Table of Contents

Message from the Chair ................................................................. 2
Department Overview ................................................................. 3
Department Leadership ............................................................... 4
Administrative Staff ................................................................. 5
Endowed Lectureships & Awards ................................................ 6

OUTREACH

Reaching the World with Training & Compassion ....................... 8
Regional Anesthesia Initiative Improves Care in Kenya ............... 10
Pediatric Anesthesiologists have a Guatemala Connection .......... 11

CLINICAL CARE

Clinical Overview .................................................................... 12

   Creative Doctors Keep Burnout at Bay ......................... 13
Division of Ambulatory Anesthesiology ............................. 15

   Study Screens Patients at Risk for OSA ...................... 16
Division of Anesthesiology Critical Care Medicine ............... 17
Division of Cardiothoracic Anesthesiology ......................... 18

   Patients Benefit from TEE, Inside OR and Out .............. 19
Certified Registered Nurse Anesthetists ............................... 20

   Anesthesia Technicians Provide Critical Support ............ 21
Division of Multispecialty Adult Anesthesiology ...................... 22

   Neuroanesthesiology Expands to Meet Demands .......... 23
Division of Obstetric Anesthesiology .................................. 24
Division of Pain Medicine .................................................... 25
Division of Pediatric Anesthesiology ................................. 27

   Family Finds Hope After Playground Trauma ............... 28
   Scanning Efficiently, with Families in Mind ................. 29
Division of Pediatric Cardiac Anesthesiology ...................... 30

   Proactive Team Reduces Unneeded Transfusions ............ 31

Vanderbilt Preoperative Evaluation Center (VPEC) .................. 32
Veteran’s Affairs Anesthesiology Service ........................... 33

EDUCATION

Office of Educational Affairs .................................................. 34
Educational Courses & Conferences ....................................... 35
Acknowledging Excellence .................................................... 36

RESEARCH

Research Overview ................................................................. 38
Labs Focus on Translational Science ...................................... 39

   BH Robbins Scholars Excel ....................................... 41
Key Clinical Research Studies, 2010-2011 ............................ 43

   Physician-Scientists Thrive at Vanderbilt ...................... 44
   Putting the Power of Technology into Practice ............ 45
Perioperative Clinical Research Institute (PCRI) ..................... 47

   Research Symposium Highlights Investigators ............ 49
Center for Research and Innovation in Systems Safety (CRISS) ................................................................. 51
Selected Publications, 2010-2011 ........................................ 52
Achieving Balance ............................................................... 59

Vanderbilt Anesthesiology

Established 1946
The academic year 2010-2011 has been one of exciting growth and transformation for the Vanderbilt University School of Medicine’s Department of Anesthesiology. Overall, the Department is vibrant and strong, and we are well prepared to face the challenges that the changing healthcare economy will surely place before us.

The Department is excelling in all areas of our three-fold mission:

• Practicing excellent perioperative medicine
• Providing top-notch education for our medical students, residents and fellows
• Conducting cutting-edge basic, translational and clinical research

Our Department has one of the largest clinical programs in the country, covering more than 90,000 adult and pediatric anesthetic encounters annually at more than 90 anesthetizing locations. We cover critical care, pain management and all perioperative anesthesia needs. Vanderbilt University Hospital is the region’s only Level I Trauma Center. Additionally, we have an active high-risk obstetrics program, a busy Transplant Center, and the region’s only pediatric referral hospital. All of these services and centers of excellence are growing, and the Department is developing to meet their needs.

Responding to growing demand for ambulatory procedures, we added an off-site service location at Vanderbilt Bone & Joint in 2011. We also consolidated our Pain Medicine services under a new Division Chief who will develop and lead Vanderbilt Anesthesiology’s comprehensive services for both acute and chronic pain.

Our patient safety focus broadened with the formation of the Center for Research and Innovation in Systems Safety (CRISS) which conducts basic and applied research in healthcare informatics, patient safety and clinical quality, and designs and evaluates informatics user interfaces, care processes and medical technology across VUMC. In 2011, we also formed the Perioperative Data Systems Research (PDSR) group to leverage our wealth of historical data. The PDSR also reports to each clinician an “optimum care score” – the proportion of their patients who received every one of a predefined list of best-practice interventions.

To support clinicians in their pursuit of patient care excellence, we have also redoubled our development of cutting-edge perioperative information systems. In 2011 we continued development and deployment of our internally-developed OR Vigilance™ and VigiVU™ applications. These applications provide increased transparency and situational awareness for clinicians by making data visible and pushing it – literally – to the clinician’s hand.

Our educational programs continue to excel. In the 2011 National Residency Match, the Department received 798 applications for 15 positions. After interviewing 122 outstanding medical students, the program successfully filled all 15 positions from the top 40 students on its Match list, including five of the top ten.

Over the past year, the Department has added to its already vibrant academic portfolio. We nurture enterprising young researchers through the innovative BH Robbins Scholars Program, and we are home to leading basic science researchers in pain mechanisms and channel biology. The Department also makes a major material investment in research support for its faculty, in part through a robust Perioperative Clinical Research Institute which provides complete support for clinical research. Finally, the Department celebrates academic anesthesiology broadly defined to include the arts as well as the sciences.

In the 2010-2011 academic year, our faculty produced more than 150 publications, including three books, 59 book chapters and more than 80 original manuscripts. At the 2011 Annual Meeting of the American Society of Anesthesiologists, Department members contributed 126 unique entries.

The Vanderbilt Department of Anesthesiology is in a great position at the end of this academic year. We are excelling in patient care, providing superb education across the whole anesthesia curriculum and advancing research and academic inquiry across all fronts. We proactively seek innovative ways to provide the best possible care for patients with the smartest use of our advanced resources and technology. Through its successes, our Department is positively influencing the future of our specialty as a whole.

Message from the Chair

Warren S. Sandberg, MD, PhD
Chair, Department of Anesthesiology
Vanderbilt University School of Medicine

Over the past year, the Department has added to its already vibrant academic portfolio. We nurture enterprising young researchers through the innovative BH Robbins Scholars Program, and we are home to leading basic science researchers in pain mechanisms and channel biology. The Department also makes a major material investment in research support for its faculty, in part through a robust Perioperative Clinical Research Institute which provides complete support for clinical research. Finally, the Department celebrates academic anesthesiology broadly defined to include the arts as well as the sciences.

In the 2010-2011 academic year, our faculty produced more than 150 publications, including three books, 59 book chapters and more than 80 original manuscripts. At the 2011 Annual Meeting of the American Society of Anesthesiologists, Department members contributed 126 unique entries.

The Vanderbilt Department of Anesthesiology is in a great position at the end of this academic year. We are excelling in patient care, providing superb education across the whole anesthesia curriculum and advancing research and academic inquiry across all fronts. We proactively seek innovative ways to provide the best possible care for patients with the smartest use of our advanced resources and technology. Through its successes, our Department is positively influencing the future of our specialty as a whole.
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 and scientific discovery.

Vanderbilt Anesthesiology is also:

- a national leader in developing and applying new technologies – often developed in-house by our own physicians – to improve the effectiveness and safety of perioperative patient care.
  - These include electronic medical record keeping, automated real-time decision support and smart phone-based OR transparency software.
- well-represented on the editorial boards of major anesthesia journals;
- a noted presence at the Annual Meeting of the American Society of Anesthesiologists and at national anesthesiology subspecialty conferences;
- home to a number of NIH-funded principal investigators and six Board Examiners for the oral exams of the American Board of Anesthesiology.

In addition to our Department’s achievements, recent accolades for Vanderbilt’s medical program are many:

- In April 2011, VUMC was recognized for the 12th consecutive year as one of the top 100 hospitals in the country in a study by Thomson Reuters Healthcare.
- Vanderbilt University School of Medicine ranks 15th out of 126 accredited medical schools, according to U.S. News and World Report’s ranking of graduate education programs and health disciplines released in April 2011.
- U.S. News and World Report’s annual rankings for America’s Best Children’s Hospitals placed Monroe Carell Jr. Children’s Hospital at Vanderbilt among the top 30 children’s hospitals in the United States in five pediatric specialty categories.
- For the seventh consecutive year, Vanderbilt University Medical Center is among the nation’s 100 “Most Wired” hospitals and health systems, according to the 2011 Most Wired Survey and Benchmarking Study conducted by Hospitals and Health Networks magazine.
- Vanderbilt University Medical Center is ranked as one of the nation’s leading health care providers by U.S. News and World Report in the publication’s annual “America’s Best Hospitals” released in July 2011, achieving a best-ever No. 14 ranking.
- Vanderbilt University Hospital was ranked among the nation’s 65 Leapfrog Top Hospitals for 2011, the only Tennessee hospital that made the list.
- Vanderbilt was named one of the best places for life scientists to work in academia in a 2010 ranking by The Scientist magazine. Vanderbilt ranked No. 12.

