Department Profile 2017-2018

DEPARTMENT OF ANESTHESIOLOGY

VANDERBILT UNIVERSITY

MEDICAL CENTER

THE DREAM TEAM

www.vandydreamteam.com
Department of Anesthesiology

Vanderbilt University Medical Center

Compassionate | Creative | Committed | Collaborative
Table of Contents

2 Message from the Chair
3 Department Leadership
4 Department History
4 About Vanderbilt University Medical Center
5 About Nashville
6 Clinical Care
20 Education
26 Research
31 Key Clinical Research Studies
32 Endowments
34 Selected Publications, 2016-2017
42 Jennie Stuart Medical Center, VUMC launch teleICU patient care
43 Achieving Balance
44 Leadership in the Profession
Message from the Chair

Thank you for your interest in the Vanderbilt University Medical Center Department of Anesthesiology. Our growth and success stem from the foundation of Vanderbilt University Medical Center’s five-pillar commitment to excellence, which consists of people, service, quality, growth & finance, and innovation. Our department follows the Vanderbilt credo, driving 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 – emerge as the keystones of our structure and systems, as seen throughout this guide. We are compassionate, based not only on our own assessment but also on what we are being told. 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.

We are creative, advancing the frontiers of science, healthcare and technology. Our informatics infrastructure continues to increase patient safety and clinician effectiveness through innovative methods and novel use of both live and archived data.

Our investigators brought in more than $8 million in total extramural research funding in 2016-17. This included more than $4 million in awarded NIH grants, which placed Vanderbilt Anesthesiology 14th among U.S. academic anesthesiology departments in NIH funding. Within the department, faculty published 287 papers in fiscal year 2017, up from 241 papers in fiscal year 2016, within peer-reviewed literature. Twenty-eight members of the department have been elected into the Association of University Anesthesiologists (AUA).

At the 2016 Annual Meeting of the American Society of Anesthesiologists, department members contributed more than 100 activities, including oral presentations, medically challenging cases, poster presentations, problem-based learning discussions, workshops, panel discussions and refresher courses.

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

Much of our success can be attributed to the collaboration that occurs across Vanderbilt University Medical Center and beyond. Our clinical teams assisted patients in more than 102,000 encounters last year, spanning the entire spectrum of anesthesiology; for every age group, subspecialty and procedure, caring for patients along their journey to wellness. And we are moving 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 to bring our skills and values to more patients.

As you read through the following pages, we invite you to contact us or visit our website at vandydreamteam.com to learn more about our programs.

Warren S. Sandberg, MD, PhD
Chair, Department of Anesthesiology
Vanderbilt University Medical Center
Department Leadership

Executive Committee

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

Matthew McEvoy, MD
Vice Chair, Educational Affairs

Mark Rice, MD
Vice Chair, Clinical Affairs
Chief, Multispecialty Adult Anesthesiology

David H. Chestnut, MD
Chief, Obstetric Anesthesiology

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

Kurt Dittrich MD
Interim Chief, Pain Medicine

Katherine Dobie, MD
Chief, Ambulatory Anesthesiology

Amy Robertson, MD
Associate Vice Chair, Clinical Affairs

Andrew Shaw, MB, FRCA, FFICM, FCCM
Executive Vice Chair, Anesthesiology

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

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

Alexander Hughes, MD
Interim Chief, Pediatric Cardiac Anesthesiology

Jill Kilkeary, MD
Chief, Pediatric Anesthesiology

Letha Mathews, MBBS
Interim Chief, Neuroanesthesiology

Matthew Weinger, MD
Vice Chair, Faculty Affairs

Stephen Doherty, MMHC, Department Administrator

Pratik Pandharipande, MD, MSCI
Chief, Anesthesiology Critical Care Medicine

Michael Pilla, MD
Associate Chief, Multispecialty Adult Anesthesiology

Mas Pretorius, MBChB, MSCI
Chief, Cardiothoracic Anesthesiology

Ann Walia, MBBS
Chief, Veterans Affairs Anesthesiology Service

Division Chiefs

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Director, Basic Science Research
BH Robbins Director in Anesthesiology Research

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Chief, Cardiothoracic Anesthesiology

Ann Walia, MBBS
Chief, Veterans Affairs Anesthesiology Service
The Vanderbilt Department of Anesthesiology was one of the first independent departments of anesthesiology in the United States, established on December 12, 1945.

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

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

### About VUMC

**U.S. News & World Report**: No. 1 hospital in Tennessee, No. 1 healthcare provider in Nashville, 12 adult clinical specialties ranked among the nation's best, one of the elite children's hospitals in the nation, with 10 out of 10 specialties ranked

Healthcare's “Most Wired”: Among the nation’s 100 “most wired” hospitals and health systems, recognizing VUMC’s innovative medical technology

**Becker's Hospital Review**: One of “100 Great Hospitals in America” and the only Tennessee hospital to make the list

American Nurses Credentialing Center: VUMC and the Monroe Carell Jr. Children's Hospital at Vanderbilt both designated “magnet” hospitals, where nurses deliver excellent patient care and enjoy a high level of job satisfaction

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

Truven Health Analytics: One of the top 50 cardiovascular hospitals in the nation

The Leapfrog Group: VUMC earns an “A” in hospital safety, Children's Hospital one of only nine in the nation to be ranked a top hospital

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<tr>
<td>hospital locations</td>
<td>licensed beds</td>
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About Nashville

Nashville’s history of country music has earned the city its fame as Music City, USA – but its metropolis is about more than tunes and twang. Visitors and residents enjoy great dining, entertainment and cultural life. Travel to Nashville is convenient and inexpensive, since Nashville International Airport is a Southwest Airlines hub. With a growing population of 1.6 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 U.S. for corporate relocations by Expansion Management.

533 square miles
1.6 million population for the Metropolitan Statistical Area
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 more than 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 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 and perform approximately 4,300 anesthetics per year in the labor and delivery suite.

Our trauma service, which includes the orthopedic trauma program, is among the busiest in the nation and ranked as a Level One trauma facility, with more than 2,000 LifeFlight helicopter transports this year.

The Vanderbilt Preoperative Evaluation Center (VPEC) offers preoperative evaluation before patients undergo procedures at Vanderbilt University Medical Center. During the VPEC visit, the patient can ask questions and we gather information to help prevent day-of-surgery complications and delays. VPEC helps give patients information so they are as comfortable as possible during anesthesia, surgery and recovery.

Perioperative medicine is built on full engagement in patient care, from diagnosis to operative recovery. It includes a full-time teaching service with 24/7 consultative availability and extensive use of system-wide information technology and mobile applications to support clinical decision-making, capture data and measure outcomes, such as the quality of recovery after surgery. Vanderbilt is one of the few medical training centers with a 3D transesophageal echocardiography (TEE) simulator, used to teach the essential skill of cardiac ultrasound.

Highlighted on the following pages are the services provided by the department’s clinical divisions.

We are compassionate, offering exceptional perioperative care and pain management to a complex population.
The Division of Ambulatory Anesthesiology consists of 12 faculty members and 36 nurse anesthetists who practice in five locations: Cool Springs Surgery Center, Vanderbilt Bone and Joint, Tennessee Fertility Institute, Medical Center East and Vanderbilt Outpatient Surgery.

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

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

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

The Ambulatory faculty members presented nine abstracts at the 2017 meeting of the Society for Ambulatory Anesthesia (SAMBA) and are 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. Here they learn the critical and distinct practice of regional and ambulatory anesthesia in combination, a vital learning experience for future anesthesiologists, as we expand the population of ambulatory surgery care to include more complex cases.

Dr. E. Jane Brock has been appointed by Governor Bill Haslam to the Tennessee Department of Health Board for Licensing Health Care Facilities now through June 2020.

Dr. E. Jane Brock serves on the SAMBA Clinical Outcomes Registry (SCOR) Committee.

Dr. Katherine Dobie will serve on the SAMBA Scientific Papers Committee and will serve as co-moderator for the poster sessions at SAMBA’s annual meeting in 2018.

DIVISION HIGHLIGHTS

During the moderated poster sessions at the 32nd annual meeting of SAMBA in May, Dr. Vikram Bansal presented four abstracts, Dr. E. Jane Brock presented three abstracts and Dr. Katherine Dobie presented two abstracts. In addition to those who presented abstracts, five division members (Drs. Eric Briggs, Chris Canlas, Stephen Harvey, Chris Sobey and CRNA Jordan C. Miller) submitted abstracts.

Chief: Katherine Dobie, MD

Ambulatory Anesthesiology

4,000
or more peripheral nerve blocks administered per year

36
nurse anesthetists

5
locations

23,000
or more anesthesia procedures annually

12
faculty ambulatory anesthesiologists

9
abstracts presented at the SAMBA Annual Meeting
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 VA TVHS, Nashville. An ongoing alliance between the ACCM Division and the School of Nursing supports acute care nurse practitioner intensivist training.

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

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

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.

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

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**DIVISION HIGHLIGHTS**

Development of innovative clinical programs: Remote monitoring of at risk patients through the bedside monitoring and the Tele-RRT and Tele-ICU programs (lead, Dr. Weavind); expansion of the Adult V-A and V-V ECMO program (lead, Dr. S McGrane); development of a perioperative surgical home program at the VA TVHS, Nashville campus (lead, Dr. Alvis).

New research grants: Mentored research grants for Dr. Adam Kingeter (FAER-MRTG) and Dr. Robert Freundlich (VUMC Faculty Research Scholars); R01 (co-investigators, Drs. Pandharipande and Hughes) and investigator-initiated industry grants (Drs. Weavind, Hughes and Freundlich).

