, PhD: High Density Lipoprotein Characteristics and the Risk of Acute Kidney Injury Following Cardiac and Vascular Surgery

Jenna Walters, MD: Mindfulness to Improve Functional Outcomes in Patients with Fibromyalgia or Central Sensitization: A Pilot Feasibility Study

Jonathan Wanderer, MD, MPhil: Patient Satisfaction with Anesthesia

Evaluation of Mobility Assessment Tools for Preoperative Assessment

Real-time Decision Support for Postoperative Nausea and Vomiting (PONV) Prophylaxis

Beyond Borders of Current Hypotension Research: How Modelling a Blood Pressure Threshold Affects the Association Between Intraoperative Hypotension and Adverse Perioperative Outcomes

Evaluation of a Data-Based Case Planning Tool for Anesthesia Providers

Impact of Intraoperative Reminders on ACGME Case Logging

National Practice Patterns for Postoperative Nausea and Vomiting Prophylaxis

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

Liza Weavind, MBBCh, MMHC: Goals of Care at the Time of Rapid Response Calls: Impact on Patient Care & ICU Resources

Matthew Weinger, MD: IMPACTS: Improving Medical Performance During Acute Crises Through Simulation (AHRQ)

Understanding the Cognition and Decision Making of Community Anesthesiologists in their Management of End-of-Case Neuromuscular Blockade: A Mixed Methods Study (MISP)



BH Robbins Scholars

The Benjamin Howard Robbins Scholar Program, which began in 2007, supports the professional development of departmental early-stage physician-scientists. The program builds critical research skills under direct mentorship of established scientists to help the Robbins Scholars establish vigorous, independently funded research programs. The program is named in honor of the Anesthesiology Department's first chairman, 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. Scholars apply and are rewarded on a competitive basis.

"The BH Robbins Scholar Program provides a unique mentored research experience for young scholars that culminates in a two-year multidisciplinary fellowship, with at least one year devoted to research," said Department Chair Warren Sandberg, MD, PhD.

"Our Robbins Scholars benefit from one-on-one mentorship, a wealth of research and educational resources, protected research time and a stipend during their residency and fellowship."

The BH Robbins Scholar Program is directed by F. T. (Josh) Billings IV, MD, MSCI. The areas of research for our current scholars are described briefly here.

Christina Boncyk, MD (Scholar 2018-2021) is currently investigating the impact of inappropriate medications following intensive care unit (ICU) survival, with a special focus on antipsychotic medications for the management of ICU delirium. Her long-

term research interests include improving ICU survivorship through identification of modifiable medication interventions. Boncyk is mentored by Christopher Hughes, MD, and Pratik Pandharipande, MD, MSCI.

Robert Freundlich, MD, MS (Scholar 2017-2020) is an anesthesiologist, a cardiovascular intensivist and a clinical informatics 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 Pratik Pandharipande, MD, MSCI.

Dianne Lou, MD, PhD (Scholar 2019-2022) is interested in the pathological processes that result in widespread chronic pain in cancer survivors. Under the guidance of Barbara Murphy, MD, in the Department of Medicine's Hematology/Oncology Division and David A. Edwards, MD, PhD, in Anesthesiology's Pain Medicine Division, she is investigating the presence of a distinct brain signature in head and neck cancer survivors with varying levels of pain symptomatology using functional and structural magnetic resonance imaging techniques.

Puneet Mishra, MD (Scholar 2016-2021) is principal investigator for a randomized control trial examining the efficacy of preoperative genicular nerve radiofrequency

