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

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

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

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

I invite you to peruse this guide and visit www.vandydreamteam.com to learn more about our programs.
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.

DEPARTMENT HISTORY

Vanderbilt has a proud tradition of excellence in anesthesiology.

PREVIOUS DEPARTMENT CHAIRS

- **Dr. Benjamin H. Robbins**
  - 1946–1961
- **Dr. Charles B. Pittinger**
  - 1962–1969
- **Dr. Bradley E. Smith**
  - 1969–1993
- **Dr. Charles Beattie**
  - 1994–2001
- **Dr. Jeffrey R. Balser**
  - 2001–2004
- **Dr. Michael S. Higgins**
  - 2004–2010

While the Department of Anesthesiology has undergone many changes over the years, its commitment to excellence has remained constant.

### ABOUT VUMC

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

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

Becker’s Hospital Review: one of the “100 Greatest Hospitals in America”

The Leapfrog Group: grade “A” in Hospital Safety Score

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

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

Nashville Business Journal: Middle Tennessee’s healthiest employer

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

About Nashville

Nashville’s history of country music has earned the city its fame as Music City, USA – but this metropolis is about more than tunes and twang. Visitors and residents enjoy great dining, entertainment and cultural life. Because Nashville International Airport is a Southwest Airlines hub, travel to Nashville is convenient and inexpensive. With a growing population of 1.8 million people in the Metropolitan Statistical Area, Nashville has been nicknamed “Newville” by GQ magazine and called the “It City” by The New York Times. It must be the southern hospitality that has this city growing, because Nashville has been named America’s friendliest city for three years in a row. A hub for massive and rapid economic growth, Nashville was named by Forbes magazine as one of the 25 cities most likely to have the country’s highest job growth over the next five years, named one of the best cities in the nation for work and family by Fortune magazine and ranked No. 1 most popular city in the United States for corporate relocations by Expansion Management.

### Statistics

- 40,216 surgical operations
- 20,235 VUMC employees
- more than 1,162 residents training at VUMC
- 56 hospital locations
- 12 hospitals and health systems
- 1.8 million population
- 533 square miles
Serving in one of the largest clinical programs in the nation, the Vanderbilt Department of Anesthesiology’s clinicians provide procedural, critical care, pain management and all perioperative anesthesia services for more than 102,000 adult and pediatric patient encounters annually at approximately 100 anesthetizing locations. Of these, more than 8,500 patients are seen annually in the Vanderbilt Interventional Pain Clinic, and approximately 25,000 Vanderbilt adult and pediatric patients receive anesthetic care during a radiologic, gastrointestinal, interventional or other diagnostic or therapeutic procedure.

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

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

The Vanderbilt Preoperative Evaluation Center (VPEC) offers preoperative evaluation before patients undergo a diagnostic or therapeutic procedure. The Vanderbilt Preoperative Evaluation Center (VPEC) offers preoperative evaluation before patients undergo a diagnostic or therapeutic procedure. The Division of Ambulatory Anesthesiology consists of 10 faculty members and 34 nurse anesthetists who practice in five locations: Cool Springs Surgery Center, Spring Hill Surgery Center, Vanderbilt Bone and Joint, Medical Center East and Vanderbilt Outpatient Surgery. Expansion to a sixth location, Cool Springs Plastic Surgery Center, is planned for November 2018.

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

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

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

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

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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 Tanner Valley Healthcare System (TVHS) Vanderbilt Veterans Administration Medical Center in Nash- ville. Additionally, division members provide perioperative anesthetic care for patients un- dergoing major surgery, and some participate in the perioperative consult service both at Vanderbilt and at the TVHS, Nashville. An ongoing alliance between the ACCM Division and the School of Nursing supports acute care nurse practitioner intensivist training. The ACCM provides tertiary care, promotes education and engages in research. Faculty and fellows have authored over 200 peer-reviewed manuscripts and have won numerous awards, including the Stahlman, MD, Award for Extraordinary Perfor- mance, the American Society of Anesthesiologists John M. Eisenberg, MD, Award, and the American Society of Anesthesiologists’ premier “High-Dose Perioperative Atorvastatin and Acute Kidney Injury Following Cardiac Surgery: A Randomized Clinical Trial” (AKIN). Stuart McGinnis, MBChB, MScG, was awarded the Mildred T. Stahlman, MD, Award for Extraordinary Perfor- mance of Clinical Service for his development and leadership of the ECMO Transport/Reper- fusion Program, Joseph Schneider, MD, was in- terviewed by Michael Niederman of CNN for his innovative work on hospital medical alarms.

Research Grants: Research grants for Marco Lopez, MD, MS, (K23), Antonio Hernandez, MD, PhD, and Robert Freeman, MD, PhD, were awarded for contributions to the division’s clinical practice and are performed on all adult cardiac surgery procedures, aortic surgery and ventricular assist device (VAD) insertions. The division’s structural heart disease program is the busiest program in the country. The VAD program at Vanderbilt currently places about 50 devices per year. The heart transplant program recently achieved the milestone of its 1,000th heart transplant operation, making it the second busiest program in the country. The division’s structural heart disease program employs the newest techniques involving transcatheter aortic valve replacement (TAVR), catheter-based repair of mitral regurgitation (MitraClip) and left atrial appendage occlusion devices. Intraoperative transesophageal echocardiography (TEE) is an integral part of the division’s clinical practice and is performed on all adult cardiac surgery patients, in electrophysiology to guide placement of left atrial appendage occlusion devices and to guide transcatheter valve procedures. Division faculty members conduct research in vascular biology, pre- cision perioperative medicine, acute kidney injury and the perioper- ative inflammatory response. Extramural grant support comes from the Department of Defense, the National Institutes of Health and industry.