Quality improvement projects: Pathways for caring for patients after pituitary and acoustic neuroma surgery have reduced lengths of stay and cost (Dr. Weaver).

Dr. Pandharipande served as the president of the American Delirium Society and is a core co-leader for the newly funded Network for Investigation of Delirium across the U.S. (NIDUS) funded by the National Institutes on Aging.

Development of programs focusing on peer-peer mentoring, standardization of practice and work-life balance.

**FELLOWSHIP DETAILS**

ACGME-accredited, one-year program

9 positions available

Core rotations include the CVICU, SICU, NCU, Trauma ICU, Burn ICU, VA-SICU, ECHO/Ultrasound

Electives include intraoperative TEE, MICU, PICU, perioperative medicine, tele-ICU, international rotations, palliative care, medical subspecialties, research

Applications accepted through SF Match
The Division of Cardiothoracic Anesthesiology provides anesthetic care for adult cardiac surgery, thoracic surgery, interventional pulmonology, electrophysiology and interventional cardiology at Vanderbilt University Medical Center. A subset of the division’s faculty members provides critical care services in the adult cardiovascular intensive care unit. Also, some members participate in ambulatory anesthesia and the perioperative consult service.

The division provides perioperative care for approximately 1,400 adult cardiac procedures per year. These include coronary artery bypass graft (on- and off-pump) surgery, valvular surgery, heart and lung transplantation, adult congenital procedures, hybrid procedures, aortic surgery and ventricular assist device (VAD) insertions. The VAD program at Vanderbilt currently places about 50 devices per year. The heart transplant program recently achieved a major milestone, performing 1,000 heart transplantations, making it the second busiest program in the country. Our 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 our 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. Dr. Susan Eagle holds several patents and has licensed intellectual property created at Vanderbilt to a multi-national medical corporation.

**DIVISION HIGHLIGHTS**

Andrew Shaw, MB, FRCA, FFICM, FCCM, is the treasurer/secretary of the Society of Cardiovascular Anesthesiologists and was elected secretary, American Society for Enhanced Recovery. He is a question writer for both the NBE Basic PTE exam and the Critical Care Echo exam.

Mias Pretorius, MBChB, MSCI, serves on the NBE Advanced PTE exam question writing committee as well as the Society of Cardiovascular Anesthesiologists research committee.

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

Adam Kingeter, MD, has been appointed to the CMS MACRA Episode-Based Cost Measures cardiovascular disease subcommittee.

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

**FELLOWSHIP DETAILS**

ACGME-accredited program
5 positions available
Core rotations include adult cardiac, thoracic, pediatric cardiac, TEE and ICU
Electives include heart failure, TTE, CT surgery and research
Applications accepted through SF Match
The Division of Multispecialty Adult Anesthesiology (MSA) is the department's largest division, providing perioperative anesthetic care in 45 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 22 full-time and 12 part-time faculty members, most of whom have significant subspecialty training and expertise. As Vanderbilt is a Level One Trauma Center, MSA faculty and staff provide 24-hour coverage for emergency and trauma surgery for the region. Our trauma center covers 65,000 square miles and has about 3,000 admissions per year.

Since 2014, our Perioperative Consult Service has provided co-management of surgical patients, starting from the decision to operate and continuing through the period after discharge from the hospital. This started with a pilot program involving colorectal surgical patients and has quickly grown to include such services as orthopedic trauma, abdominal wall reconstruction, surgical weight loss and hepatobiliary-pancreatic/surgical oncology patients. Recently, we have initiated a cancer pain service, which includes clinic work as well as a busy invasive pain practice.

MSA division faculty provide 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 regional anesthesia, airway management, information technology, perioperative cognitive dysfunction, point-of-care diagnostics, echocardiography, ultrasound imaging and perioperative medicine. The common goal of all of these projects is safer, more efficient perioperative care and throughput.

Chief: Mark Rice, MD

REGIONAL ANESTHESIA AND ACUTE PAIN MEDICINE FELLOWSHIP

ACGME-accredited program

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

2 positions available

Core rotations include anesthesiology perioperative consult service, OR anesthesia, oromaxillofacial surgery, addiction psychiatry, ambulatory regional anesthesia, pediatric pain management, inpatient chronic pain

Electives include research, obstetric anesthesia

Applications accepted through submissions to program coordinator

1,600 perioperative consult patients

800 bed days returned

7,000 or more regional blocks performed

25 cancer patients seen per month (and about 10 procedures)
Clinical Chief: Adam King, MD

The Vanderbilt Department of Anesthesiology provides perioperative consult services to Vanderbilt University Hospital, Monroe Carell Jr. Children’s Hospital at Vanderbilt and the Veterans Administration Medical Center in Nashville, offering preoperative evaluation and preparation, intraoperative care, acute postoperative care and pain management. By providing care before, during and after surgery, patients are receiving better, more standardized care.

The Perioperative Consult Service (PCS) at VUH is staffed by nine anesthesiologists, including representation from the divisions of Anesthesiology Critical Care Medicine, Cardiothoracic Anesthesiology and Multispecialty Adult Anesthesiology. Also, the PCS employs five nurse practitioners.

In addition to providing ongoing improvements in perioperative care through the PCS, the department, starting this academic year, is offering four perioperative medicine fellowship positions. Faculty instructors in the fellowship program come from the VUMC Departments of Anesthesiology, Surgery, and Medicine, making this a truly cross-departmental educational effort that mirrors the collaboration inherent in the concept of perioperative medicine.

Enhanced Recovery After Surgery (ERAS) care pathways, initiated in the 1990s in Europe, are evidence-based protocols designed to improve pain control and speed patient recovery for adults and children. To date, Vanderbilt has implemented ERAS protocols in seven surgical populations, securing itself as a national leader in ERAS. VUH’s experience was presented at five national conferences this year.

In the first nine months of the 2016-2017 academic year, the PCS interacted with approximately 1,100 patients and, through the benefits of ERAS, returned a median 306 bed days back to the hospital by reducing length of stay. This puts us on pace to increase the number of patients having an ERAS intervention by 20% over last year and increase the number of hospital bed days returned by 63% over the previous year. The PCS service continues to develop ERAS protocols that address the common reasons for prolonged hospital length of stay. In addition, the PCS continues to work on global issues that affect all patients, such as opiate reduction in the perioperative period. In addition to providing perioperative ERAS care, the PCS has also expanded its services to provide procedural support for central line placement and lumbar puncture for all of VUH.

Developing and implementing pediatric ERAS protocols are also an important focus of Pediatric Pain Management Services, 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 enhanced surgical recovery are the same. “Setting expectations preoperatively and utilizing multimodal opioid-reducing perioperative strategies enhances the patient’s experience, reduces perioperative complications and leads to earlier discharge from the hospital,” states Dr. Andrew Franklin, Director of Pediatric Pain Management Services at the Monroe Carell Jr. Children’s Hospital at Vanderbilt. Pediatric ERAS protocols are a fledgling concept, and Vanderbilt remains at the forefront of advancing these ideas in pediatric surgical care.

Multidisciplinary pediatric ERAS protocols have already been implemented for complex hip surgery and pectus excavatum surgery, with protocols for several other surgical procedures under development.

At Tennessee Valley Healthcare System (TVHS) Veterans Administration Medical Center in Nashville, the Department of Anesthesiology, Pain Management & Perioperative Medicine in collaboration with the Vanderbilt University Medical Center Department of Anesthesiology and the Anesthesiology Critical Care Medicine Division started a perioperative care service (VA-PCS) in 2016. The staff for this service includes seven critical care anesthesiologists and eight acute care nurse practitioners. The VA-PCS provides 24-hour, 7 days per week perioperative medicine coverage for postsurgical patients. Collaborations exist with the Departments of Orthopedic Surgery, Urology, Neurosurgery, General Surgery, Otolaryngology and Plastic Surgery. Eight ERAS pathways have been developed over the course of 2016. In addition to ERAS, we also manage the epidural, nerve block catheters and pain consults at TVHS-VA. The VA-PCS team is actively involved in the preoperative and postoperative care of these surgical patients, averaging around 25 patients per day. We have cared for a total of 400 patients since the service began in 2016. To date, we have reduced the total knee arthroplasty, total hip arthroplasty and spinal surgery length of hospital stay by one day while also decreasing opiate consumption. In addition to reductions in hospital length of stay, the service has also been able to save an estimated 230 intensive care unit days by avoiding ICU admissions. An introduction publication has been accepted for publication by Anesthesia & Analgesia in 2017.
Neuroanesthesiology

Interim Chief: Letha Mathews, MBBS

Neurosurgery and other neurologic services continue to expand at Vanderbilt University Medical Center. The Neuroanesthesiology Division provides perioperative care for over 5,000 cases per year and covers nine operating rooms. Faculty members specializing in neuroanesthesiology are providing increasingly complex anesthesia and sedation services.

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

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

VUMC has seven designated neurosurgical operating rooms where anesthesia services are provided for operations, including brain tumor, blood vessel malformation, aneurysms, stroke intervention, trauma, complex spinal procedures, functional neurosurgery and chronic pain management. The Division of Neuroanesthesiology also provides specialized anesthesia services for “awake craniotomies,” when patients are intermittently awake to facilitate speech and motor mapping during surgery in order to preserve the most vital areas of the brain. Additionally, as of November 2016, Neuroanesthesiology provides perioperative care for ortho-spine patients.

Development and practice of evidence-based perioperative pathways and guidelines have improved patient outcomes and reduced length of ICU stay and overall hospital length of stay after certain neurologic procedures.