Department Overview

Dr. Warren S. Sandberg
(April 2010-present)

Dr. Michael S. Higgins
(2004-March 2010)

Dr. Jeffrey R. Balser
(2001-2004)

Dr. Charles Beattie
(1994-2001)

Dr. Bradley Edgerton Smith
(1969-1993)

Dr. Charles Bernard Pittinger
(1962-1969)

Dr. Benjamin Howard Robbins (1946-1961)
Department Leadership

**Vice-Chairmen**

- Frank Rosato, Vice-Chair for Administration
- William Furman, MD, Vice-Chair for Clinical Affairs
- John Algren, MD, Vice-Chair for Educational Affairs; Acting Vice-Chair for Pediatric Affairs
- Matt Weinger, MD, Vice-Chair for Faculty Affairs

**Division Chiefs**

- Shannon Hersey, MD, Division of Ambulatory Anesthesiology
- Lee Parmley, MD, Division of Anesthesiology Critical Care Medicine
- Robert Deegan, MD, Division of Cardiothoracic Anesthesiology
- James Berry, MD, Division of Multispecialty Adult Anesthesiology
- Curtis Baysinger, MD, Division of Obstetric Anesthesiology
- Marc Huntoon, MD, Division of Pain Medicine
- Ira Landsman, MD, Division of Pediatric Anesthesiology
- Suanne Daves, MD, Division of Pediatric Cardiac Anesthesiology

**Certified Registered Nurse Anesthetists**

- Ann Walia, MD, Division of Veteran’s Affairs Anesthesiology
- Steve Blanks, MCM, Chief CRNA
- Buffy Lupear, MS, Assistant Chief CRNA
Administrative Staff

The Vanderbilt Department of Anesthesiology’s administrative and research staff members provide critical support for every division of the Department. From personnel who manage clinical scheduling and payroll, to personnel who provide research support and perform general administrative duties, each division of the department has assigned administrative staff members. There are approximately 40 administrative staff members and 25 research staff members. These individuals are vital to successfully achieving the Department’s three-fold mission of practicing excellent perioperative medicine; providing exemplary education for our medical students, residents and fellows; and conducting cutting-edge basic, translational and clinical research.

The Vanderbilt Department of Anesthesiology hosts several special lectureships throughout the year and presents distinct recognitions to Department members who have provided exemplary service to patients or colleagues. Many of these lectureships and awards are supported by philanthropy from our alumni, as well as from current department members and other program supporters. Fortunately, such “seed” funding is within the reach of many private donors, whose gifts materially improve the academic life of the Vanderbilt Department of Anesthesiology.

“We are very appreciative of our many donors who support our Department,” said Chairman Warren Sandberg, MD, PhD. “Through these gifts we are able to establish and strengthen programs; support innovative research endeavors; and advance the education and continued betterment of our faculty, staff and students.”

In 2011, Dean Andropoulos, MD, MHCM, Chief of Anesthesiology at Texas Children’s Hospital presented a well-received Grand Rounds lecture on “Anesthesia for Non-cardiac Surgery in the Patient with Congenital Heart Disease.” Past Phythyon Lectureship speakers include: Shobha Malvia, MD, of The University of Michigan Health System; Philip Morgan, MD, of the University of Washington and Seattle Children’s Hospital; Francis X. McGowan Jr., MD, of the Children’s Hospital Boston; Peter Davis, MD, of the Children’s Hospital of Pittsburgh; and Myron Yaster, MD, of Johns Hopkins University School of Medicine.

Dr. James Phythyon Endowed Lectureship in Pediatric Anesthesiology

For the past six years, the Dr. James Phythyon Endowed Lectureship in Pediatric Anesthesiology has brought renowned experts in the field to Vanderbilt’s campus as visiting professors. At a special Grand Rounds lecture, these experts share their research findings and expertise with the Department. During their visit, the speakers also meet with residents and fellows for small group teaching sessions and informal discussions. The lectureship was established by the family of Dr. James Phythyon, a founding member of VUMC’s 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 supporters of the Department. Each year, they attend the lecture and other events in honor of Dr. Phythyon.

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. An anesthesiologist for 30 years, Dr. Sandidge recognized how lacking her early training had been in controlling pain for the youngest of patients when her grandson was born with a painful form of osteogenesis imperfecta. He lived just one day, but Sandidge realized then that pain control provided infants something irreplaceable: the opportunity to be held comfortably by the people who love them for the few precious moments they have.
The second annual Sandidge Pediatric Pain Management Award recognized Stephen Hays, MD, FAAP, Associate Professor of Anesthesiology & Pediatrics and Director of Pediatric Pain Services, for his outstanding clinical work in pediatric pain management and leadership of the growing pediatric pain services at Children’s Hospital. Dr. Hays presented a special Grand Rounds: “Should Regional Anesthesia be First-line Therapy for Complex Regional Pain Syndrome in Children?”

Dila Vuksanaj Memorial Fund for Resident Education

Pediatric anesthesiologist Dila Vuksanaj, MD, practiced at Children’s Hospital for 13 years, dedicating herself to both 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. The fund is used to present an annual award to the anesthesiology resident who demonstrates the best overall performance in pediatric anesthesiology. In 2011, Justin Sandall, DO, received the Vuksanaj Award for his outstanding service. Elizabeth Lee, MD, was the first recipient of the award in 2010.

Dr. Bradley E. Smith Endowed Lectureship on Medical Professionalism

Throughout his more than four decades of practice and leadership, former Anesthesiology Department 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.

As chairman of the Department for nearly 25 years, Dr. Smith was a national leader in the development of anesthesia subspecialties and was a cofounder of the Society for Obstetric Anesthesia and Perinatology (SOAP), as well as the Society for Technology in Anesthesia (STA). He also represented the state of Tennessee on the ASA Board of Directors for many years.

Peter McDermott, MD, PhD, past president of the American Society of Anesthesiologists, was the guest speaker in 2011, and he addressed “The Changing Face of Medical Professionalism in the Practice of Anesthesiology.” Dr. Joseph Gerald “Jerry” Reves, Dean of the College of Medicine at the Medical University of South Carolina (MUSC), was the inaugural guest speaker for this lecture.
Vanderbilt’s Department of Anesthesiology has extended its mission of providing education in safe anesthesia practice to underserved populations around the world. In 2007, the Department developed a global health vision that involved service, education and research. This provides the foundation for Vanderbilt International Anesthesia (VIA), an initiative which allows faculty, trainees and staff to have global anesthesia involvement. VIA is led by Mark Newton, MD, a Vanderbilt pediatric anesthesiologist.

“We have successfully positioned our department to lead in global anesthesia development from our home base at Vanderbilt,” said Department Chairman Warren Sandberg, MD, PhD. “It is rewarding to know that our efforts have a definitive impact on the provision of safe, effective anesthesia in parts of the world where people often die due to the lack of basic medical care. Going overseas to both train and be trained is invaluable to our residents and fellows, and they typically come back from VIA missions changed doctors. They gain experiences there that cannot be learned from a textbook or from our clinical environments in the United States.”

Working in partnership with the Vanderbilt Institute of Global Health (VIGH), VIA has sent residents, fellows, and faculty to areas including Haiti, Guatemala, Vietnam, Jamaica, and East Africa (Kenya) for the past four years in order to improve anesthesia provision in these areas. Using ‘teach a man to fish’ approaches, Vanderbilt clinicians have provided education to anesthesia care providers in Kenya, Guatemala, Jamaica and Vietnam through locally organized seminars.

Vanderbilt residents in their CA-3 year can participate in an ACGME-approved, one-month, international anesthesia rotation at Kijabe Hospital in Kenya. The program provides a unique educational experience unlike any other found in U.S. academic anesthesiology training programs. In academic year 2010-2011, six residents participated. Each resident learns through experience that clinical skills must be sharpened to compensate for lack of technology and supplies. The residents also provide clinical training and give classroom lectures to local medical providers. The nurse anesthetist training program in Kenya continues to expand under Dr. Newton’s leadership, with now up to 20 students per class. After
Anesthesiology Resident Shane Volney, MD, instructs a Kenyan anesthetist on how to perform an ultrasound-guided femoral nerve block for a patient undergoing a total knee replacement.

Donated supplies and equipment are a key factor in the success of VIA programs across the globe. Here, Mark Newton, MD, and others unload equipment for Kijabe Hospital in Kenya.

graduation, these students will provide anesthetic care in remote areas of Africa.

“Perhaps the most important thing to me about this rotation is that it reminded me of why I went into medicine,” said Kristalynne Godwin, who travelled to Kenya as a resident. “I remembered why I want to study hard and become an excellent doctor.”

“Over the next year, we hope to strengthen bonds with the University of Nairobi and develop a research base focusing on anesthesia and ICU care,” said Dr. Newton. “We also plan to provide leadership in a Pediatric Anesthesiology Fellowship for East Africa, which will be the first fellowship of any kind in East Africa.”

“These are exciting times for our department, and our leadership in global health continues to attract some of the brightest residents and fellows who want to impact the world with their specialty training,” said Dr. Sandberg.
After only two years, the VIA Regional Anesthesia and Acute Pain Initiative is thriving in Kijabe, Kenya, providing patients a safe alternative to general anesthesia and postoperative narcotics. The initiative was begun under the leadership of Dr. Randall Malchow to train anesthesia providers living in East Africa and elsewhere in the Third World in regional anesthesia and analgesia techniques.

“There is not another academic program in the world which has a regional anesthesia initiative in low-income countries, like our program in Kenya,” said VIA Director and pediatric anesthesiologist Mark Newton, MD. “This work in regional anesthesia will directly save lives every day. Local students receiving regional anesthesia training will cover the country of Kenya and train the next generation of health care providers in these critical modalities.”