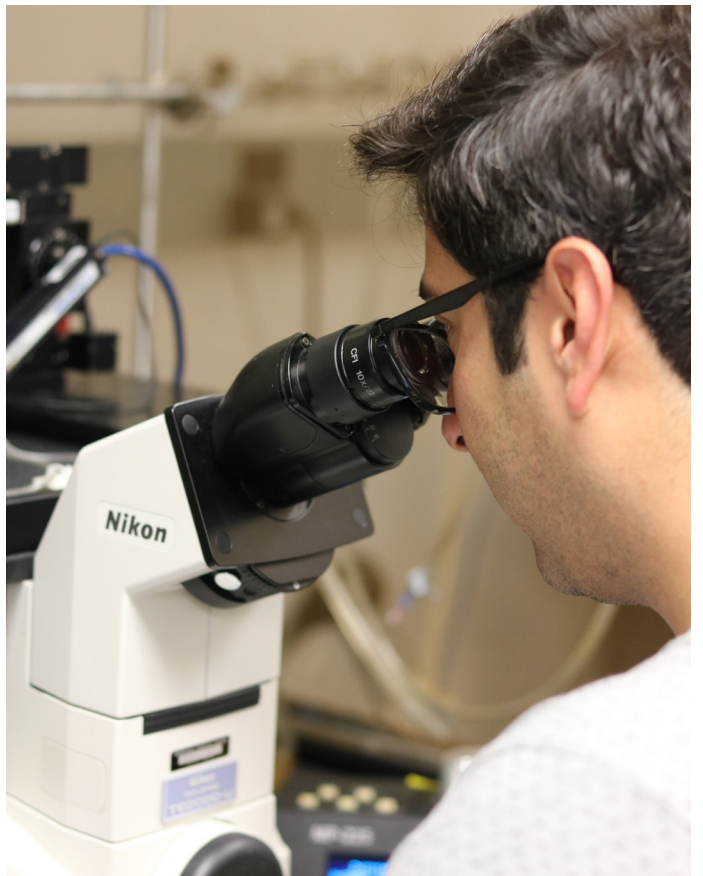
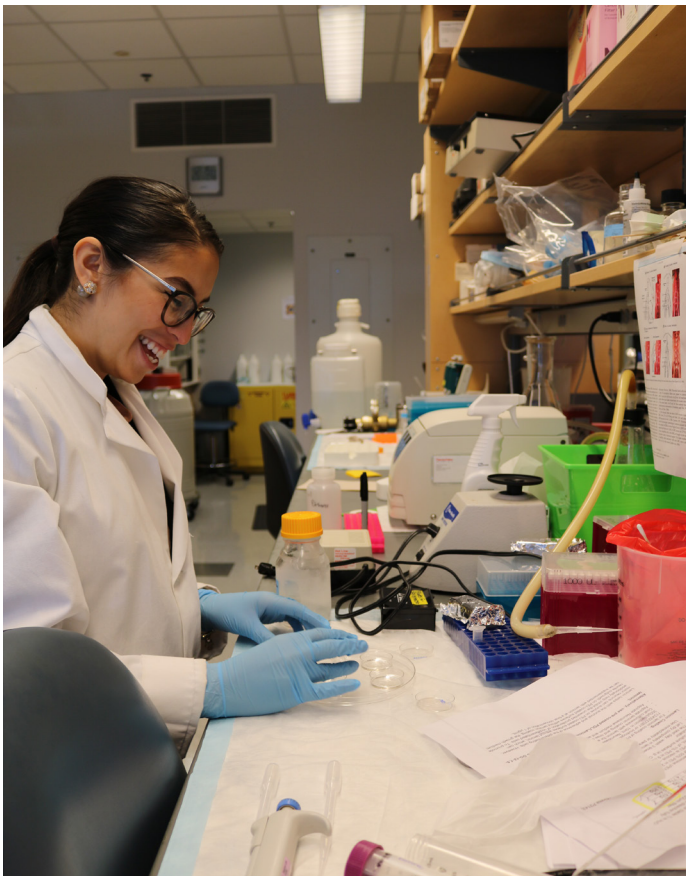
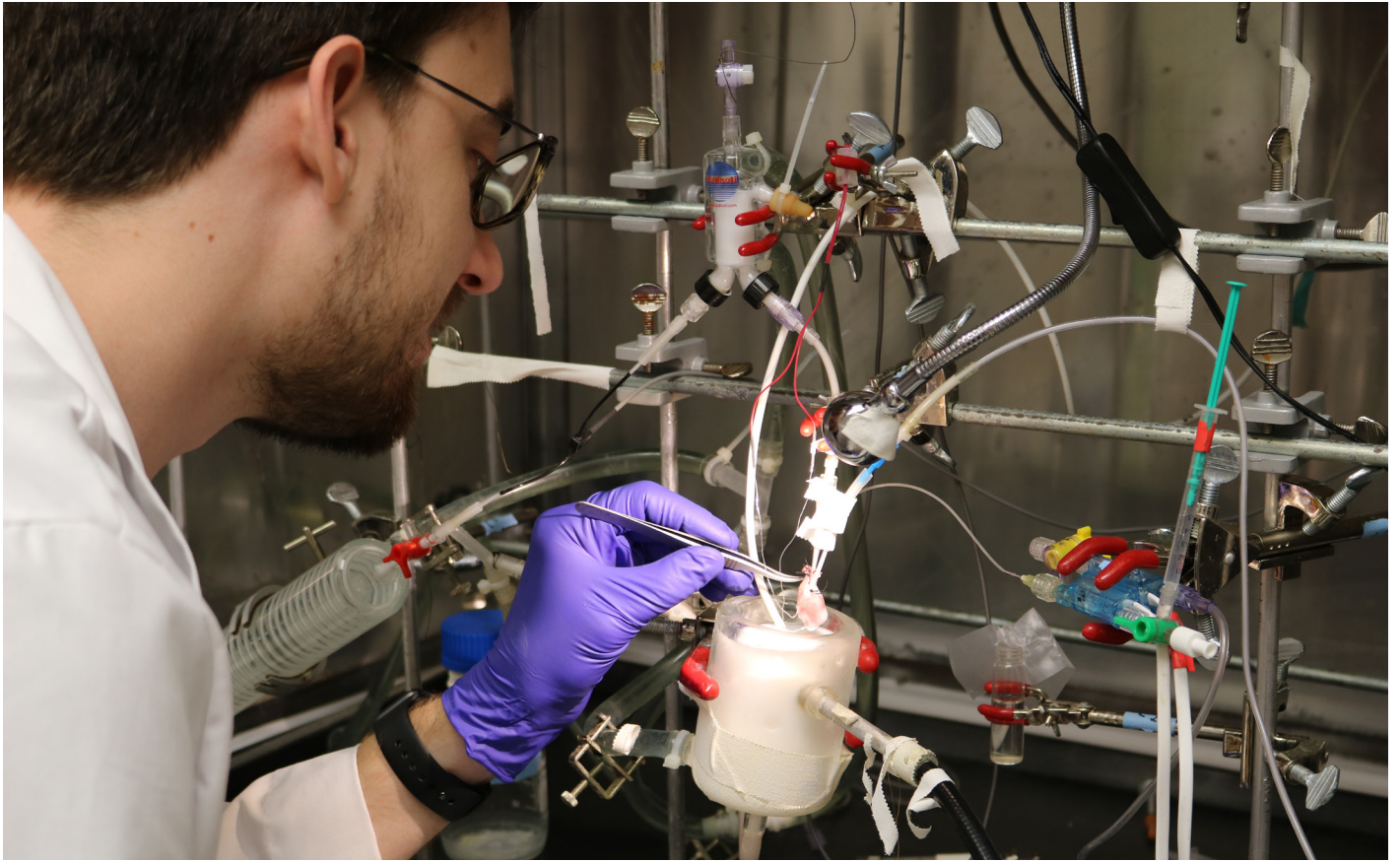
ablation in reducing pain and improving functional outcomes in patients undergoing total knee arthroplasty. Over the course of this year, Mishra plans to conduct a second randomized control trial investigating the effectiveness of preoperative transforaminal epidural injections with clonidine as well as dexamethasone in reducing back and radiculopathic pain in patients undergoing a single level lumbar discectomy. Mishra is mentored by Stephen Bruehl, PhD.