The Division of Cardiothoracic Anesthesiology provides anesthetic care for adult cardiac surgery, thoracic surgery, interventional pulmonology, electrophysiology and interventional cardiology at Vanderbilt University Medi- cal 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 proce- dures, aortic surgery and ventricular assist device (VAD) insertions.

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Regional Anesthesia & Acute Pain Medicine Fellowship

ACGME-accredited program.

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

Two positions available each year.

Core rotations include anesthesiology perioperative consult service, OR anesthesiology, otorhinolaryngology, facial plastic surgery, trauma, biliary surgery, and nephrology.

Learn more at: bit.ly/VUMC_Periop

Acute Pain Service & Anesthesiology Perioperative Consult Service

Director: Acute Pain Service/Brain Amin, MD; Associate Chief: Michael Plia, MD

The Division of Multispecialty Adult Anesthesiology (MSA) is the Department of Anesthesiology's largest division, providing perioperative anesthetic care in 60 operating rooms and procedure suites for a wide variety of surgical services, including general surgery, orthopedics, urology, plastic surgery, ophthalmology, vascular surgery, otolaryngology, hepatobiliary surgery, liver and renal transplantation and oral/maxillofacial surgery.

The division has 30 full-time and 10 part-time faculty members, most of whom have significant subspecialty training and expertise. As Vanderbilt University Medical Center is a Level One Trauma Center, MSA faculty and staff provide 24-hour coverage for emergency and trauma surgery for the region. Our trauma center covers 65,000 square miles and has about 3,000 admissions per year.

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

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

The Vanderbilt Department of Anesthesiology provides both Acute Pain (APS) and Perioperative Consult Services (PCS). Together these services perform preoperative evaluation and preparation, intraoperative care, acute postoperative care and pain management to Vanderbilt University Hospital, Monroe Carell Jr. Children’s Hospital at Vanderbilt and the Tennessee Valley Healthcare System (TVHS) Veterans Administration Medical Center in Nashville. By providing care before, during and after surgery, these services give patients better, more personalized care throughout the entire perioperative care period. With widespread use of regional anesthesia and other opioid-sparing pain management techniques, these services have led to a >80% reduction of in-hospital opioid use and a >50% reduction in opioids prescribed at discharge.

Enriched Recovery After Surgery (ERAS) care pathways are evidence-based protocols designed to improve pain control and facilitate faster recovery for patients. PCS has a national leader in ERAS implementation. Across the Adult, Children’s and VA hospitals, the department cares for several thousand patients each year, and APS and PCS perform over 7000 regional blocks (not including any ambulatory locations). PCS continues to develop ERAS protocols that improve patient outcomes and reduce costs, the most recent for prolonged hospital length of stay. Beyond this clinical work, the divisions routinely give presentations at national and international meetings related to ERAS and non-opioid pain management. In 2017, faculty published more than a dozen papers on this topic and, in 2018, have published numerous additional ERAS papers.

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

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

At the TVHS Veterans Administration Medical Center in Nashville, a perioperative care service modeled on APS and PCS at VUMC is being established, with six nurse practitioners and one pediatric pain nurse practitioner. Collaborations exist with multiple departments.

Core rotations include anesthesiology, geriatrics and research.

Learn more at: bit.ly/VUMC_Periop

Since 2016, VA-PCS also manage the epidural, nerve block, catheter and pain consults at TVHS.

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

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Learn more at: bit.ly/VUMC_Regional_Fellowship

Perioperative consult patients approximately 1,600 regional blocks performed more than 7,000 beds days saved approximately 800
The division includes all-time faculty and six CRNAs, as well as CRNAs from other divisions. Additionally, several faculty from the ACCM and MSA Divisions contribute significantly to the division’s work. Dedicated CRNAs and faculty work as a team along with the neurosurgeons, ortho-surgeon surgeons and perioperative nurses in providing outstanding clinical care for patients. Faculty are actively engaged in resident and medical student education. Faculty also make significant contributions at national and international meetings, such as SNACC, SAA, AMA, ACG and NCS, and provide leadership in these organizations. Faculty members have been actively engaged in research, and Jesse Ehrenfeld, MD, MPH, is the recipient of over $2 million in grant funding. Like their surgical colleagues, neuroanesthesiologists face many unique challenges, including the length of procedures (which may last more than 18 hours), unusual patient positioning and unexpected intraoperative events, such as spinal cord injury 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 Chief Jeanette Bauchat, MD, MS, is an associate professor of Anesthesiology, with fellowship training in obstetric anesthesia and a master’s degree in healthcare quality and safety. Medical Director Susan Dumas, MD, has practiced as an obstetric anesthesiologist for over 20 years, with extensive experience in systems and process improvement.

The Division of Obstetric Anesthesiology provides dedicated, 24-hour, in-house obstetric anesthesia care for over 4,500 deliveries at Vanderbilt University Medical Center (VUMC) annually—over half of the deliveries are considered high risk. In addition to offering the full complement of techniques for labor analgesia, the division provides consultation and critical care management services for high-risk obstetric patients, as well as specialized anesthesia care for intratropical fetal surgery. The division collaborates with the VUMC maternal-fetal medicine (MFM) group in caring for mothers with congenital heart defects and other co-morbidities. The obstetric anesthesiologists collaborate with the MFM, gynecologic oncology, urology and emergency general surgery physicians in an innovative approach to the care of patients with abnormal placenta.

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

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

As of November 2018, Neuroanesthesiology provides perioperative care for over 4,000 cases per year and covers nine operating rooms. Faculty members specializing in neuroanesthesiology are providing increasingly complex anesthesia and sedation services.