The division includes five full time faculty and six CRNAs, with significant contributions from the Anesthesiology Critical Care Medicine and Multispecialty Adult Anesthesia Division faculty, as well as CRNAs from other divisions. Our dedicated CRNAs and consistent faculty work as a team along with the neurosurgeons, ortho-spine surgeons and perioperative nurses in providing outstanding clinical care for our patients.

Division faculty are actively engaged in resident and medical student education. Faculty members also make significant contributions at national and international meetings, such as SNACC, SEA, AMA, AACD and NCCS, and provide leadership in these organizations. Dr. Jesse Ehrenfeld is on the Board of Trustees of the AMA, and Dr. Jane Easdown is on the Board of Directors of SEA.

Faculty members have been actively engaged in research and have published over 70 peer reviewed manuscripts and book chapters in the past year. Dr. Ehrenfeld is the recipient of over $3 million in active research grant funding.

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

DIVISION HIGHLIGHTS

Dr. Jesse Ehrenfeld serves on the Board of Trustees of the American Medical Association.

Dr. Jane Easdown serves on the Board of Directors of the Society for Education in Anesthesia.

Division faculty provide leadership at the national and international levels in organizations such as Society for Neuroscience in Anesthesiology and Critical Care, Society for Education in Anesthesia, American Medical Association, Association of Anesthesia Clinical Directors and The National Children’s Cancer Society.

As of November 2016, Neuroanesthesiology provides perioperative care for ortho-spine patients.
Chief: David H. Chestnut, MD

Division Chief David Chestnut, MD, is the editor of Chestnut’s Obstetric Anesthesia: Principles and Practice. This book is widely considered the premier obstetric anesthesia textbook, and the sixth edition will be published in 2019. Curtis Baysinger, MD, is co-editor of the second edition of A Practical Approach to Obstetric Anesthesia, which was published in 2016 and is another highly regarded textbook.

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

The division collaborates with VUMC maternal-fetal medicine, gynecologic oncology and urology physicians in an innovative approach to the care of patients with placenta accreta/percreta, which is a form of abnormal, invasive placentation that places the mother at high risk for massive blood loss and significant morbidity. With this approach, patients with known placenta accreta/percreta undergo a modified cesarean delivery through a fundal uterine incision, and the placenta is left in situ, with plans to perform hysterectomy six weeks postpartum. The division also provides anesthesia services for approximately 2,500 gynecologic surgical procedures in a suite of three operating rooms adjacent to the labor and delivery unit. Division faculty and staff collaborate with the department’s Perioperative Consult Service to provide anesthesia care using multimodal, enhanced-recovery-after-surgery (ERAS) protocols.

The division sponsors a highly regarded, ACGME-accredited obstetric anesthesia fellowship led by experienced Program Director Michael Richardson, MD, and Associate Program Director Holly Ende, MD. The division is also taking a leadership role in the use of in situ simulation training for obstetric emergencies.

Recent clinical research projects include a landmark assessment of nitrous oxide labor analgesia and patient satisfaction with administration of nitrous oxide for labor analgesia. Women who chose nitrous oxide alone for labor analgesia and subsequently underwent vaginal delivery reported high levels of satisfaction with nitrous oxide, despite variable labor analgesic effectiveness. Future research will probe the reasons for these paradoxical findings. Other planned clinical research projects involve strategies to improve postpartum analgesia and patient satisfaction while reducing postpartum opioid use before and after hospital discharge in obstetric patients.

DIVISION HIGHLIGHTS

Jill Boyle, MD, received a prize for her poster presentation on a novel perioperative management plan for patients with placenta percreta at the 2016 World Congress of Anaesthesiologists, Hong Kong.

Curtis Baysinger, MD, Jill Boyle, MD, and Mary DiMiceli-Zsigmond, MD, participated in international clinical and education programs related to obstetric anesthesia in Kenya, Serbia and Bosnia.

Ray Paschal, MD, and other members of the Vanderbilt fetal surgery team demonstrated and taught the Vanderbilt technique for intrauterine fetal surgery in Australia.

A division-sponsored landmark study of obstetric patient satisfaction with nitrous oxide labor analgesia received extensive media coverage, and first author Michael Richardson, MD, ably represented the division in an Open Anesthesia podcast interview.

David Chestnut, MD, gave the Emery A. Rovenstine Memorial Lecture at the 2016 annual meeting of the American Society of Anesthesiologists in Chicago. Dr. Chestnut also recently gave the Bernard H. Eliasberg Lecture – and received the Eliasberg Medal for significant contributions to the specialty of anesthesiaology – at Mount Sinai Hospital and Icahn School of Medicine, New York, New York.

FELLOWSHIP DETAILS

ACGME-accredited, one-year program

2 positions available

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

Applications accepted through the Fall Fellowship Match

9 faculty obstetric anesthesiologists

15 peer-reviewed articles and book chapters

4,500 or more obstetric deliveries
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.

Pediatric Pain Management Services, led by Drew Franklin, MD, MBA, is engaged in an increasing number of perioperative regional anesthesia techniques, as well as a growing volume of both inpatient consultations and patients seen in our Pediatric Pain Clinic. Over the past year, the pain service has implemented two Pediatric Perioperative Interdisciplinary Surgical Home Protocols, one for hip dysplasia patients and the other for pectus excavatum patients, with the goal of enhanced recovery after those procedures.

The Department of Anesthesiology oversees Pediatric Sedation Services, under the leadership of Peter Chin, MBBS, who also leads anesthetic care in our remote anesthetizing locations, specifically our radiology suites at Children’s Hospital. Some of our 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 Thanh Nguyen, MD, and our pediatric spine fusion team led by Brian Emerson, MD. To provide safest, best care practices for our patients in the postoperative recovery room (PACU) area, we have a robust nursing-anesthesia collaboration led by Carrie Menser, MD.

We also have 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.

Many pediatric division faculty are major leaders in the department’s international outreach work, including Camila Walters, MD, Laura Zeigler, MD, Jenna Sobey, MD, Matt Kynes, MD, Kelly McQueen, MD, MPH, and Mark Newton, MD. In 2016 and 2017, respectively, Dr. Newton and Dr. McQueen each received from the American Society of Anesthesiologists the prestigious Nicholas M. Greene, MD, Award for Outstanding Humanitarian Contribution.

Education and training of anesthesia residents, fellows, medical students, as well as nurses and associated healthcare personnel, are major faculty commitments. Associate Anesthesiology Residency Program Director, Elisabeth Hughes, MD, a leader in departmental initiatives including enhanced ways to evaluate trainees and give

Continued on next page

DIVISION HIGHLIGHTS
In 2017, our division and the Cumberland Pediatric Foundation co-hosted the first Annual Southeast Regional Pediatric Pain Management Symposium. The symposium, held in Nashville, Tennessee, included lectures by all six members of our Pediatric Pain team, Drs. Franklin, Hays, E Hughes, Kynes, Menser and Sobey.

Jill KilKelly, MD, was elected to the Pediatric Anesthesia Leadership Council, a section of the Society for Pediatric Anesthesiology that seeks to advance the specialty by providing a forum for leaders to collaborate.

Monroe Carell Jr. Children’s Hospital at Vanderbilt successfully obtained American College of Surgeons (ACS) Level 1 Verification for Pediatric Trauma Care, a widely recognized distinction that less than 50 pediatric hospitals across the nation have achieved. Our Pediatric Anesthesiology team was recognized, specifically, as a strength of the program.

Drew Franklin, MD, MBA, was elected to a two-year term on the steering committee of the national Pediatric Regional Anesthesia Network.

Stephen Hays, MD, served as program chair for the fourth annual meeting of the Society for Pediatric Pain Medicine (SPPM), Austin, Texas, March 2017, and was also elected by SPPM to its board of directors.

FELLOWSHIP DETAILS
ACGME-accredited one-year program
4 positions available
Electives include ability to travel to Guatemala and/or Kenya for international care experiences
Core rotations include pediatric OR, pediatric cardiac OR, PICU, NICU, Pediatric Pain Management Services, recovery room (PACU) management/pediatric preoperative clinic
Final month dedicated to ‘supervisory’ role to foster transition to the attending role

17 perioperative nurse practitioners
16 anesthesia technicians
36 pediatric CRNAs
19 pediatric anesthesiologists
Since 2006, the Dr. James Phythyon Endowed Lecture-ship in Pediatric Anesthesiology has brought renowned experts in the field to Vanderbilt’s campus as visiting professors. In 2017, Dolores Njoku, MD, presented “Understanding Outcomes from Pediatric Spine Fusion.” Pictured here are Phythyon daughters Sarah Miller, Mary Neal Meador and Elizabeth Donner with Dolores Njoku, MD, and Warren S. Sandberg, MD, PhD.

Pediatric Cardiac Anesthesiology

Children with congenital heart disease represent a complex group of patients who often require intensive surgical repairs to thrive or even survive into adulthood. At the Monroe Carell Jr. Children’s Hospital at Vanderbilt, those patients are cared for by members of the Division of Pediatric Cardiac Anesthesiology. The division was formed in 2007 and includes four faculty members and six certified registered nurse anesthetists, who provide care for an average annual volume of 600 surgical cases and 900 catheterization/electrophysiology cases in two cardiac surgical operating rooms and two catheterization laboratories.

The Pediatric Heart Institute at the Children’s Hospital is a high-volume, regional referral center. It is ranked 23rd in the 2017-18 U.S. News & World Report’s “Best Hospitals for Pediatric Cardiology & Heart Surgery.”

Beyond the focus of congenital heart disease, members of the Pediatric Cardiac Anesthesiology Division are deeply involved in pediatric delirium research, patient safety/quality improvement efforts and medical simulation training.