Kijabe Hospital, where Dr. Newton established the first Kenyan training program for nurse anesthetists, has steadily become a highly respected regional hospital, with patients from neighboring Somali, Sudan, and Ethiopia traveling many miles on primitive roads for treatment. In October 2010, a new OR suite was built at Kijabe, bringing the number of “theatres” to eight ORs and an endoscopy procedure room. In addition to orthopedic surgeries, a surprising number of pediatric urologic surgeries and pediatric neurosurgeries (spina bifida, shunts for hydrocephalus, etc.), along with many gynecologic/obstetric procedures are performed at Kijabe Hospital.

In June 2011, a Vanderbilt team led by Dr. Malchow travelled to Kijabe to provide acute pain procedure education, training and clinical care. Clinical care focused primarily on orthopedic patients and critical care medicine, with time split between the OR theatres and the ICU. The staff anesthetists and student anesthetists at Kijabe embraced the new anesthesia modality, and its efficacy was quickly demonstrated.

One case of note was a 10-year-old boy named Reuben who required a huge forequarter amputation for a large osteosarcoma of the shoulder. After discussing analgesia options with the orthopedic team, Vanderbilt anesthesiologists scrubbed in with the surgeons and inserted a pain catheter directly into the severed brachial plexus under direct visualization. In addition to the brachial plexus catheter, which was bolused once daily with bupivacaine for five days, Reuben was prescribed scheduled paracetomol and ibuprofen.

“Reuben had virtually no pain after the extremely invasive operation and essentially avoided postoperative narcotics,” said Dr. Malchow. “Each day when Reuben was evaluated, he and his mother were smiling and looking forward to his future. This child’s contentment and unbelievable attitude were inspirational to everyone involved!”

Vanderbilt anesthesia providers donated $14,000 to the VIA Regional Anesthesia and Acute Pain Fund, with the first priority being the purchase of a high-resolution ultrasound machine. A durable, portable machine was purchased with two probes: a linear probe for superficial structures and a second probe for deeper structures, including echocardiography and FAST (Focused Assessment with Sonography in Trauma) exams. When the new machine was delivered to Kijabe in June 2010, it significantly expanded the ability to diagnose and treat patients.

Multiple vendors have donated specialized equipment and supplies to support this charitable effort. The Nashville Surgery Center donates Intralipid each year to provide protection in the event of local anesthetic toxicity. Hundreds of pounds of medical supplies also have been donated and delivered to Kijabe by Vanderbilt.
Anesthesiology residents, Regional Anesthesia fellows, and faculty, including new textbooks, neurosurgical disectors, stethoscopes, sterile sutures, adult and pediatric laryngoscope handles and blades, pulse oximetry probes and cables, blood pressure cuffs, endotracheal tubes and styles, and anesthesia circuits (sterilized and reused in the Third World).

Kijabe Hospital’s Regional Anesthesia and Acute Pain practice continues to develop, and more than 30 staff and student KRNAS have now had some training in advanced regional anesthesia and acute pain techniques. More than 200 peripheral blocks and an increasing number of postoperative analgesia catheter insertions were performed at Kijabe over the past year.

“Our hope is that Kijabe Hospital may become a ‘center of excellence’ in regional anesthesia and acute pain management in East Africa, decreasing perioperative morbidity, mortality, and needless suffering in that region,” said Dr. Malchow.

The new facility was the vision of the Shalom Foundation, a Franklin-based non-profit humanitarian aid organization. Children’s Hospital has offered support to the foundation over the years to help give children access to quality medical and surgical care. The center will serve as the base for all future surgeries during mission trips. The new surgery center has three operating rooms and beds for pre-operative preparation, intensive care and recovery.

Vanderbilt Anesthesiology staff on hand in Guatemala City for the opening included: Ira Landsman, MD, chief of Pediatric Anesthesiology; Chris Karsanac, MD, assistant professor of Anesthesiology; and Veronica Nylander, CRNA.
As 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 90,000 adult and pediatric patient encounters annually at more than 90 anesthetizing locations. More than 4,000 patients are seen annually in the Vanderbilt Interventional Pain Center, and approximately 20,000 Vanderbilt adult and pediatric patients receive an anesthetic during a radiologic, gastrointestinal, or other diagnostic or therapeutic procedure.

Our faculty, residents, fellows, Certified Registered Nurse Anesthetists (CRNAs), and nurse practitioners provide care in five adult intensive care units, the pediatric and neonatal intensive care units, and perform approximately 4,000 anesthetics per year in the labor and delivery suite. The inpatient arm of the Vanderbilt Preoperative Evaluation Clinic (VPEC) completed more than 5,000 preoperative assessments in 2010. Also, VPEC clinicians evaluated more than 18,000 patients in clinic, or approximately 60% of all on-campus adult surgical patients.

Our outstanding faculty, residents, fellows, nurse anesthetists, and nurse practitioners provide services in three hospitals (Vanderbilt University Hospital, Monroe Carell Jr. Children’s Hospital at Vanderbilt, and the Nashville Veterans Administration Hospital) and five outpatient facilities. We provide the full range of anesthetic techniques and procedures in the operating rooms, procedural suites, intensive care units and pain management clinics. All surgical specialties are represented, including adult and pediatric cardiac surgery, all types of solid-organ transplantation, robotic surgery, neurosurgery, and high-risk obstetrics. Our trauma service, which includes our orthopedic trauma program, is among the busiest in the nation.

Our operating room staff practices 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. By means of this model, we deliver the highest quality care in a safe and effective manner using the unique skills of all team members.

Our department is also known for innovation in the use and development of new technologies to both deliver and improve patient care and to improve our educational offerings. We use advanced human patient simulators to teach basic anesthesia skills, critical event response techniques, and team management in the operating rooms and intensive care units. We are one of the few medical training centers with a 3-D TEE simulator to teach the essential skill of cardiac ultrasound. The medical information systems at Vanderbilt are second to none and support the delivery of safe and efficient patient care. Perioperative record keeping is highly automated and managed through an anesthesia information management system developed by our department. This system both enhances effective patient care and supports our clinical research program.

Highlighted on the following pages are the services provided by the Vanderbilt Department of Anesthesiology’s clinical divisions.
It’s Dr. Brett Campbell’s “reset” button. Dr. Stephen Harvey calls it a necessary “stress reliever.” Dr. Steve Hyman admits it’s his passion.

The trio of Vanderbilt anesthesiologists accept, even relish, the stress of their “day” jobs. They also are quick to credit the arts for helping them cope and thrive in demanding careers as academic anesthesiologists at a high-acuity referral hospital. Harvey writes poetry, applying a love of words to tell precisely executed stories of life, suffering and dreams. Campbell uses bold colors to create striking Warhol-flavored posters – “anesthesia propaganda,” as he says – aimed at entertaining and educating his colleagues. Hyman’s piano performances help make him whole: “I do medicine to support my music.”

By day, these doctors help save lives with skilled hands and quick, educated actions.

“There are big stress inducers in this job,” says Campbell, 29, a chief resident, whose next career step is a critical care fellowship at VUMC. “No. 1 is the acuity of the illness you see in patients. Nobody is normal under anesthesia – nobody. And it can lead to a lot of bad things, with dramatic changes in physiology. Being able to rapidly recognize those changes, and then rapidly intervene in just the right way is one of the challenges.”

Harvey, 36, paints a similar picture. “A good day is a boring day, and excitement is not always a good thing,” he says. “When things go bad, they can go bad very quickly. It can be physically draining. Anytime there’s an event in the OR, immediately afterward you feel emotionally and physically drained.”

Hyman, 58, says his mindset helps. “A lot of people say they have a career in medicine. To me, it’s a job. It’s a job I like a lot, but it’s a job. If you let it be more than a job, then it’s more stressful. You have to deal with people being sick. You have to deal with people dying. You have to keep yourself somewhat detached so you don’t get emotionally devastated when bad things happen.”

As much as the emotional separation is necessary for medical professionals, so is having an artistic outlet. Hyman was the lead author on a 2011 survey study and literature review on career burnout in anesthesiologists, published in Anesthesiology. He also moderated an accompanying American Society of Anesthesiologists’ webinar entitled: “Risk of Burnout in Perioperative Clinicians.” The study points to the importance of clinicians seeking out stress relievers and support in their personal lives to counterbalance workplace pressure.

Hyman’s piano playing is not a secondary pursuit, but a lifelong love that helps shape his life. As a child, his mother encouraged him, and he flourished, earning recognition in concerts and competitions as a teenager. In school, he was told he couldn’t focus both on the piano and medical studies. He listened, but now says the naysayers didn’t understand that mastering the piano, or any art, is not that much different from mastering medicine. Practicing medicine is a science, “but there’s also a lot of art to it.”

“After I started my anesthesiology residency, I really didn’t play any more until I was 40 years old,” he laments. When asked to play again years later and not meeting his own standards, he became determined to nurture his artistry and reclaim the skills that made him an award-winner. In addition to taking lessons, he decided to pursue a music degree at Belmont University in Nashville, which meant he had to cut back his work schedule at Vanderbilt. The payoff: In 2004, he received his Master’s degree in music, with a focus on piano performance.
He and partner Mark Lee Taylor – they share their home with miniature schnauzers Kandi and Oskar – have always been boosters of the arts in Nashville. But now, as an accomplished pianist, Hyman doesn’t just attend events, he sometimes performs. And his nurturing anesthesiologist side waits in the wings. “I play the piano as though I was killing it. It’s fun.”