The division is included in all-time faculty and six CRNAs, as well as CRNAs from other divisions. Additionally, several faculty from the ACCM and MSA Divisions contribute significantly to the division’s work. Dedicated CRNAs and faculty work as a team along with the neurosurgeons, ortho-surgeon surgeons and perioperative nurses in providing outstanding clinical care for patients. Faculty are actively engaged in resident and medical student education. Faculty also make significant contributions at national and international meetings, such as SNACC, SAA, AMA, ACG and NCS, and provide leadership in these organizations. Faculty members have been actively engaged in research, and Jesse Ehrenfeld, MD, MPH, is the recipient of over $2 million in grant funding. Like their surgical colleagues, neuroanesthesiologists face many unique challenges, including the length of procedures (which may last more than 18 hours), unusual patient positioning and unexpected intraoperative events, such as spinal cord injury 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.

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

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

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

Pediatric Cardiac Anesthesiology Services, led by Drew Franklin, MD, MBA, is engaged in an increasing number of pediatric regional anesthesia techniques, has implemented Pediatric Perioperative Interdisciplinary Surgical Home Protocols with the goal of enhanced recovery after those procedures, and handles a growing volume of both inpatient consultations and patients seen in our Pediatric Cardiac Clinic. In 2017, the division and the Cumberland Pediatric Foundation co-hosted the first Annual Southeast Regional Pediatric Pain Management Symposium.

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

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

Monroe Carell Jr. Children’s Hospital at Vanderbilt recently successfully obtained American College of Surgeons (ACS) Level 1 Verification for Pediatric Trauma Care, a widely recognized distinction that less than 50 pediatric hospitals across the nation have achieved. Many pediatric division faculty are major leaders in international outreach work. Specifically, in 2016 and 2017, respectively, Mark Newton, MD, and Kelly McQueen, MD, MPH, each received the prestigious award for Outstanding Humanitarian Contribution from the ASA.

To provide the safest, best care practices for patients in the postoperative recovery room (PACU) area, the division has a robust anesthetic care collaboration led by Carrie Messer, MD. The division also has a unique Complex Coordination of Care program, led by Jill KilKelly, MD, which seeks to minimize multiple disconnected episodes of surgical care for pediatric patients by coordinating anesthetic care, when even appropriate, into single continuous anesthetic plans for procedural and imaging needs.

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

The educational mission of the division is multifaceted. Both pediatric anesthesiology and adult cardiothoracic anesthesiology fellows rotate on the service. Senior anesthesiology residents are also permitted to do so as an elective rotation. The division provides educational observation experiences to both pediatric cardiology fellows and pediatric intensive care fellows.

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

The Division of Pediatric Cardiac Anesthesiology is made up of six faculty members and six certified registered nurse anesthetists whose primary practice sites are the two cardiac operating rooms and two catheterization laboratories at the Monroe Carell Jr. Children’s Hospital at Vanderbilt. The division’s average yearly case volume is approximately 600 cardiac surgeries and 900 catheterizations and electrophysiologic procedures. Specifically, the Pediatric Heart Institute ranks as one of the nation’s busiest in both heart transplants and adult congenital electrophysiologic procedures.

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

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

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

The Veterans Affairs Anesthesiology Service at the Tennessee Valley Healthcare System (TVHS) provides a variety of anesthesia services for over 96,000 patients every year across its two main campuses in Nashville and Murfreesboro.

The TVHS Anesthesiology Service is the only service in the Veterans Integrated Service Network (VISN 9) that provides comprehensive complex pain management, including invasive procedures like radiofrequency ablation, spinal cord stimulator, subcutaneous implants and implant ketamine infusions for unremitting pain and denervation. With over 14,000 encounters per year, TVHS pain management will be part of 18 centers selected nationally to establish an integrated whole health program, which comes with an $8.5 million grant over three years.

Across the two campuses, TVHS provides care to over 6,500 surgical patients in the operating room and nearly 4,000 non-operating room procedures per year. These activities are supported by a very active preoperative evaluation clinic that is responsible for over 2,500 patient encounters per year. TVHS is among the first in the nation to offer a 24/7/365 comprehensive, integrated perioperative care service, which was established in 2016 and has been instrumental in decreasing hospital and ICU length of stay, and perioperative and long term opioid use, well below national standards, and improving patient satisfaction.

The VA Anesthesiology Service also provides 24/7/365 coverage to our 13-bed surgical intensive care unit that provides care to a complex mix of patients, including but not limited to cardiovascular, vascular, transplant, orthopedics, neurosurgery and general surgery.

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

John Barwise, MBChB, has been appointed as the immediate past president of the Association of VA Anesthesiologists and has been appointed to the National Surgical Field Advisory Board. She established the Annual DOD-VAA meetings starting in 2015 and was the director of the 2015 and 2016 meetings. She serves on the national advisory panel for new chiefs and is the VISN 9 lead for Anesthesiology. She has been appointed as a site reviewer for many other VAs across the country. She was an invited speaker at the National VA Anesthesiology Chiefs meeting in 2017 and gave a presentation on worldwide capture and productivity in the VA. She also gave a presentation on establishing the perioperative service and the ketamine initiative at the VA.

Among the first in the VA to offer a 24/7/365 in-house perioperative care team and to offer ketamine infusions for complex pain, both recognized as National Best Practice.

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

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Chiefs, David Edwards, MD, PhD

Veterans Affairs Anesthesiology Service

bit.ly/VUMC_VA

Learn more:

bit.ly/VUMC_PainManagement

bit.ly/VUMC_Pain_Fellowship

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

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

The Veterans Affairs Anesthesiology Service at the Tennessee Valley Healthcare System (TVHS) provides a variety of anesthesia services for over 96,000 patients every year across its two main campuses in Nashville and Murfreesboro.

The TVHS Anesthesiology Service is the only service in the Veterans Integrated Service Network (VISN 9) that provides comprehensive complex pain management, including invasive procedures like radiofrequency ablation, spinal cord stimulator, subcutaneous implants and implant ketamine infusions for unremitting pain and denervation. With over 14,000 encounters per year, TVHS pain management will be part of 18 centers selected nationally to establish an integrated whole health program, which comes with an $8.5 million grant over three years.