A core mission of the division involves the education of both pediatric anesthesiology and adult cardiothoracic anesthesiology fellows in the care of the critically ill child undergoing cardiac surgery or catheterization. Recently we have expanded these educational opportunities to include senior level anesthesia residents, who may also opt to spend elective time on the service.

Interim Chief: Alexander Hughes, MD

Continued from previous page

productive feedback, is a Pediatric Anesthesiology Division member. The Pediatric Anesthesiology Fellowship program, led by Drs. Thomas Romanelli and Jenna Sobey, has four trainees each year and includes unique opportunities for international anesthesia rotation experiences.

Academic interests 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.

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

DIVISION HIGHLIGHTS

Scott Watkins, MD, is the vice chair of the Anesthesiology Section of the Society for Simulation in Healthcare.

Recent Publications of Note


4 faculty members
6 CRNAs
600 cardiac surgeries
900 catheterization/EP procedures

Since 2006, the Dr. James Phythyon Endowed Lecture-ship in Pediatric Anesthesiology has brought renowned experts in the field to Vanderbilt’s campus as visiting professors. In 2017, Dolores Njoku, MD, presented “Understanding Outcomes from Pediatric Spine Fusion.” Pictured here are Phythyon daughters Sarah Miller, Mary Neal Meador and Elizabeth Donner with Dolores Njoku, MD, and Warren S. Sandberg, MD, PhD.
Clinicians at The Vanderbilt Pain Center use a multidisciplinary approach to pain care, offering thorough evaluations, consultations and referrals in order to employ the most effective evidence-based treatments. The Vanderbilt Pain Center offers care at six centers, as follows:

Adult patients with chronic pain are seen at:
- The Vanderbilt Interventional Pain Clinic at the One Hundred Oaks outpatient center,
- Cool Springs Surgery Center in Franklin,
- The Vanderbilt Pain Center in Clarksville,
- By video-conference to Telehealth in Clarksville and Springhill.

Cancer patients are seen at the Vanderbilt Ingram Cancer Center Pain Clinic, and pediatric patients are seen at the Pediatric Pain Clinic at Monroe Carell Jr. Children’s Hospital at Vanderbilt.

The Vanderbilt Pain Center sees patients with all types of pain caused by all kinds of disease processes. During the first clinic visit, a patient’s medical history is thoroughly reviewed, and his or her condition is evaluated by a board certified pain specialist to develop a team-based treatment plan.

The multidisciplinary pain consultation team includes specialists from:
- Anesthesiology
- Psychology
- Psychiatry
- Neurology
- Neurosurgery
- Orthopedics
- Physical Medicine and Rehabilitation
- Physical Therapy

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

Our division is active in research encompassing clinical trials to develop new treatment modalities in peripheral ablation and neuromodulation, treatments for complex regional pain syndrome (CRPS), safety with intrathecal drug delivery devices, acupuncture and acupressure, caged-release drug delivery, population health, drug development, international delivery of pain treatment, and more.

The division includes:
- 6 faculty anesthesiologists,
- 4 APRNs and 5 RNs

Exciting highlights include:
- The Intrathecal Pump Database Team, which includes Pain Medicine Division member Chris Sobey, MD, won the Elevate Team Award at the VUMC Leadership Assembly in August 2017. The team designed, developed and implemented a database tool and workflow process for targeted intrathecal drug delivery in order to improve patient safety.
- Pain Medicine Division faculty and fellows collaborate with investigators such as Stephen Bruehl, PhD, an NIH-funded (R01) investigator and professor from our department’s Research Division, who is looking at the role of perioperative oxidative stress mechanisms in development of chronic pain and CRPS following total knee arthroplasty and conducting an R01 funded clinical trial exploring the effects of aerobic exercise training on endogenous opioid analgesia and responses to opioid analgesic medications in chronic low back pain.

FELLOWSHIP DETAILS
ACGME-accredited one-year program
4 positions available
Rotations include interventional pain, regional anesthesia, psychiatry, addiction medicine, neurology, radiology, neuroradiology, neurosurgery, physical therapy, cancer pain, integrative medicine, international pain delivery and palliative care
Focus on comprehensive, multidisciplinary treatment of acute, subacute and chronic pain diagnoses
Training leaders in Academic and Community Pain Practice
High volume training exposure with state of the art therapies such as implantable spinal cord stimulators, radio-frequency ablation, fluoroscopic and ultrasound-guided procedures and intrathecal drug-delivery systems
Completion of publishable academic projects including original research, review articles and book chapters
Applications accepted through NRMP Match
The Veterans Affairs Anesthesiology Service at the Tennessee Valley Healthcare System (TVHS) provides a variety of anesthesia services for over 60,000 patient encounters every year across its two main campuses in Nashville and Murfreesboro. The TVHS Anesthesiology Service is the only service in VISN 9 (Veterans Integrated Service Network 9) that provides comprehensive complex pain management, with over 10,000 encounters per year, and will be one of 18 centers selected nationally to establish an integrated whole health program, which comes with an $8.5 million grant over 3 years. Across the two campuses, we provide care to over 7,000 surgical patients in the operating room and perform nearly 6,000 non-operating room procedures per year. These activities are supported by a very active preoperative evaluation clinic that is responsible for over 10,000 patient encounters per year. TVHS is among the first in the nation to offer a 24/7/365 comprehensive, integrated perioperative care service, which was established in 2016 and has been instrumental in decreasing hospital and ICU length of stay below national standards and improving patient satisfaction. The VA Anesthesiology Service also provides 24/7/365 coverage to our 13-bed surgical intensive care unit that provides care to a complex mix of patients including but not limited to cardiothoracic, vascular, transplant, and general surgery.

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

Chief: Ann Walia, MBBS

The Veterans Affairs Anesthesiology Service provides a variety of anesthesia services for over 60,000 patient encounters every year across its two main campuses in Nashville and Murfreesboro. The TVHS Anesthesiology Service is the only service in VISN 9 that provides comprehensive complex pain management, with over 10,000 encounters per year, and will be one of 18 centers selected nationally to establish an integrated whole health program, which comes with an $8.5 million grant over 3 years. Across the two campuses, we provide care to over 7,000 surgical patients in the operating room and perform nearly 6,000 non-operating room procedures per year. These activities are supported by a very active preoperative evaluation clinic that is responsible for over 10,000 patient encounters per year. TVHS is among the first in the nation to offer a 24/7/365 comprehensive, integrated perioperative care service, which was established in 2016 and has been instrumental in decreasing hospital and ICU length of stay below national standards and improving patient satisfaction. The VA Anesthesiology Service also provides 24/7/365 coverage to our 13-bed surgical intensive care unit that provides care to a complex mix of patients including but not limited to cardiothoracic, vascular, transplant, and general surgery.

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FACULTY HIGHLIGHTS

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

Bret Alvis, MD, presented the impact and results of the perioperative care service at the 2nd Annual DOD-AVAA meeting in October, 2016.

Randall Malchow, MD, presented at the annual Association of VA Anesthesiologists meeting in October 2016.

Nine anesthesiologists from our service were part of the teaching faculty at the 2nd Annual DOD-AVAA meeting in October 2016.

Ann Walia, MBBS, is immediate past president of the Association of VA Anesthesiologists, has been appointed to the Surgical Field Advisory Board, organized the Annual DOD-AVAA meetings in 2015 and 2016, serves on the national advisory panel for new chiefs, is VISN 9 lead for Anesthesiology.

SERVICE HIGHLIGHTS

Among the first in the VA to offer a 24/7/365 in-house perioperative care team.

Among the first in the VA to offer ketamine infusions for complex pain.

Provides comprehensive interventional pain clinic with addiction management.

Offers hospital-wide PICC line placement service.
Certified Registered Nurse Anesthetists

SERVICE HIGHLIGHTS

Tammy Freehling, MS, CRNA, received the Clinical Excellence Award from the Middle Tennessee School of Anesthesia.

Six VUMC CRNAs presented posters at the 2016 Congress of the American Association of Nurse Anesthetists, representing their work in clinical innovation, quality improvement and education.

Buffy Krauser-Lupear, DNP, CRNA, was selected for both the Middle Tennessee March of Dimes Advanced Practice Nurse of the Year Award and the VUMC Advanced Practice Nurse of the Year Award.


39 anesthesia technicians and technologists

55 student registered nurse anesthetists on monthly rotation

158 certified registered nurse anesthetists

6 specialty divisions

6 facilities
The Vanderbilt Department of Anesthesiology continues to set the nationwide standard for collaborative practice 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 158 CRNAs in the nurse anesthesia division provide anesthesia for all types of surgical procedures, including cardiac, pediatrics, vascular, trauma, neurosurgery, plastics, radiologic and special procedures throughout the medical center. CRNAs administer general, regional and monitored anesthesia care for scheduled and emergency surgical, obstetric and diagnostic procedures.

Our CRNAs are full partners in department clinical practice initiatives and frequently contribute to the development of quality improvement and efficiency initiatives. Thus, the CRNAs are essential to many core endeavors. In terms of personnel, the CRNA division is the largest within the Department of Anesthesiology.

Vanderbilt is the primary clinical 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. Student nurse anesthetists assist in approximately 7,000 anesthetics per year while on Vanderbilt rotations. CRNAs provide clinical teaching to these learners.

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.
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, nurses and faculty for productive careers as clinicians, academicians and scientists. In addition to our 4-year anesthesiology residency program, we offer ACGME-accredited fellowships in Adult Cardiothoracic Anesthesiology, Anesthesiology Critical Care Medicine, Pain Medicine, Pediatric Anesthesiology, Obstetric Anesthesiology, Regional Anesthesia and Acute Pain Medicine, and Clinical Informatics. We also offer fellowships in Perioperative Medicine and Global Anesthesiology.