Naeem Patil, MBBS, PhD (Scholar 2018-2020) is investigating the molecular mechanisms leading to sepsis-induced alterations in innate leukocyte function, under the T32 training grant. His current studies are focused on characterization of macrophage mitochondrial metabolism upon TLR4 stimulation and evaluation of mitochondrial metabolic intermediates as novel mediators altering host innate immunity. He was recently awarded the US Shock Society Faculty Research award. Patil is mentored by Edward R. Sherwood MD, 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 2016-2019) 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.

Amanda Stone, PhD (Scholar 2018-2020) is a clinical psychologist with primary interests in pediatric pain and intergenerational factors affecting children's health outcomes. Under the T32 training grant, she is currently investigating predictors of opioid use for postoperative pain following tonsillectomy procedures. Stone also actively collaborates on research evaluating predictors of parent and child outcomes. Stone is mentored by Stephen Bruehl, PhD.





Selected Publications 2018-2019

Peer-reviewed Publications

205
peer-reviewed
publications

48
reviews

89
original research
publications

22
infographics

22
editorials/
commentaries

10
letters to the editor

Authors

89
faculty

12
trainees

7
research staff

3
advanced practice
nurse practitioners/
CRNAs

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



BASIC SCIENCE

Aretz CD, Morwitzer MJ, Sanford AG, Hogan AM, Portillo MV, **Kharade SV**, Kramer M, McCarthey JB, Trigueros RR, Piermarini PM, **Denton JS**, Hopkins CR: Discovery and Characterization of 2-Nitro-5-(4-(phenylsulfonyl)piperazin-1-yl)-N-(pyridin-4-ylmethyl)anilines as Novel Inhibitors of the Aedes aegypti Kir1 (AeKir1) Channel. ACS Infect Dis 2019; 5:917-931

Cai K, Wang J, Eissman J, Wang J, Nwosu G, Shen W, Liang HC, Li XJ, Zhu HX, Yi YH, Song J, Xu D, **Delpire E**, Liao WP, Shi YW, Kang JQ: A missense mutation in SLC6A1 associated with Lennox-Gastaut syndrome impairs GABA transporter 1 protein trafficking and function. Exp Neurol 2019; 320:112973

Chen R, Prael FJ, 3rd, Li Z, **Delpire E**, Weaver CD, Swale DR: Functional

Coupling of K(+)-Cl(-) Cotransporter (KCC) to GABA-Gated Cl(-) Channels in the Central Nervous System of Drosophila melanogaster Leads to Altered Drug Sensitivities. ACS Chem Neurosci 2019; 10:2765-2776

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Fukuda S, Ihara K, **Bohannon JK**, **Hernandez A**, **Patil NK**, **Luan L**, Stothers C, Stark R, Prough DS, Herndon DN, **Sherwood ER**, Enkhbaatar P: Monophosphoryl Lipid A Attenuates Multiorgan Dysfunction During Post-Burn Pseudomonas Aeruginosa Pneumonia In Sheep. Shock 2019 Apr [Epub]

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CLINICAL AND TRANSLATIONAL SCIENCE

Bruehl S, Burns JW, Morgan A, Koltyn K, **Gupta R**, Buvanendran A, **Edwards D**, **Chont M**, Kingsley PJ, Marnett L, **Stone A**, Patel S: The association between endogenous opioid function and morphine responsiveness: a moderating role for endocannabinoids. *Pain* 2019; 160:676-687

Bruehl S, Gamazon ER, Van de Ven T, Buchheit T, Walsh CG, **Mishra P**, Ramanujan K, Shaw A: DNA methylation profiles are associated with complex regional pain syndrome following traumatic injury. *Pain* 2019 May [Epub]

Burdick KJ, Jorgensen SK, Holmberg MO, Kultgen SP, Combs TN, **Schlesinger JJ**: Benefits of sonification and haptic displays with physiologic variables to improve patient safety. *Proceedings of Meetings on Acoustics* 2018; 35:020001

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Department members present at XGM

By Jenelle Grewell

Originally published in the Spring 2019 issue of Anesthesia Monitor, the department newsletter.

Brain Rothman, MD, and Jonathan Wanderer, MD, MPhil, presented at the Expert Group Meetings (XGM) Epic from Monday, April 29 to Friday, May 10.