Across the two campuses, TVHS provides care to over 6,500 surgical patients in the operating room and nearly 4,000 non-operating room procedures per year. These activities are supported by a very active preoperative evaluation clinic that is responsible for over 2,500 patient encounters per year. TVHS is among the first in the nation to offer a 24/7/365 comprehensive, integrated perioperative care service, which was established in 2016 and has been instrumental in decreasing hospital and ICU length of stay, and perioperative and long term opioid use, well below national standards, and improving patient satisfaction.

The VA Anesthesiology Service also provides 24/7/365 coverage to our 13-bed surgical intensive care unit that provides care to a complex mix of patients, including but not limited to cardiovascular, vascular, transplant, orthopedics, neurosurgery and general surgery.

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

John Barwise, MBChB, has been appointed as the immediate past president of the Association of VA Anesthesiologists and has been appointed to the National Surgical Field Advisory Board. She established the Annual DOD-VAA meetings starting in 2015 and was the director of the 2015 and 2016 meetings. She serves on the national advisory panel for new chiefs and is the VISN 9 lead for Anesthesiology. She has been appointed as a site reviewer for many other VAs across the country. She was an invited speaker at the National VA Anesthesiology Chiefs meeting in 2017 and gave a presentation on worldwide capture and productivity in the VA. She also gave a presentation on establishing the perioperative service and the ketamine initiative at the VA.

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

The 160 CRNAs in the nurse anesthesia division provide anesthesia for all types of surgical procedures, including cardiac, pediatrics, trauma, neurosurgery, plastics, radiologic, and special procedures throughout the medical center. CRNAs administer general, regional, and monitored anesthesia care for scheduled and emergency surgical, obstetric, and diagnostic procedures. Our CRNAs are full partners in department clinical practice initiatives and frequently contribute to the development of quality improvement and efficiency initiatives.

Over 25 CRNAs are actively pursuing doctoral education. Five CRNAs serve within the divisional leadership to facilitate practice evolution, education, and professional development of their respective teams. Thus, the CRNAs are essential to many core endeavors, with a sharp focus on patient experience and outcomes. In terms of personnel, the CRNA Division is the largest within the Department of Anesthesiology. Vanderbilt is the primary clinical teaching affiliate of the Middle Tennessee School of Anesthesia (MTSA). Based in Madison, Tennessee, MTSA is the second largest nurse anesthesia program in the country. Vanderbilt is also a clinical affiliate for the Union University Nurse Anesthesia program in Jackson, Tennessee, and the Emory University Nurse Anesthesia Program in Atlanta, Georgia.

Student nurse anesthetists participate in approximately 7,000 anesthetics per year while on Vanderbilt rotations. CRNAs provide expert clinical teaching to these learners. Internally, we continue to offer robust continuing education opportunities that are coordinated by our two dedicated CRNA Educators.

VUMC is staffed by 39 anesthesia technicians and technologists. For more information on career opportunities, please contact the Division Administrative Assistant at (615)-343-6336.

Between the Vanderbilt University Hospital and the Monroe Carell Jr. Children’s Hospital at Vanderbilt, 160 certified registered nurse anesthetists deliver anesthesia for all procedures spanning all divisions of the Anesthesiology Department. Of the 160 CRNAs, 38 practice within Children’s Hospital.
The Office of Educational Affairs supports and oversees undergraduate medical education, graduate medical education for residents and fellows, and continuing education for faculty and advanced practice nurses. The extensive education and training programs offered by the Department of Anesthesiology prepare medical students, residents, fellows, nurses and faculty for productive careers as clinicians, academicians and scientists.

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

Residents and fellows benefit from in-depth training in all subspecialties 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.
- The BH Robbins Scholar Program, which offers one-on-one mentorship and collaboration for aspiring physician-scientists preparing for careers as academic anesthesiologists.
- Faculty Development Seminars, providing targeted training for professional development.
- Combined Integrative Health and Pain Medicine Quarterly Rounds, which focus on issues related to the management and treatment of pain.

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

Residents

The Anesthesiology Department residency program is highly sought after by the nation’s top medical students. Proof of this is in the numbers: in the 2018 National Residency Match, the department received 1,133 applications for 18 positions.

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

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

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

Fellows

Building from the department’s strength in subspecialties, nine clinical fellowships, as well as a research fellowship, are offered to individuals seeking advanced, focused training.
The Anesthesia Summer Internship Program provides an opportunity for undergraduate and medical students to participate in research projects with our faculty. Edward Sherwood, MD, PhD, and Josie Ehrenfeld, MD, MPH, serve as directors. The program receives funding from FAER and NIH to support summer students and is a part of the NIH Short Term Training Program for Minority Students.

Morbidity & Improvement (MSKI) Conferences. In addition, Vanderbilt is a primary clinical affiliate of the Middle Tennessee School of Anesthesiology, the Union University Nurse Anesthesia Program and the Emory University Nurse Anesthesia Program. Student nurse anesthetists participate in approximately 7,000 anesthesiatics 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) Intensive 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. ACNP students perform their clinical rotations in seven of the Vanderbilt 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 partnerships 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 anesthetists in the country. The Division of Anesthesiology Critical Care Medicine has 35 acute care nurse practitioners who work in intensive care settings. The Preoperative Evaluation Clinic and Perioperative Consult Service include another 17 advanced practice nurses as an integral part of these teams.

The Center for Experiential Learning and Assessment

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

Maintenance of Certification in Anesthesiology (MOCA®)

MOCA® simulation courses are taught at Vanderbilt’s Center for Experiential Learning and Assessment (CELA), where state of the art immersive patient simulation training is offered. Pictured below is Arma Banerjee, MBBS, Assistant Dean for Simulation in Medical Education and Administration and Associate Professor of Anesthesiology, Surgery and Medical Education.