Harvey similarly takes his poetry seriously, seeking publication not just in medical journals but also in the mainstream. He’s even planning on entering a manuscript in a book award competition. His love for words predates medicine. Harvey attended Milligan College and got an English degree, but after graduation, he was uncertain about his career path. The initial plan had been to go to law school, but Harvey decided to delay that decision.

“My mom was a nurse, and she got me a job as an orderly at Williamson Medical Center [in Franklin, Tennessee]. I kind of hit it off with the anesthesiologists. They took me under their wing.”

That camaraderie led him to take pre-med classes at area colleges with one specialty in mind: “I just looked around the hospital and saw who was happy and who wasn’t. Anesthesiologists fell in that first category.”

Harvey – whose wife Sara is a radiologist at VU specializing in women’s imaging – is more than satisfied with the choice of anesthesiology as a specialty. “You see immediate results.”

This “hands-on” specialty carries with it a peculiar stress that leads him to retreat into composition of classical poetry. “It’s therapeutic. I feel good about myself when I’m doing it. I almost feel guilty when I don’t take time to do it.”

Harvey actually “becomes” a poet after 2-month-old daughter, Hanna, is in bed and the house is quiet. His poetry was a “deep, dark secret” for a while, because “there’s a lot about the arts and sciences where they distrust each other.” But his talent, which led to publication in medical journals, exposed the poet. How do his colleagues view his literary pastime? “Some look at me a little differently,” he admits.

Campbell’s artwork, which for the most part consists of bold pop-art takes on the world of anesthesiology, sprang from a college comic strip.

“I started doing artwork when I was at Notre Dame,” he says. “I got an Adobe Photoshop program because I was doing comics for the school newspaper.”

Later, when he was in medical school at the University of Rochester, he started making unique posters that are for the most part “educational” about anesthesiology.

“I call them anesthesia propaganda,” he says. But while there are lessons and messages about his business captured in this pop wizardry, the posters are also eye-catching, wall-worthy works of art. And, like his colleagues who play the piano and write poetry, Campbell’s art is a large part of his being.

“I try to make new ones all the time,” says the father of 1-month-old Quinten and husband of VU microbiology research technician Kate. “To me it’s an important thing to do. I enjoy doing it, and it’s a stress reliever to produce something that looks nice and is kind of fun.”

His art also remained pretty much a secret until one of his medical admirers asked him to produce posters to be auctioned for the annual Vanderbilt International Anesthesiology fundraiser. Once his work netted $1,100, he began plans for the next year’s auction. This is one of his avocations endorsed by his wife, who has put the kibosh on skydiving. His other pleasure, scuba, is difficult in landlocked Nashville. But there’s always a time and place for poster art, he says. “If an idea can exist in your head, it can exist on paper.”

Department Chair Warren Sandberg is an admirer of all three of Vanderbilt Anesthesiology’s avowed artists. “I’ve been to hear Steve play, and I admire him for moving his interest in humanity closer to the part of his life that he calls the job,” says Dr. Sandberg.

“Steve (Hyman) exemplifies the sort of Renaissance academic anesthesiologist that Vanderbilt is proud to call one of its own. Steve Harvey was shy about his poetry, but he didn’t need to be – we embrace all forms of academic pursuit in anesthesiology.

“And I must admit, as a former liver transplantation anesthesia specialist, I loved Brett’s vaspressor poster. ‘Press on to Victory!’ is a great slogan – and the signed print hangs in my office.”

Writer Tim Ghianni, who spent almost 3½ decades as an award-winning writer and editor for daily newspapers, is now a Nashville-based freelance writer.
With national statistics showing that more than 70 percent of all surgeries are now performed in an outpatient setting, Vanderbilt’s Division of Ambulatory Anesthesiology is meeting this increased demand with growth in both ambulatory surgery locations and additional services.

In March 2011, the Division of Ambulatory Anesthesiology began providing anesthesia services at Vanderbilt’s newest ambulatory surgery center, Vanderbilt Bone & Joint in Franklin. The three-room center specializes in orthopedic procedures and will extend VUMC’s regional anesthesia services to Williamson and neighboring counties.

“It was a very successful transition,” said Ambulatory Anesthesiology Division Chief Shannon Hersey. “The VBJ surgeons, who are new to Vanderbilt, were very pleased with the improvements we were able to provide. It’s an exciting addition to our off-site orthopedic surgery program and should add about 3,000 more cases a year.”

The Division of Ambulatory Anesthesiology was formed in 2008 to provide services for a growing number of Vanderbilt University Medical Center satellite locations which, in addition to Vanderbilt Bone & Joint, include Nashville Surgery Center (NSC), Vanderbilt Outpatient Surgery (VOS), and Cool Springs Surgery Center (CSSC). The Division of Ambulatory Anesthesiology cared for an estimated 11,100 patients in 2010, with 1,100 cases at VOS, 4,500 cases at NSC and 5,500 cases at CSSC. Two of the four centers are joint ventures with for-profit surgicenter companies and perform cases from both Vanderbilt and community surgeons, allowing for a broad base of cases rarely seen in an academic practice.

“As NSC is primarily an orthopedic/sports medicine center, the majority of training in regional anesthesia occurs there. From 2009 to 2011, 4,200 blocks were performed at NSC, all of which were utilized for resident training. Under the leadership of Randall Malchow, MD, Director of Outpatient Regional Anesthesia, the residents receive training in the techniques of ultrasound-guided regional blockade and the placement of regional catheters for home-based postoperative pain management.

“We are unique among resident training programs in that we take the residents out of the OR for an eight-hour didactic training session at the beginning of their regional rotation,” said Hersey. “Attending anesthesiologists do the blocks that day, and residents do not start performing clinical regional anesthesia until we know they have a strong knowledge base.”

This approach allows the teaching of regional anesthesia in the setting of a busy surgicenter without compromising the efficiency of a fast throughput center. The rotation allows residents to focus on learning the techniques of regional blockade, including the use of ultrasound and the placement of regional catheters for home-based, post-operative pain management. Five-hundred fifty of these catheters have been placed since 2009 with excellent results, and successful implementation of this program has allowed the migration of complex shoulder and foot and ankle cases out of the inpatient setting into the more patient-friendly ambulatory setting. All regional blocks are put into a comprehensive database for future academic research, and the regional catheter program will soon be added at the VBJ site as well.

As NSC is primarily an orthopedic/sports medicine center, the majority of training in regional anesthesia occurs there. From 2009 to 2011, 4,200 blocks were performed at NSC, all of which were utilized for resident training. Under the leadership of Randall Malchow, MD, Director of Outpatient Regional Anesthesia, the residents receive training in the techniques of ultrasound-guided regional blockade and the placement of regional catheters for home-based postoperative pain management.

“We are unique among resident training programs in that we take the residents out of the OR for an eight-hour didactic training session at the beginning of their regional rotation,” said Hersey. “Attending anesthesiologists do the blocks that day, and residents do not start performing clinical regional anesthesia until we know they have a strong knowledge base.”

This approach allows the teaching of regional anesthesia in the setting of a busy surgicenter without compromising the efficiency of a fast throughput center. The rotation allows residents to focus on learning the techniques of regional blockade, including the use of ultrasound and the placement of regional catheters for home-based, post-operative pain management. Five-hundred fifty of these catheters have been placed since 2009 with excellent results, and successful implementation of this program has allowed the migration of complex shoulder and foot and ankle cases out of the inpatient setting into the more patient-friendly ambulatory setting. All regional blocks are put into a comprehensive database for future academic research, and the regional catheter program will soon be added at the VBJ site as well.

“Overall, our ambulatory surgery centers have a greater than 95% ‘excellent’ patient satisfaction rating, with minimal complications,” said Hersey. “We’re happy with those numbers and are continually looking for ways to improve them.”
Minimally invasive ambulatory spine surgeries, including anterior cervical discectomy and minimally invasive lumbar laminectomy, have been increasing in number at Cool Springs Surgery Center in Franklin, with 71 cases performed in 2010. The volume of pain management procedures offered at Cool Springs has also increased with the addition of a satellite location of the Vanderbilt Interventional Pain Center. Dan Lonergan, MD, who completed a Pain Medicine Fellowship at Vanderbilt, is performing interventional pain procedures at Cool Springs to serve Williamson and adjacent counties.

Outpatient GI endoscopies have been increasing in volume at CSSC and pediatric volume has been exponentially increasing at every center, with the largest percentage being pediatric ENT cases from community surgeons. The Vanderbilt outpatient surgery center (VOS) is primarily an ENT center where complex ear, sinus, and voice cases are performed, along with routine tonsils and adenoidectomies.

In 2011, Katherine Dobie, MD, a Vanderbilt Anesthesiology residency alumna, joined the Division of Ambulatory Anesthesiology faculty, and she oversees anesthesia services at Vanderbilt Bone & Joint. Staci Ridner, MD, who completed her anesthesiology residency at the University of Texas Health Science Center, also joined the faculty in 2011. The Division of Ambulatory Anesthesia is led by Dr. Shannon Hersey and consists of five full-time faculty, 16 CRNAs, and two to three residents who rotate through the program monthly.

Study Screens Patients at Risk for OSA

Patients with obstructive sleep apnea (OSA) are known to be at higher risk for postoperative problems, particularly if opioids are used for postop pain control. With the increasing number of procedures performed in outpatient settings, it is unclear if sending OSA patients home routinely is exposing them to unnecessary risk. Considering that the majority of patients with OSA are probably undiagnosed and yet increasingly undergo ambulatory procedures, the Division of Ambulatory Anesthesiology is conducting a pilot study with a home OSA screening device for ambulatory patients.