Rothman's Presentation

Rothman's presentation is titled "Period Flightboards in Every OR." The presentation demonstrates Vanderbilt's successful OR Flightboard implementation using Epic Monitor across more than 90 OR locations. "This was a 'big bang' implementation. At that time, I don't believe the Epic flightboard had been implemented simultaneously in that many locations," said Rothman. "Our implementation wasn't perfect at first, but we got it to work seamlessly in a reasonable amount of time."

"Our teams prepared extremely well for the implementation," Rothman explained, "and there is only so much that can be done before you just have to turn the system on. It is the team's response after the system is turned on that matters. Our build team went above and beyond."

OR flightboards positively impact patient care and contribute to patient safety throughout the intraoperative period. The presentation discussed how this tool improves care team work flows, patient safety, and the necessary build for a successful implementation. The presentation focuses on the real-time electronic timeout feature, in particular, that electronically supports required pre-incision timeouts to improve patient safety and decrease the likelihood of wrong surgeries.

Rothman explained that VUMC worked with Epic to get an electronic timeout with a design element that helped implement it. Electronic timeout is the right thing to do in a perioperative space, and Epic provides a tool to do that. The World Health Organization (WHO) has said that timeouts before surgery are important.

"We partner with Epic," he said. "They do site visits where they come to our office." VUMC and Epic collaborated to have Saga, VUMC's website, work together with Haiku, a mobile application. Another thing they have worked

on with Epic has been document mass transfer protocols.

Wanderer's Presentation

Wanderer's presentation at XGM, titled "Procedure Path and Enhanced Recovery After Surgery: A Path to Opioid-Free Anesthesia," describes the tooling that VUMC has put together to support our enhanced recovery after surgery protocols. "This is helping with reduction in length of stay, reduction of intraoperative opioids, and reduction of opioids prescribed at discharge," Wanderer said. He explained that the most engaging presentations demonstrate novel use of Epic's functionality as well as share the results that have been obtained with the help of those tools.

In keeping with that approach, he also discussed VUMC's enhanced recovery after surgery implementation and results. The Department of Anesthesiology's Perioperative Consult Service team provides regional anesthesia and/or multimodal analgesia for patients prior to certain procedures and input on medical management, from decision to operate through discharge. "We developed robust informatics support for that service in our legacy system, and then I invested time before Epic Go Live rebuilding that function in our eStar system," he said.

"I became certified as a physician builder and learned system architecture to create tools within eStar that provide services to the perioperative consult service team and regional anesthesia team."

A lot of complex configuration is possible within Epic, and Wanderer showed off tools within Epic that made the perioperative configuration possible. Epic's tools can be used in different ways at different institutions. "We are able to learn from other institutions and share what we've learned at XGM so we can make our respective electronic health records function better." Wanderer also leads VUMC's Physician Builder Program and serves on Epic's Anesthesia Specialty Steering Board, where he provides feedback on new features under development, highlighting areas for improvement.

Summary

Rothman said that working with Epic on special projects reflects the innovative culture of VUMC. According to Wanderer, "VUMC is unique because the institution has really committed to



Brian Rothman, MD



Jonathan Wanderer, MD, MPhil

involving clinicians with system design and optimization. "We have support from Dr. Balsler for growing our physician builder program which, in the long run, will help us optimize our eStar system across all of our clinical programs."

Anesthesiology Department Chair Warren Sandberg, MD, PhD, said it is truly amazing to see how much the Epic implementation at VUMC has changed and improved over the past year, due to the hard work of numerous people like Rothman and Wanderer. "Epic is so important to the quality of care here at VUMC, and they continue to lead developments that lock in the quality of care we expect."

Anesthesiology project set to expand in Africa



Master educators in Kenya for training of trainers course. Photo submitted by Bantayehu Sileshi, MD.

By Jenelle Grewell

Originally published in the Winter 2018 issue of *Anesthesia Monitor*, the department newsletter.