Educational Research

The department is a national leader in rigorous educational research, and faculty are involved with the latest in pedagogical and educational implementation sciences research. Leslie Fowler, MEd, J. Matthew Kynes, MD, Matthew McEvoy, MD, Mark Newton, MD, Tiffany Richburg, MD, and Bantayehu Sileshi, MD, are the current education researchers. Kynes’ research focuses on the impact of high-fidelity simulation workshops on clinical skills for providers involved in obstetric care in Kenya. He also studies the preparation and experience of anesthesiology residents participating in international rotations and their impact on improving clinical exposure and long-term engagement in humanitarian activities. Kynes’ research includes the impact of and utilization of online curricula in pediatric anesthesiology by providers in low- and middle-income countries. McEvoy’s research involves understanding the best methods to deliver information so clinicians deliver evidence-based, timely care. This research is within the domain of assessing curriculum development and the application of checklists and smartphone applications related to crisis and perioperative medicine management. In the clinical arena, he is interested in implementation science within the perioperative sphere and using novel educational methods, such as spaced education via a smartphone web applications, to drive practice change. Sileshi has funded research investigating the effects of education capacity-building efforts and the implementation of a novel perioperative data collection tool in low- and middle-income countries.
The mission of Anesthesia Global Health and Development is to improve safe surgical and anesthesia care worldwide by 2030—a substantial step toward achieving the United Nations’ Sustainable Development Goals. The department’s commitment to global health, including an interview by a local reporter. The generous donations from a multi-

tude of people will be turned into future projects to continue advancing care across the globe.

**Vanderbilt Anesthesia Global Health and Development**

More than 5 billion people around the world do not have adequate access to safe surgical and anesthesia care. Through the Van-
derbilt International Anesthesia (VIA) program, the Vanderbilt Department of Anesthesiology is committed to improving peri-
operative and anesthetic care in medically underserved regions of the world to help close this gap through service, education and research.

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

Additionally, among these initiatives, the IMPACT Africa program has a particular focus on improving maternal, infant and trauma-related morbidity and mortality in the perioperative period and has recently expanded into training programs in Ethiopia. A grant from the EMA Foundation was recently provided to IMPACT Africa to support the training of an additional anesthesia providers from rural coastal and western Kenya. Beyond leading on-the-ground projects globally, faculty have been involved in international advocacy. Of special note Kelly McQueen, MD, MPH, contributed to the Lancet Commission on Global Surgery, and she was involved in creating the World Health Assembly resolution to achieve safe surgical and anesthesia care worldwide by 2030—a substantial step toward addressing the global anesthesia crisis. McQueen has also led efforts to develop research on the effectiveness of short-term missions in Guatemala, where faculty from pediatric anesthesia are involved on a continuing basis.

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

The attendees heard from a knowledgeable panel of leaders involved in global health, including an interview by a local reporter. The generous donations from a multitude of people will be turned into future projects to continue advancing care across the globe. Kelly McQueen, MD, MPH, Professor of Anesthesiology and Surgery, is Director of Vanderbilt Anesthesia Global Health and Development and the Vanderbilt Global Anesthesia Fellowship, and is a globally recognized expert in the field. McQueen is currently leading research efforts as principal investigator for IBS approved projects in Ethiopia, Guatemala and Mozam-
bique. These projects have the ability to expand into every low-income country over time. In 2017, McQueen received the Nicholas M. Greene, MD, Award for Outstanding Humanitarian Contribution, given by the ASAA Committee on Global Humanitarian Outreach. Of note, Vanderbilt International Anesthesia Program Director Mark Newton, MD, received the Greene Award in 2016.

**Photo Credit to Ryan Oosthuysen, MD**

![Photo Credit to Ryan Oosthuysen, MD](https://www.amcharts.com/visited_countries/)
The vision of the Research Division is to advance the department’s currently successful program by fostering excellence, collaboration and the development of young investigators in anesthesiology.

In federal fiscal year 2017, the Vanderbilt University School of Medicine (VUSM) ranked 15th among U.S. medical schools for National Institutes of Health (NIH) funding, with more than $434 million in funding, and VUSM funding from all sources has more than doubled since 2001.

Anesthesiology investigators brought in more than $8 million in total extramural research funding. This included more than $47 million in awarded NIH grants, which placed Vanderbilt Anesthesiology 13th among U.S. academic anesthesiology departments in NIH funding.

Within the department, faculty published 284 papers in fiscal year 2018 up from 241 papers in fiscal year 2016, within the peer-reviewed literature. Anesthesiology clinical research centers include the Perioperative Clinical Research Institute (PCRI), Vanderbilt Anesthesiology Clinical Research Advisory Committee (VACRAC), Vanderbilt Anesthesiology & Perioperative Informatics Research (VAPIR).

PCRI provides a full range of services necessary for successful clinical research. These services include regulatory management, data management, contracts management, biostatistics, bioinformatics and financial oversight. The PCRI oversees more than 150 active clinical trials, with many more studies in development. The PCRI is directed by Vice Chair for Research Edward Sherwood, MD, PhD, and Director of Clinical Trials Research Debra Craven, MSN, MMHC. The team consists of highly trained and broadly experienced research professionals, including six research nurses, four clinical trial coordinators, a regulatory specialist and a budget analyst.

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

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

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

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

Stephan Bru Nehl, PhD, Professor of Anesthesiology, has identified pain-related alterations in interacting cardiovascular-pain modulation systems that can contribute to enhanced pain responsiveness. Eric Delpire, PhD, Professor of Anesthesiology, Molecular Physiology and Biophysics, Director of Basic Science Research and BH Robbins Director in Anesthesiology Research, utilizes genetically-modified mouse models and a variety of molecular techniques to investigate how neuronal Cl transporters modulate inhibitory synaptic transmission and how renal Na transporters and associated proteins regulate salt reabsorption and blood pressure.