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

We offer a wide-range of learning opportunities that parallel our excellent clinical training and development. As a result, the average score of Vanderbilt anesthesiology residents on in-training exams is in the 75th – 80th percentile when compared to the nation.
Resident
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 2017 National Residency Match, the department received 1,012 applications for 18 positions.

Our physician educators are nationally and internationally recognized as leaders in their fields, and the department successfully supports residents interested in academic anesthesiology so they can develop careers focused on advancing knowledge in the specialty. Every year, the department typically has 25-30 residents who present original research and overviews of challenging cases at national meetings, a clear indication that the department’s educational programs are creating physician-scholars who are prepared for medical practice, peer-education and scientific investigation.

The department’s educational program for residents and fellows consists of a combination of comprehensive didactic conferences, mentored clinical training by subspecialists in every domain of anesthesiology, simulation training, and self-study. Simulation training features prominently in the cognitive, procedural and teamwork aspects of anesthesiology education, and the Center for Experiential Learning and Assessment is a nationally renowned, on-campus resource for this training. Our education team is constantly updating and improving the curriculum to assure its alignment with the evolving ACGME Milestones system as well as the recent changes to the ABA Certification process, such as the inclusion of OSCEs in the APPLIED Exam.

The goal of ongoing curriculum development and revision in the Milestones era is to continue to reach the highest level of educational achievement using modern learning techniques. Accordingly, Leslie Fowler, MEd, our Director of Educational Research and Curriculum Development, is overseeing the department’s curriculum improvements along with Dr. Gelfand and the core education faculty. Among other projects, Leslie and the VU School of Medicine Spark team have worked together to develop a “flipped classroom” model of learning for anesthesiology education. Spark is the school’s IT platform for learning management. The flipped classroom is a learning environment in which course content is accessed by learners outside of the classroom, and classroom time is used for interactive projects and discussion. Once the flipped classroom re-design is complete, anesthesiology residents at every level of training will have access to rotation-specific curriculum and learning modules 24 hours a day. Our faculty and residents are also developing the same concept for nurse anesthetist training in East Africa.

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

The following clinical fellowships are offered at Vanderbilt:
- Adult Cardi thoracic Anesthesiology* – 5 fellows
- Clinical Informatics* – 1-2 fellows
- Anesthesiology Critical Care Medicine* – 9 fellows
- Global Anesthesiology** – 1-2 fellows
- 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
**ACGME Accreditation not offered

Nurse Anesthetists
The continuing education of more than 100 Certified Registered Nurse Anesthetists in the department is supported with recurring programs, including Grand Rounds and Mortality, Morbidity & Improvement (MM&I) Conferences. In addition, Vanderbilt is a primary clinical affiliate of the Middle Tennessee School of Anesthesia, the Union University Nurse Anesthesia Program and the Emory University Nurse Anesthesia Program. Student nurse anesthetists participate in approximately 7,000 anesthetics per year while on Vanderbilt rotations, and their on-campus training is coordinated by the Department of Anesthesiology.

Advanced Practice Nurses
The Department of Anesthesiology has a unique partnership with the Vanderbilt University School of Nursing to offer an Acute Care Nurse Practitioner (ACNP) Intensivist track as part of the ACNP master’s degree program. The program combines the didactic training of the School of Nursing’s ACNP Program with supplemental specialty lectures in critical care medicine. Students perform their clinical rotations in seven of the Vanderbilt and VA ICUs. Students also receive additional exposure to ICU medicine through twice-monthly simulation sessions and weekly clinical case conferences, taught jointly by members of both faculties. Additional partnership programs between the Anesthesiology Department and the School of Nursing are being planned. Vanderbilt University Medical Center is one of the largest employers of nurse practitioners in the country. The Division of Anesthesiology Critical Care Medicine has 35 Acute Care Nurse Practitioners who work in intensive care settings. Our Continued on next page
Preoperative Evaluation Clinic and Perioperative Consult Service include another 17 Advanced Practice Nurses as an integral part of these teams.

**The Center for Experiential Learning and Assessment**

Under the leadership of Dr. Arna Banerjee, CELA offers medical learners at all levels a simulation education on computerized, life-like mannequins. Participants get hands-on training in anesthesiology airway management, critical care, perioperative management and transesophageal echocardiogram procedures.

CELA was endorsed by the American Society of Anesthesiologists (ASA) as one of approximately 40 centers in the nation officially approved to deliver certified educational programs. Anesthesiologists can receive continuing medical education (CME) simulation training at CELA that qualifies for American Board of Anesthesiology Maintenance of Certification in Anesthesiology (MOCA®) credit. To achieve the ASA endorsement, the CELA program met strict criteria, including having strong leadership and the necessary equipment, facilities and personnel to provide consistent, effective training.

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.

On Friday, June 16, 2017, our department held its annual Recognition & Awards Ceremony, which celebrates the notable and outstanding efforts of faculty and residents.
The Anesthesia Summer Internship Program provides an opportunity for undergraduate and medical students to participate in research projects with our faculty. Drs. Edward Sherwood and Jesse Ehrenfeld 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 (STTP).

Educational Research

The department is a national leader in rigorous educational research, and our faculty are involved with the latest in pedagogical and educational implementation science research. Dr. Brian Allen and Dr. Robert Deegan are investigating the use of CUSUM (cumulative summation analysis) in clinical competency assessments for regional anesthesia and TEE, respectively. Dr. Scott Watkins, Dr. Louise Alexander and Dr. Mary DiMiceli-Zsigmond have grant-funded educational research investigating the use of decision support tools to improve team-based care delivery in high-stakes perioperative events in pediatric, general adult and obstetric populations in Kenya. Dr. Bantayehu Sileshi and Dr. Mark Newton have 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.
Building Safe Anesthesia Capacity Around the World

The most recent statistics state that more than 5 billion people around the world do not have access to safe surgical and anesthesia care. The Vanderbilt International Anesthesia (VIA) program is committed to the WHO goal for Universal Health Coverage, which includes reducing deaths related to the lack of access to safe surgery and anesthesia care. The Vanderbilt Department of Anesthesiology is committed to improving perioperative and anesthetic care in medically underserved regions of the world. The theme of the VIA program last year was ‘Expanding Horizons’, which certainly occurred.

The commitment of our department is shown through the involvement of faculty, residents, fellows and staff in a variety of innovative projects to address the healthcare shortage in under-developed and developing countries. From short-term trips for clinical care delivery to long-established partnerships of educational capacity-building to international advocacy, VIA efforts have been invested in improving safe surgical and anesthesia care to save lives, promote health and support economic growth. The map to the right illustrates our global impact as a department, with recent involvement in over 15 countries and including 12 faculty, 3 fellows, 8 residents and 5 CRNAs impacting lives beyond VUMC’s hospital walls.

Additionally, among these initiatives, the ImPACT Africa (Improving Perioperative & Anesthesia Care and Training in Africa) program continues to grow. This program is supported through grant funding ($4M) from the GE Foundation (Developing Health Globally), which has allowed for the creation of a sustainable training model that aims to improve perioperative outcomes through the ongoing training of skilled anesthesia providers in Kenya. Dr. Mark Newton and Dr. Bantayehu Sileshi are key leaders in the ImPACT program, which also includes effort from numerous other faculty members, fellows, residents and CRNAs in the department. The ImPACT Africa program has a particular focus on improving maternal, infant and trauma-related morbidity and mortality in the perioperative period. The infographic on the next page depicts the current achievements of this program. A grant from the ELMA Foundations was recently provided to ImPACT Africa to support the training of additional anesthesia providers from rural coastal and western Kenya. Dr. Watkins and Dr. Newton are the co-principal investigators for this 3-year grant.

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The mission of Anesthesia Global Health and Development is support of all global endeavors within the Department of Anesthesiology, including sustained service activities, research and education. As such, the Global Anesthesiology Fellowship, the Vanderbilt International Journal Club, the Global Surgery website (housed at Vanderbilt Institute for Global Health), and research and service provided in Ethiopia, Guatemala, Kenya and Mozambique are nurtured as part of this endeavor.

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

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

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

Vanderbilt Anesthesia Global Health and Development

Beyond leading on-the-ground projects globally, faculty have been involved in international advocacy. Of special note, Dr. Kelly McQueen contributed to the Lancet Commission on Global Surgery, and she was involved in creating the World Health Assembly resolution to achieve safe surgical and anesthesia care worldwide by 2030—a substantial step toward addressing the global anesthesia crisis.

Our VIA Annual Fundraiser was a great success again this year. The theme of the evening and of the VIA program throughout the year was “Doing Good Globally.” Dyer Observatory was enjoyed by all, with excellent music, food and drinks. The attendees heard from a knowledgeable panel of leaders involved in global health. The generous donations from a multitude of people will be turned into future projects to continue Doing Good Globally.

ImPACT Africa- Outcomes To Date

- 127 KRNA students trained
- Creation of two sim centers of excellence
- Over 500 training sessions performed
- 173 healthcare professionals trained through mobile sim
- 20 trainers trained
- 13 master mobile simulation trainers
- ~30,000 individual cases collected
- One published manuscript and 3 in writing stage
- Several poster and oral presentations at National meetings

Continued from previous page

Kelly McQueen, MD, MPH, delivered her TEDxTalk, "Solving the Global Anesthesia Crisis," on Friday, August 4, 2017, at HEALTHNEXT, an official TEDx Nashville Event focused on health and healthcare.
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 2016, the Vanderbilt University School of Medicine (VUSM) ranked 8th among U.S. medical schools for National Institutes of Health (NIH) funding, and VUSM funding from all sources has more than doubled since 2001.