The small pilot study (50 patients) recruits patients who are at risk for OSA by a validated screening questionnaire performed at the Vanderbilt Preoperative Evaluation Clinic. Patients are sent home with a monitoring device for a preoperative apnea screening. After downloading their baseline data the day of surgery, they again wear the device for the first postoperative night, after a general anesthetic and while using opioids for pain control at home.

“Although OSA patients are generally considered to be at increased risk for respiratory complications after general anesthesia and narcotics for pain control in an ambulatory setting, there is very little data currently available to define that risk,” said Shannon Hersey, MD, Ambulatory Anesthesia Division Chief. “For our pilot, we are enrolling patients that we currently would do on an outpatient basis and observing their pre- and postoperative OSA screens in the environment they would routinely be in.”

Dr. Hersey concludes: “If the pilot shows that possible OSA patients are exactly the same before and after ambulatory surgery, then we probably need to focus on better screening to delineate the more severe, potentially higher-risk patients. If we see evidence that patients are at significantly higher risk after general anesthesia and narcotic pain control at home, we will focus on various anesthetic techniques that may alter that risk.”
Vanderbilt anesthesiologists provide critical care services in many of Vanderbilt University Hospital’s ICUs. The medical center opened an 11-story Critical Care Tower in November 2009. The 329,000-square-foot tower includes 12 state-of-the-art operating rooms and 102 patient beds in medical, surgical and neurological intensive care units. Because Vanderbilt University Hospital is the region’s only Level I Trauma Center and is home to the Vanderbilt Transplant Center, the Division of Anesthesiology Critical Care Medicine plays a vital role in providing outstanding care to the most complex of cases.

To address the growing demands for critical care services, 18 acute care nurse practitioners and one physician assistant were added to the Department of Anesthesiology Division of Critical Care Medicine in 2010. These critical care practitioners have faculty appointments and work alongside the Division’s intensivist faculty. The Division employs a multidisciplinary, intensivist-led critical care model that is being deployed with increasing frequency across the nation, according to Critical Care Medicine Chief Lee Parmley, MD, JD.

Through a novel partnership between the Vanderbilt University School of Nursing and the Division of Anesthesiology Critical Care Medicine, acute care nurse practitioner students receive specialty training in critical care. Graduates of the program have become invaluable partners in the critical care teams at Vanderbilt and elsewhere. This program was awarded a Health Research Services Administration grant to promote its further development. Currently, work is underway to develop an advanced practice nurse critical care fellowship through the Doctor of Nursing Practice (DNP) program, based on the ongoing alliance between the Critical Care Division and the School of Nursing.

“Our clinical operations have evolved with the development of our team model, in which we have the intensivist, the acute care nurse practitioner, the bedside nurse, the PharmD, and usually a dietician and a respiratory therapist working together,” said Dr. Parmley. “Those are the people responsible for directing the care of the critically ill patient at the bedside. There are times when it’s also appropriate to have others involved, such as the case manager, the physical therapist, the occupational therapist, and our ethicist.”

By encouraging research and identifying better ways to care for critically ill patients, the Division is taking a proactive approach to ever-changing demands and regulations in health care, and the changing spectrum of critical illness. Several Critical Care Medicine faculty members have ongoing research projects. One study by investigators Chad Wagner, MD, Medical Director for the Cardiovascular ICU, and Anne Miller, PhD, looks at the interdisciplinary communication that occurs during the rounding process in the cardiovascular intensive care unit and seeks to identify ways to improve continuity of care across shifts. Dr. Pratik Pandharipande, MD, MSCI, has several ongoing studies examining postoperative delirium as well as sedation and analgesia in the ICU, and Frederick “Josh” Billings, MD, has current investigations related to postoperative acute kidney injury.

In addition to ongoing research and continued improvements in clinical operations, education is a focus of the Division. All levels of trainees from medical students to fellows receive training and education provided by the Division’s faculty. In 2010-2011, the Division saw a welcome increase in applications for the six ACGME Critical Care Medicine fellowships.

The Division of Critical Care Medicine, under Dr. Parmley’s leadership, includes 17 physician faculty, 19 nurse practitioner/physician assistant faculty, and six critical care fellows. The Division’s physicians also provide service in the VUH ORs, and thus they bring a holistic appreciation of the entire arc of perioperative medicine to bear in the critical care setting.
Innovation, research, and education are all key components of the Division of Cardiothoracic Anesthesiology, as is evidenced by its support of novel clinical environments such as the hybrid cath lab/OR; the Division’s introduction of transesophageal echocardiography as a monitoring tool in intensive care units; the Division’s many research initiatives; and a strong commitment to being a national leader in cardiothoracic anesthesia education.

The Division works alongside the surgeons and cardiologists of the Vanderbilt Heart and Vascular Institute to perform approximately 1,100 adult cardiac procedures a year. These include coronary artery bypass (the majority of which are performed off-pump), valvular surgery, cardiac transplantation, adult congenital procedures, hybrid bypass procedures, aortic aneurysm and dissection repair, and ventricular-assist device insertions. The addition of a new cardiac transplant/VAD surgeon in mid-2011 is expected to further expand case volume, as is the Medtronic CoreValve study. This study is a clinical trial of percutaneous aortic valve replacement for severe aortic stenosis in patients who are too high risk for open-heart surgery. In July 2011, Vanderbilt performed the first of these procedures in Tennessee, becoming one of 40 medical centers in the country to have access to this technology.

“This will bring more high-intensity cases into the hybrid OR,” said Cardiothoracic Anesthesiology Division Chief Robert Deegan, MD, PhD. “Even though we only anticipate doing 100 or so of these cases a year, we will bring in many more patients to assess them for eligibility in the trial. There are strict criteria to enter the trial, and we anticipate a big increase in overall volume as we bring these patients in for assessment. Even if they don’t meet the trial criteria, they could possibly be recommended for other cardiac procedures.”

Intraoperative transesophageal echocardiography (TEE) is an integral part of the clinical practice and is performed on nearly 100 percent of all adult cardiac patients. All studies are performed and interpreted by the cardiothoracic anesthesiologist, and cases are digitally archived for future study.

In addition to cardiac surgery, the Division works with the thoracic surgeons to perform about 700 thoracic cases annually, including thoracotomy, mediastinoscopy, and esophageal procedures. Anesthesia services are also provided for bronchoscopies, insertion of internal cardiac defibrillators, valvuloplasty, electrophysiology procedures, and septal ablations, which together account for approximately 2,500 cases annually. A subset of the Division’s faculty is also board-certified in intensive care medicine. These individuals rotate through the Cardiovascular Intensive Care Unit under the direction of Division member Chad Wagner, MD.

The Cardiothoracic Anesthesiology faculty conduct research in vascular system function, cardiopulmonary conditioning, renal failure, and perioperative inflammatory response, and extramural grant support comes from the American Heart Association and the National Institutes of Health.

The Division also has significant external and internal education presence. Division faculty have hosted successful workshops in perioperative transesophageal echocardiography (TEE) and hemodynamic echo, drawing anesthesiology residents, fellows, faculty and private practitioners from throughout the region. Cardiothoracic anesthesiologist Julian Bick, MD, received a $100,000 Research in Education Grant from the Foundation for Anesthesia Education and Research which is being used to train CA-1 residents in TEE. A TEE simulator, which provides 3-D, computer-generated views of the heart as a probe is guided through a mannequin, is housed at Vanderbilt’s Center for Experiential Learning & Assessment (CELA), and the Division’s TEE training is conducted with the simulator as the centerpiece.

The Division of Cardiothoracic Anesthesiology is led by Dr. Robert Deegan, MD, PhD, and includes ten faculty members and ten nurse anesthetists. Each month, three residents rotate through the service. The fellowship program, under the leadership of Annemarie Thompson, MD, has expanded to three fellows trained annually. The Division is a microcosm of the larger department within which it resides, supporting the tripartite missions of clinical excellence, academic pursuits in anesthesia, and education.
Vanderbilt cardiothoracic anesthesiologists and surgeons are pioneering the use of a tool that many in the cardiac field are calling the “new stethoscope” when it comes to monitoring critically ill patients. Transesophageal echocardiography (TEE) is a diagnostic procedure that involves feeding an ultrasound probe through a patient’s mouth and into their esophagus to evaluate heart function. TEE generates high-resolution images as the organ pumps and is invaluable in locating cardiac blood clots, masses and tumors, as well as detecting the severity of valve problems, congenital heart diseases, and aortic tears.

Vanderbilt’s cardiothoracic anesthesiologists have more than 15 years’ experience utilizing TEE for patients undergoing cardiac surgery, and doctors are expanding TEE technology into VUMC intensive care units. Recently introduced smaller, disposable TEE probes are now being used to monitor the hearts of critically ill patients in intensive care units for as long as three days. Using TEE to monitor cardiac patients in intensive care units both before and after surgery allows medical staff to quickly intervene in a crisis and use the resulting information to guide treatment decisions.

“This technology is another example of what we describe as ‘flying with instruments,’ that is, the systematic approach of measuring and recording outcomes so as to guide further care,” said Dr. John Byrne, Chairman of the Department of Cardiac Surgery.