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

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

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

Edward Sherwood, MD, PhD, Professor of Anesthesiology, Pathology, Microbiology and Immunology, Cornelius Vanderbilt Chair in Anesthesiology and Vice Chair for Research,
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 R. Randall Brenn, MD, director, and Jonathan Wanderer, MD, MPhil, associate director, designs, develops and implements system enhancements for the peri-procedural and inpatient care areas. The team supports vendor-based solutions to support the Vanderbilt Perioperative Consult Service. The VAPIR, led by Jonathan Wanderer, MD, MPhil, director, and Jesse Ehrenfeld, MD, MPH, Robert Freundlich, MD, MS, and B. Randall Brenn, MD, associate directors, is responsible for managing the Perioperative Data Warehouse, which contains full data from more than 1,000,000 procedures. The division collaborates internally and externally to strengthen its mission to improve patient care here and abroad. Students, residents and fellows can participate in seminars, journal clubs and a structured summer research training program. Experts in biomedical informatics and clinical research share their research at monthly seminars as visiting scholars. Among its many projects, VAPIR has:

- Extending and integrating our electronic OR status boards with Epic.
- Participating in the VUMC/Epic Collaborative to extend notification and communication functionality within Epic.
- Created the informatics backbone that supports the Vanderbilt Perioperative Consult Service.
- Analyzed the impact of real-time decision support tools created by the Perioperative Informatics team.
- Developed the informatics infrastructure that powered the data analysis for two large-scale pragmatic trials of crystalloid versus balanced salt intravenous solutions; the research study resulted in dual New England Journal of Medicine publications.
- Worked closely with Perioperative Informatics to develop a common data structure that make it feasible to analyze data seamlessly across our legacy VPMIS (Vanderbilt Perioperative Information Management System) and current eCure (Epic) system.
- Participated in the VUMC/Epic Collaboration and protocol development as well as managing the Perioperative Data Warehouse, which contains full data from more than 1,000,000 procedures.
- Worked closely with Perioperative Informatics to develop a common data structure that make it feasible to analyze data seamlessly across our legacy VPMIS (Vanderbilt Perioperative Information Management System) and current eCure (Epic) system.

The Vanderbilt Anesthesiology and PCRI comprises established researchers from the Division of Anesthesiology and PCRI. VAPIR is co-chaired by Edward Sherwood, MD, PhD, and Debra Craven, MSN, MMHC. The mission of the PCRI is to support high quality clinical research as a means of advancing the practice of anesthesiology, pain management and critical care medicine. The team provides a full range of support services, including study initiation and execution, regulatory pain management, data management, contracts management, biostatistics, biomedical informatics and financial oversight. The group, under the guidance of the Vanderbilt Anesthesiology Clinical Research Advisory Committee, supports the development of projects by providing feedback on study design and budget development. The end goal is execution of well-designed clinical research projects that answer important questions, with an eye toward publication in leading journals and at conferences. Clinical research within the department includes industry-sponsored, extramural grant funded and investigator-initiated clinical projects that focus on the advancement of medical practice in the fields of perioperative care, chronic pain and medical devices. Most of the department’s investigators are practicing physicians who use their clinical expertise to develop research protocols that answer clinically important questions.

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

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

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

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The PCRI oversees a multitude of randomized clinical trials and observational studies, with many more studies in development. The team consists of highly trained and broadly experienced research professionals, including six research nurses, four clinical trial coordinators, a regulatory specialist and a budget analyst.
CRISS investigators include anesthesiologists, cognitive psychologists, and systems engineers, with a focus on human factors and the application of cognitive science techniques, in order to improve patient care and reduce medical errors. Weinger, MD, is a recipient of the Gravenstein Award for "significant contributions to the field of medical error reduction throughout their career" by The Leapfrog Group. Matt Weinger, MD, is developing decision support for the emergency department, and is presenting to the emergency department for an open-label safety monitoring in prolonged intubated intensive care unit patients. Shilo Anders, PhD, is a highly interdisciplinary and collaborative, with projects spanning numerous clinical domains and disciplines.

Using a range of human factors, usability and systems engineering, cognitive psychology, and implementation science techniques, CRISS studies performance during patient care and in real-time simulations to better understand how and why care deviations from optimal plans are proposed to improve the safety and quality of care. CRISS investigators include philosophers, researchers, nursing and design staff, and faculty colleagues who are involved in evaluating practical innovations in quality improvement, including conducting formative usability testing of VUMC software applications, and of medical devices being considered for purchase.

CRISS continues to be involved in projects that re-engineer critical medical processes, enable clinicians and handovers decision making processes, and redesign clinical information technologies. CRISS has been instrumental in assisting the Department of Veterans Affairs to develop, test, and implement decision support modules in the national EHR system, and is also helping to develop the VA’s User Experience Guide as a website.

Shilo Anders, PhD, is a full-time faculty member at the School of Engineering, and in the School of Medicine. Shilo Anders, PhD, is a full-time faculty member at the School of Engineering, and in the School of Medicine.

Stue Adams, JD, is the Chief of Research and Innovation at VUMC. Stue Adams, JD, is the Chief of Research and Innovation at VUMC.

Jessica M. Flamand, MD, is using natural language processing to identify EHR content that is relevant to patient care and analyze the outcomes of intervention and care improvement. She is using natural language processing to identify EHR content that is relevant to patient care and analyze the outcomes of intervention and care improvement.

Brian Altshuler, MD, is the Director of the Project Integrating Electronic Health Records and Clinical Trials (PHRCT) at Vanderbilt University Medical Center (VUMC). Brian Altshuler, MD, is the Director of the Project Integrating Electronic Health Records and Clinical Trials (PHRCT) at Vanderbilt University Medical Center (VUMC).