Anesthesia investigators brought in more than $8 million in total extramural research funding. This included more than $4 million in awarded NIH grants, which placed Vanderbilt Anesthesiology 14th among U.S. academic anesthesiology departments in NIH funding.

Within the department, faculty published 287 papers in fiscal year 2017, up from 241 papers in fiscal year 2016, within peer-reviewed literature.

Anesthesia clinical research centers include the Perioperative Clinical Research Institute (PCRI), Vanderbilt Anesthesiology Clinical Research Advisory Committee (VACRAC) and Vanderbilt Anesthesiology & Perioperative Informatics Research (VAPIR).

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

VAPIR Director Dr. Jonathan Wanderer has strengthened internal communication and plays a vital role in providing superior perioperative care. VAPIR creates innovative techniques for efficient communication with clinicians to improve patient care. Through the development of automated email systems and dashboards, VAPIR has strengthened internal communication and plays a vital role in providing near real time feedback to clinicians to help them improve perioperative care. The division collaborates internally with other departments at Vanderbilt to facilitate information analysis and dissemination, with the goal of improving outcomes for surgical patients. The division also supports access to the electronic medical record to allow for high quality data acquisition and analysis to support research and quality improvement initiatives.

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

The Vanderbilt Department of Anesthesiology has a strong, multifaceted approach to research, which can be viewed on the following pages.
The work of the Basic Science Research Division is diverse and ranges from ion channel physiology and pharmacology to immunology to pain. Multiple projects by investigators are sponsored by the National Institutes of Health. Brief descriptions of work within the Research Division and its core investigators follow.

Dr. Frederic T. (Josh) Billings, IV, Associate Professor of Anesthesiology and Medicine, is focusing on mechanisms of surgery-induced organ injury, specifically the impact of perioperative oxidative damage to kidney, brain and heart, and developing new therapy for perioperative organ injury in humans.

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

Dr. Eric Delpire, 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. The laboratory also utilizes high throughput screening and protein modeling to identify novel compounds/drugs that target these transporters and regulators.

Dr. Jerod Denton, 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.

Drs. Brad and Carrie Grueter, 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.

Dr. Matthias Riess, 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.

Dr. Andrew Shaw, Executive Vice Chair and Professor of Anesthesiology, is researching common mechanistic factors leading to organ failure after cardiothoracic surgery.

Dr. Edward Sherwood, Cornelius Vanderbilt Chair in Anesthesiology and Vice Chair for Research, Dr. Julia Bohannon, Research Assistant Professor, and Dr. Antonio Hernandez, Associate Professor of Clinical Anesthesiology, are studying several aspects of sepsis and burn injury and the application of immunotherapy in critically ill patients.
Advancing Technology to Improve 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, led by Dr. Brian Rothman, director, designs, develops and implements enhancements to Vanderbilt’s Perioperative Information Management System (VPIMS). 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.

VAPIR, led by Dr. Jonathan Wanderer, director, and Dr. Jesse Ehrenfeld, associate director, is responsible for managing the Perioperative Data Warehouse, which contains full data from more than 1,000,000 procedures. The division collaborates internally and externally to strengthen its mission to improve patient care here and abroad. Students, residents and fellows can participate in seminars, journal clubs and a structured summer research training program. Experts in biomedical informatics and clinical research share their research at monthly seminars as visiting scholars. Among its many projects, VAPIR has:

- Created the informatics backbone that supports the Vanderbilt Perioperative Consult Service.
- Analyzed the impact of real-time decision support tools created by the Perioperative Informatics team.
- Developed a suite of real-time data visualization tools to enable clinicians to view quality and performance metrics effortlessly via automated email systems and online tracking dashboards.
- Worked closely with Perioperative Informatics to develop a common data structure that will make it feasible to analyze data seamlessly across our current VPIMS and upcoming Epic systems.

This year, Perioperative Informatics has been singularly focused on our transition from VPIMS and over 30 other Vanderbilt systems to the Epic unified applications suite. The majority of our team has committed to building our Epic solution and migrating the best of VPIMS into our new, integrated electronic health record, eStar. Our team members who continue to support VPIMS are developing interfaces and rigorously testing to ensure that our real-time data acquisition and delivery remain as reliable as they are today when we go live with eStar. Perioperative informatics is foundational to the research, analytics and operations management efforts that depend upon its data.
The Perioperative Clinical Research Institute (PCRI) is led by Edward Sherwood, MD, PhD, and Debra Craven, MSN, MMHC. The mission of the division is to support high quality clinical research as a means of advancing the practices of anesthesiology, pain management and critical care medicine. The division provides a full range of support services, including study initiation and execution, regulatory 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 five research nurses, two clinical trial coordinators, one research assistant, one senior clinical trials associate and one administrative assistant.

Mentorship: Shaping Tomorrow’s Leaders

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

The committee:

- Mentors investigators throughout the research development process.

- Creates opportunities for ongoing learning about research methods, proposal writing, IRB applications, data management, statistical analysis and presentation/publication skills.

- Reviews new research proposals and regularly audits ongoing investigations for effectiveness and compliance with regulatory and safety guidelines.

- Optimizes resource utilization by assessing manpower and facilities availability and use.

VACRAC members are Edward Sherwood, MD, PhD (chair); Pratik Pandharipande, MD, MSCI (co-chair); Matt Shotwell, PhD (co-chair); Josh Billings, MD, MSCI; Brian Donahue, MD, PhD; Matthew McEvoy, MD; Debra Craven, MSN, MMHC; Andrew Shaw, MB, FRCA, FFICM, FFCM; Yandong Jiang, MD, PhD; Mark Rice, MD; and Matthew Weinger, MD.

Edward Sherwood, MD, PhD, and Pratik Pandharipande, MD, MSCI
VUMC’s Center for Research and Innovation in Systems Safety (CRISS), directed by Matthew B. Weinger, MD, is a highly interdisciplinary and collaborative center, with projects spanning numerous clinical domains (from the medical home to the operating room and ICU) and disciplines (medicine, nursing and pharmacy). 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. We are particularly interested in designing and evaluating medical technologies (i.e., devices and information systems) 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.

Our involvement with VUMC operational initiatives in quality improvement includes conducting formal usability testing of VUMC software applications and of medical devices being considered for purchase. CRISS was instrumental in projects that re-engineered blood transfusion processes, improved clinician handovers, redesigned clinical informatics tools and enhanced compliance with perioperative timeouts and checklists. Recent projects include identifying opportunities for improvement for the new eStar (Epic) nursing medication administration application, improving the usability of the APD (provider directory) and contributing to the design and development of Hubbl, a new VUMC IT project management initiative.

Center Highlights

CRISS is assisting the VA to improve the user interface of its national electronic health record (EHR) and will be studying clinical workflow in anticipation of its implementation of a new EHR.

CRISS began marketing its user-centered design services to external medical device companies.

CRISS has been awarded a second Evelyn Selby Stead Fund for Innovation grant to develop a mobile app and framework for capturing and analyzing opportunities for institutional quality improvement.

Dan France received a 4-year R01 grant from NIH to study neonatal surgical safety and also became a member of the Agency for Healthcare Research and Quality Health Services Study Section.

Jason Slagle completed two research studies that will appear in Anesthesiology and is involved in three federally funded projects to design and evaluate clinical decision support systems.

25 or more years of experience studying and improving medical technologies and processes

4 full-time and 7 part-time faculty members, 3 postdoctoral fellows and 6 staff members

12 peer-reviewed publications and 11 invited presentations last year
Key Clinical Research Studies

Bret Alvis, MD: Continuous Supraglottic pH Monitoring in Prolonged Intubated Intensive Care Patients and High Risk Aspiration Intraoperative Patients

Wireless Point-of-Care Sensor for Continuous Fluid Status Monitoring of Patients with Congestive Heart Failure

Liver Transplant Hypoperfusion

Curtis Baysinger, MD: The Effects of Sildenafil, a Shorter Acting PDE5 Inhibitor, on the Human Feto-placental Microcirculation in Women with Preeclampsia: A Study Using the In Vitro, Dual Perfused, Single Isolated Cytotelydon, Human Placental Model

“A Less-Rapid” Sequence Anesthetic Induction/Intubation/Sequence? Does Apneic Oxygenation by Means of an Oxygenating Laryngoscope Blade Prolong the “Duration of Apnea Without Desaturation” in Paralyzed Non-Obese and Morbidly Obese Patients?

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 Cytotelydons Harvested from Healthy Versus Preeclamptic Mothers. II) Slope of the Increase in FAP Induced by Hypoxemia in Single Isolated Cytotelydons Harvested from Healthy Versus Preeclamptic Mothers

Frederic T. Billings, MD: Quality and Medical Management in the Outpatient Surgical Home

John Downing, MBChB: Non-invasive Versus Invasive Blood Pressure Measurement in the Super Morbidly Obese Parturient (BMI ≥ 40 kg/m2) with Severe Preeclampsia: A Comparison of Direct Arterial Blood Pressure Measurements with Readings Obtained Using Either Large Cylindrical or Novel Conical Bariatric Upper Arm Blood Pressure Cuffs

Susan Eagle, MD: Non-invasive Device to Compare Peripheral Venous Pressure with Standard Invasive Monitoring During Resuscitation of Hemorrhagic Shock

David Edwards, MD, PhD: Open-Label Safety Trial of Intravenous Neridronate Acid in Subjects with Complex Regional Pain Syndrome (CRPS) [Grunenthal KF7013-03]

Survey of Patient Experience with Telemedicine for Pain Management

Postoperative Pain Profiles, Analgesic Use, and Transition to Chronic Pain and Excessive and Prolonged Opioid Use Patterns

Jesse M. Ehrenfeld, MD, MPH: Using Natural Language Processing to Identify LGBTI Patients in the VUMC EMR and Determine How LGBTI Status Affects Diagnosis, Treatment, and Health Outcomes

The Perioperative Management of von Willebrand Disease

Is 30 Day Mortality Used as a Measure for Surgical Outcome?