Following the success of its ImPACT-Kenya (Improving Perioperative Anesthesia Care and Training) project in Kenya, the Department of Anesthesiology has received another grant to expand into neighboring Ethiopia. Faculty members Mark Newton, MD, and Bantayehu Sileshi, MD, are leading the project with \$376,000 in funding support from GE Foundation and ELMA Philanthropies.

Under the original four-year grant in Kijabe, Kenya, the ImPACT Africa program trained 150 Kenyan registered nurse anesthetists (KRNAs), who are now providing care in regions of Kenya where anesthesia was previously absent or inadequate, and equipped KRNA educators with skills in clinical and didactic teaching, data collection, and simulation training.

The training tools developed in Kenya will be utilized in Ethiopia. Despite being one of the largest countries in Africa, Ethiopia has, according to Newton, few anesthesia providers. The two-year education outcomes research and capacity building grant will begin in two regions of Northern Ethiopia—Amhara and Tigray.

The VUMC Department of Anesthesiology will collaborate with Bahir Dar University in Amhara and Mekelle University in Tigray, two leading medical institutions in their regions. The program, which also has the support of the Ethiopia Ministry of Health and regional ministries of health, will eventually reach nearby hospitals and

other regions in Ethiopia. Kijabe Hospital will act as a training hub for educators from Ethiopia, providing the program with regional sustainability.

Newton said, “This was a long process to get to this point where we have a partnership with academics in the United States, corporate foundations, the government of Ethiopia, the program in Kijabe, Kenya, and academic institutions within a region of Africa. It is a collaboration between East and West and North and South within the continent.”

There are four components of the program, Sileshi explained. The first component is a novel learning management system that uses digital modules to deliver case-based training. The system was developed to run without internet connectivity, which is limited in Ethiopia, and is supported in part by Martin Were, MD, of the Department of Bioinformatics and Vanderbilt Institute for Global Health.

The second component of the program is advancing the skills of current anesthesia educators and increasing the numbers of educators in Ethiopia through a ‘training of the trainers’ curriculum, which will improve the quality of anesthesia training programs in the country.

The third component is simulation-based training, which allows trainees to practice managing critical anesthesia events in a supervised setting before working with patients.

The final component is the deployment of a data collection tool, also specifically designed

for settings with intermittent internet access, to gather perioperative outcome data and inform our understanding of anesthesia care in Ethiopia. The tool was used successfully to measure perioperative mortality data in Kenya during the original ImPACT project; the results of that analysis were published in *Anesthesiology* in August 2017.

Born and raised in Ethiopia, Sileshi is a cardiothoracic anesthesiologist at VUMC and is looking forward to making an impact in the home country he left in high school. Sileshi said, “I was fortunate to come to the United States to further my studies and complete anesthesia training. I now have the capacity and the ability to return to Ethiopia and give back.”

Sileshi’s involvement in the program’s expansion to Ethiopia is an important asset because he is uniquely qualified to ensure that the intervention is culturally and contextually relevant and, thereby, more effective. Sileshi has been able to find an avenue in academic anesthesiology at VUMC to have a direct impact on patient care in his home through the work within ImPACT-Ethiopia.

Warren Sandberg, MD, PhD, Chair of the Department of Anesthesiology, said he is excited about the expansion of the ImPACT project. “VUMC has the global impulse throughout. I’m especially proud of our capacity building. Access to safe anesthesia can save countless lives. I am excited to see what ImPACT can do in Ethiopia by educating local providers.”

Department members contribute to new patient handoff standardization

By **Jenelle Grewell**

Originally published in the Summer 2019 issue of Anesthesia Monitor, the department newsletter.

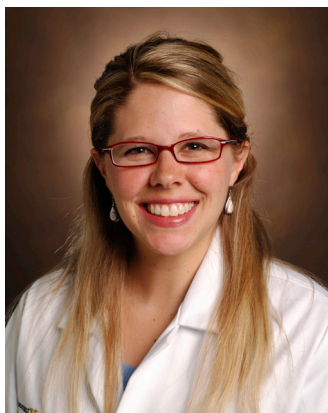
Vanderbilt University Medical Center rolled out a new process for patient handoffs on Wednesday, April 17, 2019. It is intended to improve patient care and safety. Members of the Department of Anesthesiology Sheena Weaver, MD, and Justin Liberman, MD, were a part of helping roll out and develop this process.