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Curtis Baysinger, MD, is a board-certified anesthesiologist in the Department of Anesthesiology and Pain Medicine at Vanderbilt University Medical Center. Curt Baysinger, MD, is a board-certified anesthesiologist in the Department of Anesthesiology and Pain Medicine at Vanderbilt University Medical Center.

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This is an open-label phase I study of the efficacy and safety of six different interventions in postoperative pain control and outcomes.

The Global Burden of Pain Evaluation Study in Mozambique.

Cardiac Events: A Phase II Prospective Randomized Controlled Trial to Study the Efficacy and Safety of Clinical Productivity Incentive Program Versus New Sepsis Definitions.

The Usability of Clinical Research Studies).

Reduction of Perioperative Major Adverse Cardiac Events: A Phase II Prospective Randomized Controlled Trial to Study the Efficacy and Safety of Clinical Productivity Incentive Program Versus New Sepsis Definitions.

Bantayehu Sileshi, MD, is the Director of the Division of Pain Medicine at Vanderbilt University Medical Center. Bantayehu Sileshi, MD, is the Director of the Division of Pain Medicine at Vanderbilt University Medical Center.

Weinger, MD, is a highly interdisciplinary and collaborative, with projects spanning numerous clinical domains and disciplines.

Using a range of human factors, usability and systems engineering, cognitive psychology, and implementation science techniques, CRISS studies performance during patient care and in real-time simulations to better understand how and why care deviations from optimal plans are proposed to improve the safety and quality of care. CRISS investigators include philosophers, researchers, nursing and design staff, and faculty colleagues who are involved in evaluating practical innovations in quality improvement, including conducting formative usability testing of VUMC software applications, and of medical devices being considered for purchase.

CRISS continues to be involved in projects that re-engineer critical medical processes, enable clinicians and handovers decision making processes, and redesign clinical information technologies. CRISS has been instrumental in assisting the Department of Veterans Affairs to develop, test, and implement decision support modules in the national EHR system, and is also helping to develop the VA’s User Experience Guide as a website.

Shilo Anders, PhD, is a full-time faculty member at the School of Engineering, and in the School of Medicine. Shilo Anders, PhD, is a full-time faculty member at the School of Engineering, and in the School of Medicine.

Stue Adams, JD, is the Chief of Research and Innovation at VUMC. Stue Adams, JD, is the Chief of Research and Innovation at VUMC.

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BH Robbins Scholars

The Benjamin Howard Robbins Scholar Program began in 2007 to support the professional development of young clinician-scientists pursuing extramurally funded research in critical care medicine and related critical care skills under the mentorship of an established scientist who has himself been a renowned physician-scientist. The BH Robbins Scholars Program is multidisciplinary encouraging and supporting mentor-ship and collaborations that extend far beyond the traditional boundaries of anesthesia.

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

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

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

Christina Bonsy, MD (Scholar 2018-2020), is currently investigating prescribing patterns of antipsychotic medications for the treatment of ICU delirium and their impact on patient outcomes through the T23 research training grant. Her long-term re-search interests include identification, man-agement and de-escalation of potentially inappropriate medications administered during and after critical illness. Bonsy is mentored by Christopher Hughes, MD, and Pratik Pandharipande, MD, MSCI.

Michael Chi, MD, (Scholar 2015-2018), is currently studying the application of reactive oxygen species (ROS)-respon-sive microphones for targeted anti-in-flammatory therapy of chronic neuro-pathic pain. Chi is mentored by Jerod Denton, PhD, Craig Duvall, PhD, David Edwards, MD, PhD, Edward Sherwood, MD, PhD, and Ronald Wiley, MD, PhD.

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

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

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

Puneet Mishra, MD, (Scholar 2016-2019), is currently the principal investigator for a randomized control trial examining the efficacy of preoperative geniculate nerve re-distribution ablation in reducing pain and improving functional outcomes in patients undergoing total knee arthroplasty. Over the course of this year, Mishra plans to conduct a second randomized control trial investigat-ing the effectiveness of preoperative transmural epidural injections with clonidine as well as dexamethasone in reducing back and radiculopathic pain in patients under-going a single level lumbar discectomy. Mishra is mentored by Stephen Bruehl, MD.

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

Loren Smith, MD, PhD, (Scholar 2016-2018), has identified an association that has been identified in preliminary cross-sectio-nal analysis. She also has an interest in HIV-associated metabolic dysfunction. Zola’s primary mentor is Evan Brittain, MD, MSCI.

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

Many of these are a direct result of philanthro-py and sponsorship from generous donors from current department members and other program supporters. Funding is provided by private donors, who want to better-ment improve the academic life of the Vanderbilt Depart-ment of Anesthesiology.

Dr. James Phythyon Endowed Lectureship

The endowment for this lectureship was established by the family of Dr. James Phythyon, a founding member of the Pediatric Anesthesiology Division. Dr. Phythyon’s wife, Mary Phythyon, and the couple’s daughters, Mary Neal Medearis, Elizabeth Donner and Sarah Miller, are strong department supporters.

The Sandidge Pediatric Pain Management Endowed Fund

Sandidge Endowed Pain Management Fund is used for the advancement of research in pediatric pain. The Williams Pediatric Pain Management Endowed Fund is dedicated to the study of pain management in children.

The Dila Vukanovic Memorial Fund for Resident Education

Pediatric anesthesiologist Dila Vukanovic, 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 untimely death in 2009, her family, husband, Jacques Heibig, MD, and the couple’s daughters, Mary Neal Medearis, Elizabeth Donner and Sarah Miller, are strong department supporters.