To address the need to train physicians in the use of TEE, Wagner and Dr. Julian Bick, a cardiothoracic anesthesiologist, directed an Echocardiography for Hemodynamic Monitoring course at Vanderbilt’s Center for Experiential Learning & Assessment (CELA) in 2011 that attracted physicians from premier health care systems across the United States. Participants trained using a TEE simulator, which combines a photo-realistic, three-dimensional computer-generated model, a TEE probe, and a simulated ultrasound image to help users visualize and understand complex cardiac anatomy. Dr. Bick also received a $100,000 grant from the Foundation for Anesthesia Education and Research to fund TEE simulation training for Vanderbilt University School of Medicine anesthesia resident physicians.

“The TEE simulator is highly effective in helping physicians learn TEE in combination with clinical training,” Bick said. “The simulator mirrors cardiac anatomy and function, and students often comment on the realism.”

Vanderbilt is now pushing TEE into the ICU as a new monitor of hemodynamics. “The ability to monitor cardiac function and filling in a serial fashion with miniaturized, disposable TEE probes leads to optimal patient outcome and appropriate resource utilization,” said Dr. Chad Wagner, a cardiothoracic anesthesiologist and director of the Cardiovascular Intensive Care Unit (CVICU). “The only real barrier to the routine use of this technology is physician training.”

Drs. Bick and Wagner, in collaboration with Dr. Byrne, have published the first case study on using a disposable TEE probe to care for a 66-year-old patient who became unstable in the intensive care unit following open heart surgery.

“Sometimes unstable patients need to return to the operating room for additional surgery,” said Dr. Wagner. “In this case, after placing the miniaturized disposable TEE probe, I was able to diagnose and treat the cause of the patient’s low blood pressure which did not require returning to the operating room.”

Vanderbilt has a long history of using innovative technologies to improve medical education and patient care. Efforts to train more physicians to use TEE to care for the critically ill are already underway.
The Vanderbilt University Department of Anesthesiology embraces the anesthesia care team approach to patient care, involving anesthesiologists, certified registered nurse anesthetists (CRNAs), and anesthesia technicians. The more than 100 CRNAs at Vanderbilt provide anesthesia for all types of surgical procedures including cardiac, pediatrics, vascular, trauma, neurosurgery, plastics, radiologic and special procedures. CRNAs administer general, regional and monitored anesthesia care for scheduled and emergency surgical, obstetric, and diagnostic procedures.

Key job responsibilities of the CRNA include preoperative evaluation of the patient, management of the patient through completion of the operative procedure, safe transport of the patient to the recovery area and assurance of the appropriate postoperative care. Additionally, CRNAs provide instruction and education for student nurse anesthetists. They also support the residency educational mission by providing service coverage to allow residents to attend educational activities and participate in elective rotations. Thus, the CRNAs are essential to many core endeavors. By the numbers, the CRNA Division is the largest division in the Department of Anesthesiology, and yet it maintains a turnover rate of only 2%.

“A major accomplishment for the CRNAs in 2011 involved the successful transition of Vanderbilt Bone & Joint [formerly Franklin Bone & Joint] to Vanderbilt anesthesia providers,” said Chief CRNA Steve Blanks. “The transition was seamless, and the private surgeons there have been very satisfied with all facets of our anesthesia provision. This brings the total ambulatory surgical ORs and procedural suites outside of the main VUMC campus to 17, with mobile CRNA staff floating between centers wherever coverage is required.”

Vanderbilt is the primary clinical affiliate of the Middle Tennessee School of Anesthesia (MTSA) in Madison, Tennessee, which is the second largest nurse anesthesia program in the country. Vanderbilt is also the primary clinical affiliate for the Union University Nurse Anesthesia program in Jackson, Tennessee. Student nurse anesthetists assist in approximately 7,000 anesthetics per year while on Vanderbilt rotations. Student Registered Nurse Anesthetist coordinators are CRNAs Paul Wilson and Mariah Light. In 2011, SRNA orientation was redeveloped, with the goal of ensuring that every SRNA who enters Vanderbilt gains a demonstrated knowledge of Vanderbilt policies and procedures and will have worked alongside a CRNA preceptor who “checks-off” the student on vital equipment, processes, and basic anesthesia skills.

In addition to SRNA training, the CRNA Division has developed a strong program of Continuing Education Unit-eligible educational programs designed specifically for CRNAs. These programs are overseen by Pediatric Educator Eileen Griffin, CRNA and Adult Educator Mike Leersnyder CRNA.

The CRNA Division is directed by Chief CRNA Steve Blanks and Assistant Chief CRNA Buffy Krauser-Lupear. Five designated lead CRNAs are Brian Reid in Ambulatory; Paul Wilson in Obstetric/Gynecology; Edith Newberry in Adult Cardiac; Robert Atwood in Pediatrics; and John Butorac in Multispecialty Adult Anesthesia.
Vanderbilt University Medical Center now ranks No. 3 in the nation in the number of certified anesthesia technicians on staff, with 38 total technicians providing support at both on- and off-campus locations. Anesthesia technicians contribute to safe, efficient anesthesia care by providing highly skilled assistance to anesthesiologists and nurse anesthetists.

Anesthesia technician duties also include equipment maintenance and servicing, running laboratory tests on blood samples, maintaining quality assurance records, and operating a variety of equipment used to monitor, evaluate and manage the patient undergoing anesthesia.

As the level of the anesthesia technician’s training, experience and knowledge increases, the technicians provide closer intraoperative support to the anesthesia provider, and the Department offers structured classroom lectures to train technicians in a non-distracting clinical setting. The anesthesia technician, the certified anesthesia technician and the certified anesthesia technologist cover areas related to the following adult and pediatric services: neurosurgery, plastics, urology, ophthalmology, vascular, trauma, cardiothoracic, general surgery, orthopedics, obstetrics/gynecology, and ENT. They also provide support for special procedures in the radiology department that include MRI, PET scan, radiation oncology, GI Lab, CT Scan, nuclear medicine and the cardiac catheterization lab.

In 2011, the anesthesia technician reporting structure was reorganized, with renewed emphasis on increasing clinical skill and technician certification. Buffy Krauser-Lupear, Assistant Chief CRNA, oversees the Anesthesia Technician Program. After a nationwide search, the newly created Anesthesia Technician Manager/Educator position was filled by the appointment of Sue Christian, a certified anesthesia technologist and long-time member of the Vanderbilt team. Under Christian’s guidance, 11 out of 11 technicians passed their technician certification exam. The expected pass rate for this exam is 50 percent.
Reflecting on the role of the Division of Multispecialty Adult Anesthesiology, Division Chief James Berry, MD, sees the group as an incubator for subspecialty groups to grow and then break off to form independent divisions.

“We have participated in the birth and infancy of three divisions,” said Berry. “Cardiothoracic Anesthesia split off before I came here, then Ambulatory and Pain spun off, and now we’re looking forward to Neuroanesthesia becoming independent in the near future. We’re proud to serve as an anchor for the Department and a home base for these new divisions.”

The Division’s members are also highly active in research, with numerous investigator-initiated clinical research projects in progress at any given time. For example, Berry believes the Division’s multi-year research efforts to demonstrate the value of wireless monitoring of postoperative patients will ultimately lead to institution-wide adoption of the technology. By using wireless monitors that collect patients’ vital signs in postop areas not typically monitored, medical staff can be notified and respond immediately if abnormal readings are detected.

In another study, an on-line survey is being used to collect patient health data, allowing verification of that information before patients scheduled for a procedure go through the Vanderbilt Preoperative Evaluation Center (VPEC). It is believed that such an on-line tool can make the preoperative process more efficient, while also actively involving patients in their care.

“Our goal has always been to make clinical researchers out of clinicians, and we are well on our way to achieving that,” Dr. Berry said. “We have people who have never published anything conducting valuable studies, and that’s exciting.”

The Division of Multispecialty Adult Anesthesiology is the department’s largest division, providing perioperative anesthetic care for more than 15,000 patients annually in 50 operating rooms and procedure suites for a wide variety of surgical services. MSA faculty and staff also provide 24-hour coverage for emergency and trauma surgery for the region. The Division has 50 full- and part-time faculty, most of whom have significant subspecialty training and expertise.

MSA Division faculty provide anesthesiology residents a wide variety of introductory and advanced clinical experiences and make many contributions to the educational programs for medical students, residents, and fellows. Additionally, MSA faculty teach and supervise residents from other specialties, as well as student nurse anesthetists who rotate in the MSA Division. Divisional faculty pursue a wide range of academic interests including regional anesthesia, airway management, information technology, perioperative cognitive dysfunction, echocardiography and ultrasound imaging.
Neuroanesthesiology Expands to Meet Demands

According to U.S. News & World Report’s 2011 rankings for “America’s Best Hospitals,” Neurology and Neurosurgery at Vanderbilt University Medical Center rank among the nation’s best, and that word is definitely getting out. Neurosurgery and other neurologic services continue to expand at VUMC, and Anesthesiology faculty specializing in neuroanesthesia are providing increasingly complex anesthesia services, including anesesthesia for implantation of deep brain stimulators for treatment of movement disorders such as Parkinson’s disease, and, most recently, for patients with obsessive-compulsive disorder. Neuroanesthesia also provides specialized anesthesia services for “awake” craniotomies, where patients are sedated but awake to facilitate speech and motor mapping during surgery.