This perioperative process involves standardizing patient handoffs to reduce medical errors, adverse events, and communication errors as the patients are transported from the OR to the ICUs. The handoffs will communicate the patient's medical history, operation performed, key operative findings and issues, as well as other important data points.

According to an article titled "Sentinel Event Alert" published in *The Joint Commission*, failed handoffs are a longstanding, common problem that is compounded by the high frequency of handoffs. Teaching hospitals can experience more than 4,000 handoffs a day.

The publication further states that in 2016 a study estimated that communication failures in healthcare were responsible, in part, for at least 30 percent of all malpractice claims.

Weaver, as the lead faculty for the Basics of Quality Improvement Curriculum for Anesthesiology interns, started this quality initiative back in 2017. It was a small-scale intern-led initiative based on OR-to-ICU handovers, specifically in the Neurological ICU. Preliminary observational data showed that ICU providers themselves were only notified or



Sheena Weaver, MD

present for handover about 82 percent of the time.

When ICU providers were surveyed, they felt the handover was subjectively adequate only 78 percent of the time. She said they began to track a lot of the data points that these handover strategies used and found they were only completed 60 to 82 percent of the time in the Neurological ICU.

In February 2018, a version of handoff standardization was made mandatory for all Neurosurgical cases coming to the ICU from the OR. It required all team members to be present during the huddle, all information to be given in a standard fashion, and all members to stay until the huddle was completed.

Weaver commented that it was important to make sure the team huddle didn't take up too much time, as time is a significant commodity when there is a focus on OR efficiency. "The average time for huddle in pilot was three and a half to four minutes, so not too much time when it was truly standardized."

Over the course of the first eight months of the initial pilot, Weaver said compliance was good. "Our biggest challenge was that the



Justin Liberman, MD

process was not standard for everyone outside of the Neurosurgical ORs. "There was no way to standardize it across so many providers when the process was so variable from unit to unit."

Weaver found that other ICUs were ultimately struggling with the same handover issues, and as each got wind of the new strategies in the Neurological ICU, they ended up working together in a combined effort to standardize handovers and the post-operative time out process in all surgical ICUs.

To help the ICUs work together, Executive Medical Director of Critical Care Services Tim Nunez, MD, assisted with soliciting buy-in from the different ICUs. The biggest challenge was getting the information out to so many people, from nurses to anesthesiologists to the surgical teams.

Weaver developed an in-depth set of online educational modules that helped to inform more than 1,500 staff of the nuances of the new process. With Nunez's leadership at the ICU and Surgical Sciences level, and Liberman's close relationship with perioperative clinical staff leaders and nurse managers, this alignment of

leadership efforts provided a unique opportunity to relay a lot of information to a significant number of clinicians, clinical leaders, and front-line staff in an efficient and successful manner.

Weaver said she hopes that this standardization continues to promote a culture of patient safety, which she said is something VUMC has always tried to foster. "I firmly believe that variability in healthcare is bad," Nunez said. "If you can take care of patients the same way, over and over again, because it's the right thing to do, you do better for patients." He further explained there is no logical argument against this new process, and the hope is that by eliminating variability, error will be eliminated.

Nunez noted, while it is too early to get back the numbers on how the ICU handoffs are affecting VUMC, he has been told anecdotes about how well the new process is going.

Weaver said the hope is to make a lot of this handoff process automated in Epic, so providers have even less work to do and fewer tasks to remember, which could further reduce the risk for errors.

"So far, this process has been very successful," Liberman said. He explained that there are rare instances of the new protocol not being followed, and these instances usually occur only when staff are unsure of the process.

Weaver did emphasize the fact that it is a very large team that is helping make this a successful culture change. "There are dozens of people that made this happen, from Tenisha Preston at the perioperative level to each of the ICU nurse managers to the clinical staff dedicated to protocol compliance. We have so many people to thank."