Dr. Bradley E. Smith Endowed Lectureship on Medical Professionalism

Former chairman Bradley E. Smith, MD, de-fined what it means to be a true professional, emphasizing what medical profes-sionalism was intended to bring totrainees on medical professionalism as applied to the practice of anesthesia.

Dr. Charles Beattie Endowed Lectureship

Endowed Lectureship established by Dr. Warren Sandberg, the Beattie Lectureship is intended to bring innovators in anesthesiology from unique backgrounds and compelling world views to Vanderbilt as visiting professors.
A profile of surgical burden

Leadership in the Profession

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2017; 57:3035-9
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Delpire appointed the B.H. Robbins Directorship

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

Delpire explained that neurons communicate using electric signals which are generated from the movements of ions across neuronal membranes. In the nervous system, there is constant balance between excitation and inhibition. Excitatory signals lead the brain to do things while inhibitory signals tend to stop them. “I am interested in the inhibition part. When you increase too much the inhibitory part, you get sedation or even anesthetics,” he said.

With the endowment, people will be able to do things while inhibitory signals tend to stop them. Delpire is one the most influential and dynamic scientists in his field,” Sandberg said. “He works at a foundational level that creates systems allowing other investigators to advance science using tools that Delpire developed, certainly for his own use, but also for others.”

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

On Feb. 27, 2018, The New England Journal of Medicine published a research study conducted by a team at Vanderbilt University Medical Center which found that patients who received a balanced fluid that closely resembled the liquid part of the blood have better outcomes than patients who receive a saline solution containing sodium chloride. The team examined more than 15,000 intensive care patients and more than 13,000 emergency depart- ment patients who were assigned to receive saline or balanced fluids if they required intravenous fluids. If that sounds to you like it would be a lot of data to analyze, you would be correct. Thankfully, the team was familiar with these types of data. “I think we have a good reputation for doing this work done on a daily basis by the VAPIR team, whether big or small, is pleasing and satisfying when they can see improvements to patient care.”

In particular, Delpire said he studies how specialized transporters that take the salt back into the blood. The result is high blood pressure. There are specialized transporters that take the salt back into the blood. When too much salt is reclaimed, the kidney filters salt from the blood into the urine and then reclaims it. When too much is reclaimed, the result is high blood pressure. Delpire explained that while there are many transporters in acute care, as well as perioperative areas, and in the future is really embracing this approach to pragmatic clinical trials and helping to fuel the vision in becoming a learning healthcare system,” he elaborated.

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

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

The project has received a lot of attention, from the media to the public. “It’s really cool to see a project that has taken the number of years it has taken to have that outcome after the end where you are seeing the benefits of it or reading about the benefits of IC McCarthy said.

The Vanderbilt Anesthesiology & Perioperative Informatics Research (VAPIR) Division was a part of this study. Led by Jonathan Wanderer, MD, MPH, the team took on the task of writing the code that extracted the data needed for the study. According to Wanderer, the code generated a massive data set on a weekly basis and it required a lot of work to make sure the output was correct, comprehensive and formatted in a way that would allow for statistical analysis in an easy way.

Senior Database Administrator Karen McCarthy explained that the unique challenge of this project was the amount of time it spanned. The project started in 2013 and grew, requiring multiple code revisions. “Even though we keep on our code and documentation with it, when somebody leaves, some knowledge leaves as well. When somebody new picks it up, it takes some time for them to get into the project,” she said. Other challenges included pulling information from multiple sources and reaching out to different areas for information.

Business Intelligence Analyst Frank Allee said that the team collaborated to check the integrity of the data upon export. His role specifically was to review the revisions made, make changes to the code accordingly and ensure the data were exported correctly.

The team had to perform a lot of data analysis and understand where data is missing or potentially erro-

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

Delpire appointed the B.H. Robbins Directorship in Anesthesiology Research, one of the newly formed endowed directorships at Van- derbilt University Medical Center. His endow- ment was celebrated on Monday, Jan. 22, 2018.

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Department assists with EpicLeap

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

“I think we can say across the entire department that we’re just so proud of how people share that and it doesn’t have to be reentered. Into the patient’s record, everyone is able to into the patient’s record, everyone is able to...” Dunworth explained that people knew this was going to be a mountain to climb over and everybody had the right mindset to figure this out together.

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

As for the next steps after the launch of eStar, Dunworth said it is time for polishing. He elaborated that people knew this was going to be a mountain to climb over and everybody had the right mindset to figure this out together.

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

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

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

Jesse Ehrenfeld, MD, MPH, served as Special Advisor to the Surgeon General as well as the site lead for the visit. To prepare, Ehrenfeld said he worked with his team to arrange opportunities for Adams to learn about VUMC and included our strategies around population health, advancing health equity, and responding to the national opioid crisis. I also worked closely with the Department of Health Policy to coordinate his public talk on combatting the opioid crisis. David Edwards, MD, PhD, and Leslie Fowler, MD, attended a meeting titled “Opioid Abuse Research, Public Policy, and Provider Education,” which discussed the ongoing efforts, projects, and initiatives VUMC is working on surrounding the opioid crisis in Middle Tennessee and the United States. Edwards said he shared some of VUMC’s strategies for treating peripartum pain and adictions and that patients are screened for risk of poor outcomes related to opioid addiction.

Fowler discussed a project called “Function First, Opioids Last” using the QuizTime application. This program delivers Continuing Medical Education credit to physicians for interacting with questions and content surrounding important clinical topics like opioid prescribing. One important outcome is that retention of the content may result in clinician behavior changes and better prescribing practices.

Ehrenfeld said working with a highly visible surgeon general is a great opportunity for members of the department to present United States Surgeon General Dr. Jerome Adams speaks to a small group prior to speaking at Langford Auditorium. Photo Credit to Joe Howell and Vanderbilt University Medical Center.

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Department of Anesthesiology 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