In 2011, the Departments of Neurology, Neurosurgery and Psychiatry at Vanderbilt formed a collaborative group, the Clinical Neurosciences Institute, to provide comprehensive patient care. Through the Vanderbilt Brain Tumor Center more than 400 major brain tumor operations are performed annually. In fiscal year 2011, more than 2,800 cases requiring neuroanesthesia were performed at VUMC in six operating rooms designated for neurologic procedures. Neuroanesthesia is also provided in neurointerventional radiology suites, and at Monroe Carell Jr. Children’s Hospital at Vanderbilt.

“What excites me most is the successful collaboration that we have among the Neurosurgical, Anesthesia and Nursing teams,” said Letha Mathews, MD, Medical Director for Neuroanesthesia Services. “We pride ourselves in our excellent working relationships and communication. Our experienced and dedicated anesthesia faculty ensure that our quality of care is outstanding, resulting in one of the shortest average lengths-of-stay in the country following brain tumor surgery.”

It is the patient that benefits most from the camaraderie of the clinical providers, as top quality care is consistent throughout pre-op, intra-op and post-op stages. Six outstanding certified registered nurse anesthetists led by Tammy Freehling, CRNA, are dedicated to neuroanesthesia services and are an integral part of the care team. John Barwise, MBChB, Medical Director of the Neurology/Neurosurgery Intensive Care Unit, and his team direct patients’ postoperative care in VUMC’s state-of-the-art ICU.

Neuroanesthesiologists face many unique challenges including the length of procedures (cerebellopontine angle tumor cases could mean 16 hours or more in the OR); unusual body positioning; and unexpected intraoperative events such as seizures or intracranial hemorrhage.

“We are manipulating neurophysiology with drugs and other interventions during the procedure to facilitate surgery, while we share the target organ with the neurosurgeons,” said Dr. Mathews. Many of these cases involve very large intracranial masses, raised intracranial pressures, and other co-morbidities, which makes anesthetic management challenging.”

It is just this challenging environment that excites residents going through the neuroanesthesia rotation at Vanderbilt, as well as the faculty leading the training, said Dr. Mathews. Residents participate in a variety of unique cases such as intracranial tumors, complex spinal procedures, neurovascular cases, awake craniotomies and acute intervention for strokes.

Another exciting area of growth is clinical research in Neuroanesthesiology. Several faculty members on the Neuroanesthesia team, including Drs. Jesse Ehrenfeld and Letha Mathews, have partnered with faculty in the Department of Neurosurgery on a series of clinical research projects. These activities include evaluation of the cost-effectiveness and impact of a series of interventions in patients undergoing neurosurgical procedures. One multidisciplinary effort that has already dramatically changed the postoperative care of spine surgery patients at Vanderbilt is a new comprehensive spine pathway which has been spearheaded by Neurosurgeon and Director of Clinical Spine Research, Dr. Matthew McGirt.

In other research endeavors, James Blair, DO, is conducting a double-blinded, placebo-controlled study to determine if Dexmedetomidine can reduce the time required to achieve fitness for discharge after spine surgery. Another study to evaluate the drug guanfacine (GF) for its potential to reduce or halt emergence delirium (ED) in young males is getting underway. Drs. Mathews, Jane Easdown and Kenneth Smithson are conducting a retrospective outcome study following transphenoidal hypophysectomy (TSH) using data collected at VUMC. Drs. Smithson and Mathews are also conducting a survey of neuroanesthesiologists regarding preoperative evaluation for the presence of patent foramen ovale (PFO) in patients undergoing sitting craniotomies.

“I definitely see us becoming a national leader in the field of Neuroanesthesiology,” said Dr. Mathews. “Our faculty and staff are up to that challenge.”
The Division of Obstetric Anesthesiology provides dedicated, 24-hour in-house obstetric care for approximately 4,000 deliveries annually, nearly half of which are considered high risk. The team also provides anesthesia services for approximately 2,500 gynecologic and other surgical procedures for primarily women in a separate operating room suite of three operating rooms. 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 fetal surgery.

The resumption of in utero repair of myelomeningocele, a procedure pioneered at Vanderbilt University Medical Center in 1997, has brought an added dimension of specialized clinical service to the Division of Obstetric Anesthesiology. The results of a seven-year National Institutes of Health-funded trial, Management of Myelomeningocele Study (MOMS) demonstrated clear benefit for babies who undergo fetal surgery to treat spina bifida, the most common central nervous system birth defect. Hence, these surgeries were resumed at VUMC in April 2011.

The MOMS trial found fetal surgery significantly improved the child’s chances of being able to walk. There was no increased risk of death for the baby or the mother when the fetal surgery group was compared with a group that received surgery after birth. With patients being referred from across the nation, it is estimated that about 15 of these procedures will be performed at VUMC annually, with Obstetric Anesthesiologist Ray Paschall, MD, taking the lead in providing anesthetic care for these complex cases.

Also in 2011, Obstetric Anesthesiologist Sarah Starr, MD, and Michelle Collins, MSN, were in the spotlight for bringing nitrous oxide to VUMC labor and delivery rooms as a new pain management option. VUMC joins only two other hospitals in the country in offering nitrous oxide, which is self-administered by the patient. Most women experience the effects in less than one minute and the effect dissipates within five minutes of discontinuing. Dr. Starr received partial salary funding for the nitrous oxide project conducted in conjunction with the nurse midwife group through the Vanderbilt Evidence-Based Practice Center.

Trainees in the Division of Obstetric Anesthesiology, including both residents (three monthly) and fellows (one-two annually), receive extensive experience in the care of clinically challenging patients. The Division also has a number of ongoing clinical research projects, including studies on various anesthetic techniques on patient outcomes. Research projects concerning transversus abdominis block for the relief of pain following Cesarean delivery, factors affecting the choice of pain relief during labor, and the effects of low-molecular-weight heparin on thromboelastographic measurements are ongoing.

The Division has also recently resumed work examining the effects of obstetric and anesthetic drugs on both the maternal and fetal vasculature within the placenta using a dual-perfusion technique of isolated placenta tissue subunits. Research examining the transfer of drugs across the placenta from the maternal to fetal side is also planned, as well as work to understand the ion channel expression within the vasculature of the placenta.

The Division of Obstetric Anesthesiology is directed by Dr. Curtis Baysinger and includes six other faculty members, two CRNAs, and one administrative assistant. The Division’s faculty members have all completed Obstetrical Anesthesia fellowship training and have extensive experience in obstetric care, regional anesthesia, and acute pain management.
Chronic pain affects 116 million people in the United States - more than diabetes, heart disease and cancer combined - according to statistics from the Institute of Medicine of The National Academies. Because chronic pain is complex, typically involving pathophysiological, psychological, emotional, and environmental factors, doctors at Vanderbilt are combining forces to create a focused, multidisciplinary approach to pain management, ensuring that patients are thoroughly evaluated and then treated by the specialists that can best address their unique medical situations.

In 2011, Marc A. Huntoon, MD, joined Vanderbilt’s Department of Anesthesiology as Division Chief of Pain Medicine. Dr. Huntoon is leading the institution’s multidisciplinary pain management efforts, including oversight of the Vanderbilt Interventional Pain Center at 100 Oaks, as well as the medical center’s Adult Acute Pain Service which provides pain management for postoperative patients, and the Pediatric Pain Clinic at Monroe Carell Jr. Children’s Hospital at Vanderbilt. In addition, October 1 is the anticipated opening of the new Vanderbilt Pain Management Center (VPMC), which is the culmination of more than one year of work by the multidisciplinary Vanderbilt Medical Group Pain Advisory Task Force. The VPMC is envisioned as an easy referral resource for doctors both within and outside Vanderbilt. Patients will be treated according to “best available evidence” care pathways and be referred downstream to the areas in the medical center where they are most likely to have successful outcomes. It is anticipated that this process will enhance patient satisfaction and reduce unnecessary or duplicate care.

“Marc is one of our nation’s most innovative and respected physician scientists in the field of pain management, and we are excited to have him join our leadership,” said Warren S. Sandberg, MD, PhD, Chair of Anesthesiology. “His extensive experience in pain medicine, as well as his involvement in national initiatives dedicated to advancing pain management research and improving interventional pain modalities, will bring a new level of care to our patients.”

Dr. Huntoon has extensive prior experience developing and leading comprehensive pain programs in academic medical centers and comes to Vanderbilt from Mayo Clinic in Rochester, Minnesota, where he served as Chairman of the Division of Pain Medicine beginning in 2001. Huntoon stepped down as division chairman in 2008 to focus on research in novel spinal biologic therapies and peripheral neuromodulation. He has also developed prototypes for three pain-relieving devices that are patent-pending.

“Vanderbilt has been practicing good pain medicine, but it hasn’t utilized a systems-based or patient-centered approach, but rather specialty-specific care pathways,” said Dr. Huntoon. “Knowledge about best care is thus trapped in silos. We’re committed to breaking...
down barriers to better meet patients’ needs. Many times, practitioners try various medical and interventional therapies, and then when that doesn’t work, we wonder why. If you treat a patient’s pain, but don’t work with them to improve their coping skills, to address any misconceptions they might have, and to address psychosocial factors that reinforce their pain, then you’re not addressing the entire patient. We want to change that.”