Usability of Novel Patient Data Visualizations Using Department of Defense and Civilian Medical Treatment Facility Data

Defining the Impact of Patients with High Utilization of Healthcare Services

Defining the Value of Medical Students’ Contributions to Clinical Setting

Usability of the Surgical Aggar Score on Postoperative Outcomes in Pediatrics

Leslie Fowler, MD: QuizTime: A Smartphone Application to Improve Knowledge Acquisition and Patient Centered Care Delivery

Intraoperative Transfusion Data & Computed Tomography Exam Orders

Robert Freundlich, MD: Characterizing Patient Populations and Outcomes Using Old Versus New SepsiS Definitions

External Validation of a Predictive Model for Unplanned ICU Admissions

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

Pagers and HIPAA Compliance Survey

Implementation of a Quality Improvement Checklist for Patients with a High Risk of Septis

Use of Vitamin B12 in Vasoplegic Sindrome Following Cardiac Surgery

Association of Complication Pairings and Mortality in the National Surgical Quality Improvement Database

Nurse Capnography Survey

Impact of an Early Mobility Protocol in Risk-Stratified Cardiac Surgery Patients

Postoperative Anticoagulation: Analyzing Temporal Trends in Attributable Mortality from Bleeding vs. Thrombotic Complications

Stephen Harvey, MD: Gaufacine for PONV after Sinus Surgery

Effect of Transition to New Operating Environment on Perioperative Outcomes

Patrick Henson, DO: Use of a Structured Handoff Tool to Improve Preoperative Communication

Antonio Hernandez, MD: Comparison of Endotracheal Intubation Over the Aintree via the L-l and Laryngeal Mask Airway Supreme

Douglas Hester, MD: King Vision Video Laryngoscope vs. Glidescope Video Laryngoscope: A Comparative Study in Ambulatory Surgery Center Patients

Michael Higgins, MD, MPH: Nasopharyngeal Versus Nasal Cannula Oxygen Supplementation in Oral Surgery Patients

Elisabeth Hughes, MD: AGME Case Log Survey

Heather Jackson, MSN, FNP-BC, ADS: A Randomized Controlled Trial of Auricular Acupuncture to Facilitate Outpatient Opioid Weaning

Yandong Jiang, MD, PhD: Determining the Correlation Between Pre-operative Serum Bicarbonate and the Risk of Post-operative Respiratory Insufficiency

Incidence of Dantrolene Application vs. True Malignant Hyperthermia Episode: A Retrospective Observational Study

Adam King, MD: ERAS Pathways and Outcomes after Living Donor Nephrectomy

ERAS Pathways and Outcomes after Microvascular Breast Reconstruction

Adam Kinger, MD: Effect of Targeted Interventions to Improve Value Based Health Care for Inpatient Cardiology Patients

Kofi Kla, MD: Comparison of Oxygenation and Ventilation with a Novel Nasal Mask vs. Standard of Care During Colonoscopy: A Prospective Randomized Trial

Steve Klintworth, BSN, RN, CCP: A Randomized Controlled Trial of 2% Chlorhexidine Gluconate Skin Preparation Cloths for the Prevention of Post-operative Surgical Site Infections in Colorectal Patients

Avinash Kumar, MD: Stroke-Related Early Tachyostomy vs. Prolonged Orotracheal Intubation in Neurocritical Care Trial 2

A Novel Method of Evaluating Critical Care Fellows and Key Factors for Success in a Multifaceted Fellowship Using Data Envelopment Analysis

J. Matthew Kynes, MD: An Assessment of Anesthesia Care Services at a Major Hospital in Mozambique

Yafen Liang, MD: Impact of Intraoperative Venous Congestion and Organ Hyperfusion on Postoperative Organ Injury in Lung Transplant Patients

Susan Krauser Lupear, CRNA: Peer Support Following Critical Patient Incidents

Matthew McEvoy, MD: Enhanced Recovery After Surgery in Colorectal Surgery: A Large-Scale Quality Improvement Project

RESIP for Reducing Perioperative Major Adverse Cardiac Events: A Phase II Prospective, Randomized, Controlled Trial

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

Transfusion Practices in the Perioperative Period

Enhanced Recovery After Surgery in Surgical Weight Loss: A Pilot Project to Track Patient Recovery after Discharge

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

Stuart McGrane, MBChB: “Anesthesiology Olympics” as a Method for Assessing Resident Knowledge and Skills

Kelly Mcqueen, MD, MPH: Determining the Perioperative Mortality Rate in Low-Income Countries

An Assessment of Surgical CaseLoad and Postoperative Outcomes for Service- and Teaching-Oriented International Programs from Vanderbilt University Medical Center

Impacting the Global Trauma Crisis: Pilot Study in Mozambique

The Global Burden of Pain Evaluation Proposal

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

Thanh Nguyen, MD: Pediatric Craniofacial Surgery Perioperative Registry (PCSPR)

Mark Rice, MD: Accuracy of Blood Gas Analyzers and Meters for Glucose Measurement Compared to Core Lab Testing

Una Shastri, MD: The Effect of Pectoralis Block on Analgesia after Simple Mastectomy

Edward Sherwood, MD, PhD: A Multicenter, Randomized, Double-blind, Placebo-controlled Study of CYT107 to Restore Absolute Lymphocyte Counts in Sepsis Patients

The Impact of Quantitative Neuromuscular Monitoring in the PACU on Residual Blockade and Postoperative Recovery

A Study Evaluating Gene Expression Response to TLR4 Agonists

Christopher Sobey, MD: Randomized Controlled Trial Evaluating Postoperative Analgesia and Muscle Strength Between Single Versus Continuous Adductor Canal Block for Ambulatory ACL Reconstruction

Paul St. Jacques, MD: The Epidemiology and Impact of Medication Errors in the Perioperative Setting

Jenna Walters, MD: Randomized Controlled Trial Evaluating Patient Satisfaction and Postoperative Analgesia Between Subarachnoid Block with 2-Chloroprocaine Versus General Anesthesia for Knee Arthroscopy

Jonathan P. Wanderer, MD: Analysis of Quality Metrics Reported to the Anesthesia Quality Institute National Anesthesia Clinical Outcome Registry

Evaluation of ACS NSQIP Surgical Risk Calculator Implementation in Preoperative Informed Consent Conversations

Patient Satisfaction with Anesthesia Evaluation of Mobility Assessment Tools for Preoperative Assessment

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

PACU Overnight: Impact on Length of Stay

Evaluation of Electronic Screening Tools for Preoperative Assessment

Perioperative Outcomes Awareness Project

The Electronic Medical Record Habits of Highly Effective Anesthesia Residents

Decision Support for Intraoperative Low Blood Pressure

Scott Watkins, MD: Improving Team Performance in Simulated Pediatric Emergencies Through Incorporation of Non-Technical Skills into an Electronic Decision Support Tool

Liza Weavid, MBChB, MMHC: Observational Investigation to Determine Compliance and Clinical Impact of Continuous Surveillance Monitoring (SM) on General Care Floors with a Nested Observational Study to Determine the Clinical Utility of iPI (Integrated Pulmonary Index) to Provide Early Identification of Acute Respiratory Compromise
Advancing Medical Education through Endowments

The department hosts special lecturerships 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.

BH Robbins Scholars

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

“This program provides a unique mentored research experience for young scholars that culminates in a two-year multidisciplinary fellowship, with at least one year devoted to research,” said Department Chair Warren Sandberg, MD, PhD.

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

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

Michael Chi, MD, (Scholar 2015-2020), is currently studying the application of reactive oxygen species (ROS)-responsive microspheres for targeted anti-inflammatory therapy of chronic neuropathic pain. Dr. Chi is mentored by Jerod Denton, PhD, Craig Duvall, PhD, David Edwards, MD, PhD, Edward Sherwood, MD, PhD, and Ronald Wiley, MD, PhD.

Robert Freundlich, MD, (Scholar 2017-2020), is an anesthesiologist, a cardiovascular intensivist and a clinical information specialist. He is board certified in anesthesia, 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. He is mentored by Jesse Ehrenfeld, MD, MPH.

Eric Kerchberger, MD, (Scholar 2017-2018), is a pulmonary critical care in fellow in the Department of Medicine studying genetic risk factors for organ dysfunction in critical illness and following major cardiovascular surgery using the Vanderbilt BioVU DNA biobank. Dr Kerchberger is mentored by Julie Bastarache, MD, and Lorraine Ware, MD.

Adam Kingeter, MD, (Scholar 2013-2019), is investigating evidence-based, value-driven health care. He recently was awarded a Foundation for Anesthesia Education and Research Mentored Research Training Grant in health services research. His current research project investigates the ability of an electronic, milestone-driven clinical pathway to improve health care value in patients undergoing coronary artery bypass grafting (CABG) surgery. He is mentored by Melinda Buntin, PhD, the Dean of the Department of Health Policy at Vanderbilt, and his grant mentorship committee members include Pratik Pandharipande, MD, MSCI, Mitch Edgeworth, MBA, CEO of Vanderbilt Adult Hospitals and Clinics, Jesse Ehrenfeld, MD, MPH, and C. Lee Parmley, MD, JD, MMHC.