New clinic bridges inpatient, outpatient addiction care

By Kelsey Herbers

Originally published in the VUMC Reporter on May 2, 2019.

Vanderbilt University Medical Center is launching a Bridge Clinic for patients with substance use disorder who are leaving Vanderbilt University Adult Hospital (VUAH) and require follow-up care for their addiction.

The clinic, which opens May 17 in the Village at Vanderbilt, will manage patients for a three-month transitional period to ensure they continue receiving care for their addiction in hopes of preventing future hospitalizations, morbidity and mortality.

The clinic services will prioritize patients who are caught in the hospital system without a safe or timely discharge option. Because they're often not linked to follow-up care, these vulnerable patients have longer lengths of stay and high rates of readmission locally and nationally.

"The Bridge Clinic is intended to expand access to a state-of-the-art addiction treatment model using an integrated care team that is designed around the individual's needs and will facilitate successful hospital transitions into long-term wellness in recovery and engagement in a personalized care plan," said Jameson Norton, MBA, Chief Executive Officer of Vanderbilt Psychiatric Hospital and Executive Director of Vanderbilt Behavioral Health.

"VUMC is uniquely capable of building these innovative, person-centered solutions by bringing together a multidisciplinary team of specialists to achieve better outcomes on behalf of those we serve."

According to David Marcovitz, MD, assistant professor of Psychiatry and Behavioral Sciences and medical director of the Bridge Clinic and the VUAH Addiction Consultation Service, the integrated approach will leverage collaboration by psychiatry, internal medicine and pain medicine.

The approach will be especially helpful for patients who require intravenous (IV) antibiotic therapy to treat injection-related infections, most often from opioid use disorder. These



The Addiction Bridge Clinic will be staffed by a multispecialty team, including, from left, David Edwards, MD, PhD, David Marcovitz, MD, William Sullivan, MD, MEd, Cody Chastain, MD, Katie White, PhD, MD, and Jason Ferrell, LCSW. Photo credit to Frederick Breedon.

patients are typically held in the hospital or referred to a skilled nursing facility throughout the therapy's six-week duration to avoid the potential risk of the patient injecting into the central line.

"Through the Addiction Consultation Service, we've been observing that patients with infectious complications from IV drug use are getting stuck in the hospital when there's no empirical evidence to suggest they can't be managed as outpatients with a PICC (peripherally inserted central catheter) line. These prolonged lengths of stay generate frustration for patients and providers alike at times," said Marcovitz.

"Based on preliminary data from other national leaders in this field, we believe these patients can be safely discharged once their acute medical issues are resolved to an outpatient clinic where they can receive medications for addiction treatment and regular follow-up. If we can make sure these patients don't fall through the cracks, maybe we can make it safer for them to leave the hospital."

Marcovitz believes the approach will decrease patients' length of stay and rate of readmission while freeing inpatient beds for more acute care needs.

The Bridge Clinic will operate one day per week with an eventual capacity of up to 200 patients once all new providers have been

onboarded. Patients will be followed in clinic for up to three months, starting with weekly visits for six to eight weeks after discharge, followed by biweekly visits.

Patients will then be referred to VUMC's longitudinal programs or to community providers to continue addiction treatment with appropriate medications and psychological support.

The clinic's staff will include an addiction psychiatrist, primary care physician, infectious disease doctor, pain anesthesiologist, nurse practitioner, social worker and recovery coach to cover all aspects of the patient's care.

"With so much stigma and limited availability of reliable treatment for some of the most economically and socially vulnerable of our patients, we haven't been able to treat the underlying disease that is ultimately responsible for their admission to our medical center: their substance use disorder," said William Sullivan, MD, MEd, Hugh J. Morgan Chief Resident in the Department of Internal Medicine, who will be providing primary care services in the clinic.

"With regular follow-up with the same treatment team, we will be able to make a real impact not only on the medical complications of opioid use disorder, but also on the psychological, interpersonal and familial consequences of opioid use as we develop trust between patients and providers," he said.

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