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

Dianne Lou, MD, PhD, (Scholar 2016-2020), is interested in the pathophysiology of sepsis/systemic inflammatory response syndrome and genomics for guiding precision medicine. She will be mentored by Ed Sherwood, MD, PhD.

Puneet Mishra, MD, (Scholar 2016-2019), is currently the principal investigator for a randomized control trial examining the efficacy of preoperative genicular nerve radiofrequency ablation in reducing pain and improving functional outcomes in patients undergoing total knee arthroplasty. Over the course of this year, Dr. 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. Dr. Mishra is mentored by Stephen Bruehl, PhD, and Andrew Shaw, MB, FRCA, FFICM, FCCM.

Kimberly Rengel, MD, (Scholar 2017-2020), is interested in improving functional outcomes for patients after major...
outcomes. Dr. Rengel is mentored by Christopher Hughes, MD, and Pratik Pandharipande, MD, MSCI.

Loren Smith, MD, PhD, (Scholar 2016-2017), 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. Dr. Smith is mentored by Josh Billings, MD, MSCI, and MacRae Linton, MD.

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

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. Dr. Rengel is mentored by Christopher Hughes, MD, and Pratik Pandharipande, MD, MSCI.

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Special Lectureships & Awards

Dr. James Phythyon Endowed Lectureship in Pediatric Anesthesiology

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

The Sandidge Pediatric Pain Management Endowed Fund

Retired Vanderbilt anesthesiologist Paula C. Sandidge, MD, created The Sandidge Pediatric Pain Management Endowed Fund at Monroe Carell Jr. Children’s Hospital at Vanderbilt in 2010 to recognize and encourage progress in pain management for children.

The Dila Vuksanaj Memorial Fund for Resident Education

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

Dr. Bradley E. Smith Endowed Lectureship on Medical Professionalism

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

Dr. Charles Beattie Endowed Lectureship

Established by Dr. Warren Sandberg, the lectureship is intended to bring innovators in anesthesiology from unique backgrounds and compelling world views to Vanderbilt as visiting professors.
Selected Publications, 2016–2017

Peer-reviewed Original and Review Articles


Alvis BD, Keohane AM, Hughes CG: An update on current evidence for sedation practices in the intensive care unit. Internal Medicine Review 2016; 2: http://dx.doi.org/10.18103/imr.v0i2.106


Bae L, Bohnonnn JK, Cui W, Vinish M, Tovile-Kinsky T: Fms-like tyrosine kinase-3 ligand increases resistance to burn wound infection through effects on plasmacytoid T: Fms-like tyrosine kinase-3 ligand increases resistance to burn wound infection through effects on plasmacytoid T. Anesth Analg 2017; 125:647-55


Bae L, Ryerson RR, Kristensen MS, Bennett CL: Classifying Alarms: Seeking Durability, Credibility, Consistency, and Simplicity. Biomedical Inform 2017; 97:163-70

Bansal VK, Hester DL: Anesthesia recommendations for patients suffering from Eisenmenger’s Syndrome. OrphanAnesthesiology 2016; Aug

Bennett JM: Anesthesia recommendations for patients suffering from Eisenmenger’s Syndrome. OrphanAnesthesiology 2016; Aug


Bulka CM, Ehrenfeld JM: In Reply. Anesthesiology 2017; 127:198


Chestnut DH: On the Road to Professionalism. Anesthesiology 2017; 126:780-8


Dobie KH, Shi Y, Slotwell MS, Sandberg WS: New technique targeting the C5 nerve root proximal to the traditional interscalene sonoanatomical approach is analgesic for outpatient arthroscopic shoulder surgery. J Clin Anesth 2016; 34:79-84


Radke AK, Jury NJ, Delpire E, Nakazawa K, Holmes A: Reduced ethanol drinking following selective cortical interneuron deletion of the GluN2B NMDA receptors subunit. Alcohol 2017; 58:47-51


Rothman BS, Gupta RK, McEvoy MD: Reduced ethanol drinking following selective cortical interneuron deletion of the GluN2B NMDA receptors subunit. Alcohol 2017; 58:47-51


Tiwar V, Queenan C, St Jacques PJ: Impact of waiting and provider behavior on surgical outpatients’ perception of care. Perioperative Care and Operating Room Management 2017; 7:7-11


Jennie Stuart Medical Center (JSMC) has launched teleICU technology that provides its doctors and their patients real-time access to Vanderbilt University Medical Center (VUMC) specialists.

VGo robotic technology allows specialists with advanced training in critical care medicine at VUMC to evaluate patients in the intensive care unit of the Hopkinsville, Kentucky, hospital in real time, as well as communicate with patients, nurses and physicians, through two-way audiovisual video streaming. VUMC intensivists can review their vital signs and place notes and orders in their medical records to facilitate management of critically ill patients when their physicians are unable to be at the bedside.

The technology enhances the decision-making process about treatment protocols and patient transfers. It allows JSMC and VUMC to collaborate around-the-clock on specific patient cases.

“We think our patients and their families will benefit tremendously,” said Eric Lee, President and Chief Executive Officer, Jennie Stuart Medical Center. “Not only do they have the convenience and benefit of staying in their local community at Jennie Stuart Medical Center and being cared for by medical staff who are their family, friends and neighbors, they also have the benefit of that virtual connection with the great specialists that are part of Vanderbilt University Medical Center.”

JSMC is the first hospital in the Vanderbilt Health Affiliated Network to implement teleICU technology. The Network is the region’s largest physician-led organization of like-minded health care professionals who are developing solutions to improve health and increase value to patients, providers, employers and other consumers of health care services. The Network’s goal is to transform health care delivery across the Mid-South by bringing together clinicians, hospitals, employers, patients and insurance providers in a structure that encourages collaboration to deliver high-quality, cost-efficient care.

“We are excited to partner with Jennie Stuart Medical Center physicians and nurses to put a technological safety net around the critically ill patients in their ICU,” said Liza Weavind, MBChB, MMHC, professor of Anesthesiology and Surgery, who spearheaded the teleICU initiative. “It is a privilege as a VUMC intensivist to use the teleICU platform to facilitate patient care and help support the JSMC team in their efforts to provide excellent and safe patient care around the clock. We look forward to successful implementation and some great patient outcomes from this initiative.”

New technologies have made these initiatives possible, said Warren Sandberg, M.D., Ph.D., chair of Anesthesiology for VUMC.

“TeleICU, like many other technologies in health care, has benefited over the past decade from the explosion of mobile technology and increasing miniaturization of computers,” Sandberg said.

“This allows a teleICU project like the one with Jennie Stuart to proceed with an easy, modest infrastructure addition. It brings the project back to focusing on the people: both the physicians and especially the patients.”

In addition to joining the Network in May 2016, JSMC and VUMC also forged a strategic affiliation agreement to form new clinical programs and services to be shared by the two institutions.

“We have benefited from working with the expertise and clinical teams at Vanderbilt over the past year on a number of key initiatives as part of our affiliation,” Lee said. “This teleICU affiliation represents the first clinical joint venture that has come to fruition between our entities.”

Achieving Balance

The Vanderbilt Department of Anesthesiology is a dynamic group, providing the very best in patient care, presenting challenging educational programs for our trainees and leading our specialty in investigational research. But productivity and career satisfaction are not all about work. We know how to take that same energy and have a great time. We gather for family-friendly events such as the welcome event for new residents, the fundraiser for our Vanderbilt International Anesthesia program and other fun activities throughout the year. Here are a few images from our events.
Leadership in the Profession

VUMC Department of Anesthesiology Members of AUA

Jeffrey Balser, MD, PhD
Arna Banerjee, MBBS
Curtis Baysinger, MD
Frederic T. Billings, MD
Stephen Bruehl, PhD
David Chestnut, MD
Brian Donahue, MD, PhD
John Downing, MBChB

Susan Eagle, MD
Jesse Ehrenfeld, MD, MPH
Michael Higgins, MD, MPH
Christopher Hughes, MD
Tracy Jackson, MD
Yandong Jiang, MD, PhD
Avinash Kumar, MD
Amanda Lorinc, MD
Matthew McEvoy, MD
Kelly McQueen, MD, MPH
Pratik Pandharipande, MD, MSCI

Mark Rice, MD
Matthew Riess, MD, PhD
Warren Sandberg, MD, PhD
Andrew Shaw, MB, FRCA, FFICM, FCCM
Edward Sherwood, MD, PhD
Heidi Smith, MD, MSCI, FAAP
Paul St. Jacques, MD
Lisa Weavind, MBCh, MMHC
Matthew Weinger, MD

VUMC Department of Anesthesiology Benchmarks for Research Mentors

Pratik Pandharipande, MD, MSCI
Warren Sandberg, MD, PhD
Andrew Shaw, MB, FRCA, FFICM, FCCM
Edward Sherwood, MD, PhD
Matthew Weinger, MD

VUMC Department of Anesthesiology Members of FAER Academy of Research Mentors

Pratik Pandharipande, MD, MSCI
Warren Sandberg, MD, PhD
Andrew Shaw, MB, FRCA, FFICM, FCCM
Edward Sherwood, MD, PhD
Matthew Weinger, MD

VUMC Department of Anesthesiology Members of FAER Academy of Education Mentors

Matthew McEvoy, MD

Staff
We are **Compassionate:**
Offering exceptional perioperative care and pain management to a complex population

We are **Creative:**
Advancing the frontiers of science, healthcare and technology

We are **Committed:**
Equipping future global leaders with the latest knowledge and skills

We are **Collaborative:**
Working across Vanderbilt University Medical Center and beyond to achieve measurably improved outcomes

**Department of Anesthesiology**