When patients are referred to Vanderbilt for treatment of chronic pain, a thorough review of their medical records begins before their first visit. That patient will then be evaluated by a team of specialists to develop a team-based treatment plan. This evaluation could involve a pain fellowship-trained diagnostician seeing the patient, along with a pain psychologist and a physical therapist. As conceived by the Pain Advisory Task Force, other disciplines, such as Neurology, Psychiatry, Integrative Health and Physical Medicine and Rehabilitation will participate. One potential downstream care delivery site is the Vanderbilt Center for Integrative Health. There patients can learn coping skills, stress-management techniques and receive therapies such as acupuncture, hydrotherapy and massage.

Vanderbilt’s interventional pain services are based at the Vanderbilt Interventional Pain Center, a 7,000-square-foot space at Vanderbilt Health at One Hundred Oaks, which includes state-of-the-art procedure rooms, exam rooms, recovery bays, and multidisciplinary rooms. In July 2011, a branch of the Interventional Pain Center opened in the Cool Springs area under the direction of Vanderbilt Pain Medicine Fellowship graduate Dan Lonergan, MD. Services are provided at the Cool Springs Surgery Center on Mallory Lane in Franklin.

Monroe Carell Jr. Children’s Hospital at Vanderbilt is the site of a unique Pediatric Pain Clinic where young patients are cared for by five attending physicians, a registered nurse, and a Pediatric Pain Management Fellow. The clinic sees two to three new patients every week, and additional patients who live at a distance are monitored by telephone, with Vanderbilt providers working with patients, their families and their physicians to provide the best pain management for their specific needs. The Neonatal Intensive Care Unit has its own specialized pain management program, and there is a regional anesthesia program to treat young patients as well.

The Adult Acute Pain Service at VUMC also continues to grow as patients are benefitting in increasing numbers from epidural catheters, peripheral nerve blocks, and peripheral nerve catheters for pain management for complex shoulder and arm surgery, knee arthroplasties, extensive ankle restorations, and repeated burn debridements. Providing targeted pain control in the area of injury has produced better pain control, improved patient and surgeon satisfaction, and the ability to reduce patients’ time in the hospital. In fact, many operations that previously required extensive hospital stays have now been moved to the outpatient surgery centers. In that setting, patients are discharged directly home following surgery with a small, disposable pain pump. Under the leadership of Dr. Huntoon, AAPS is expected to evolve further so that surgeons and other physicians can easily refer any patient with acute pain concerns to the service at any point in their care, not just at the immediate post-procedure stage.

Expanding pain medicine education at Vanderbilt, from the medical student level up, is a goal of Dr. Huntoon. The Regional Anesthesia and Acute Pain Fellowship has already proven successful under the leadership of Randall Malchow, MD, with two fellows in 2010-2011 learning advanced regional anesthesia, developing into educators for residents at the bedside and in the lecture hall, and growing to be scholars by developing research studies for publication. Dr. Huntoon hopes to incorporate pain medicine topics into the medical student curriculum, and improve both resident and fellow initiatives in the specialty, making use of Vanderbilt’s advanced simulation technology, as well as the anatomy lab setting.

Expanding the Division of Pain Medicine’s scope and depth of offerings has been one of the Department of Anesthesiology’s major accomplishments of the previous year. Chair Warren Sandberg, MD, PhD summarizes: “We started with a great foundation. Each of our pain service offerings developed from the enthusiasm and commitment of its founding faculty. All the pieces are there, and this coming year will be an exciting one, as we continue to grow and shape these great elements into one comprehensive, multidisciplinary end-to-end service.”

Tracy Jackson, MD, performs an fluoroscopically guided block for a patient at the Vanderbilt Interventional Pain Center.
The Division of Pediatric Anesthesiology provides perioperative care for more than 13,000 patients per year at Monroe Carrell Jr. Children’s Hospital at Vanderbilt, the region’s major pediatric referral center. The Division’s 21 attendings, 22 CRNAs and four fellows are led by Dr. Ira Landsman and provide services for a variety of pediatric surgical procedures including general, ENT, neurologic, urologic and orthopedic surgery. The Division also provides anesthesia services for procedural services outside the operating room, including oncology, gastroenterology, and diagnostic and therapeutic radiologic procedures. Faculty also provide both acute and chronic pain management services.

To provide better patient access, Vanderbilt is adding 33 additional acute, neonatal intensive care and medical-surgical beds with a five-story expansion now underway at Children’s Hospital. However, the Division of Pediatric Anesthesiology is already ahead of the curve, using continuous quality improvement techniques to find ways to provide clinical services more efficiently, while keeping both young patients and their families happy.

By putting their processes under a microscope, the Division realized there were areas that could stand improvement, including unnecessary lag time when patients are waiting for procedures. To solve this, the number of nurse practitioners performing preoperative evaluations was increased from four to nine, ensuring that a patient is never left waiting for a resident or an attending anesthesiologist to begin the process. This change alone has reduced the time to the OR by at least 30 minutes, said Division Chief Ira Landsman.

In addition, Daniel Roke, MD, was selected to serve as Clinical Director for the Preoperative Holding Area and Chair of the Perioperative Throughput Initiative at Children’s Hospital. The initiative is led by a task force consisting of a surgeon, the nurse managers of the OR and the Holding/PACU areas, two business analysts and Dr. Roke. Formed in December 2009, the group began their First Case Start project in April 2010, examining the preoperative process thoroughly. Based on their recommendations, first case start times have improved dramatically. The on-time first case start rate was 38% in April 2010 and is now in the mid 70s.

“We are very happy with the success we’ve been able to achieve through this proactive initiative,” said Dr. Roke. “We are moving on to subsequent case starts and will be involving more surgeons in the process.”

Modifications were also made to pediatric pain services and in pediatric radiology anesthesia services to increase efficiency and serve more patients. Drs. Stephen Hays and Andrew Franklin now both have dedicated clinical time to see pain patients, and the number of patients seen in the pediatric pain clinic each Wednesday has tripled. Both internal and external referrals also continue to increase. Dr. Peter Chin oversees anesthesiology services for pediatric radiology, and through finding better ways to manage patient flow, volume has increased and Saturday service for MRI procedures has been added. (See related story on page 29.)

Education and training of medical students, anesthesia residents, nurses, and associated healthcare personnel is a major faculty commitment in Pediatric Anesthesiology. Several anesthesiology residents rotate on the service each month to gain experience in the management of patients undergoing both routine and complex surgical procedures, as well as diagnostic and interventional procedures performed outside the operating room. The Pediatric Anesthesiology Fellowship Program offers a year of subspecialty training in pediatric anesthesia and perioperative care, including critical care and pain management.

Areas of academic interest to the Division’s faculty include airway management, pediatric pain management, regional anesthesia, ECMO, and perioperative care of cardiovascular patients. Several research studies are underway in pediatric anesthesia, including a study by Chris Karsanac, MD, to determine if oral diazepam causes an increase in emergence agitation.
Elaine Burke will remember May 27, 2011, at 2:05 p.m. forever. Just minutes before she picked up 7-year-old Ainsley Belle Burke from her final day of school in Gadsden, Alabama, her daughter slipped off of the monkey bars. She suffered a supracondylar humerus fracture.

Ainsley was rushed to Children’s of Alabama, a major pediatric medical center in Birmingham, Alabama, for surgery. Unfortunately, multiple complications followed. Ainsley developed compartment syndrome, a serious condition that involves increased pressure within an extremity, often leading to muscle and nerve damage. Ainsley was taken back into surgery. Her tiny arm was re-opened, with an incision extending from her shoulder to her wrist. But even after the pressure was reduced and the incision closed, Ainsley’s ordeal was far from over.

“She developed complex regional pain syndrome and displayed pain out of proportion to the injury, where even a light touch would cause extreme pain,” said Andrew Franklin, MD, a pediatric anesthesiologist specializing in pediatric pain management. “Her arm became extremely cold and pale, there were significant nail bed changes, and the fingernails actually began falling off. This is all part of the CRPS continuum.”

Here, Ainsley underwent a diagnostic ultrasound-guided stellate ganglion block and also had a continuous brachial plexus catheter inserted, with the goal of interrupting the pain so she could begin her physical therapy. Ainsley was sent home with a small, disposable infusion pump and underwent intensive, twice-daily physical therapy. Her pain completely resolved, and she regained function of her arm again.

“What makes Ainsley’s situation unique is that this is the first time where we’ve been able to send a patient of this age home with a nerve catheter and pain pump in place, at an obvious cost savings to the hospital and to the patient,” said Dr. Franklin. “She was able to return home with her family and begin her physical therapy.”

“We have our daughter back,” said Elaine Burke. “Being here has been wonderful. Dr. Franklin and Twila [Luckett, the pediatric pain service nurse] have always been available to us no matter when we called. After she had her block, Dr. Franklin called twice a day to check on her. We are on the road to recovery.”

Ainsley is returning to Vanderbilt so plastic surgeons can revise the scar on her arm. She will have another block done at that time to prevent the CRPS symptoms from re-occurring. She’ll also remain on antineuropathic medication for at least six months while she continues physical therapy. “I feel really good about this case,” said Dr. Franklin. “She’s been pain free, which is what we hoped for.”

Dr. Franklin is presenting Ainsley’s treatment as a Medically Challenging Case at the 2011 American Society of Anesthesiologists Annual Meeting.
Providing anesthesia efficiently for children undergoing radiologic procedures, while also easing the expected anxiety of young patients and their parents, has been a top priority of Peter Chin, MD, since he joined Vanderbilt on July 1, 2010. This was, coincidentally, the same day that the Division of Pediatric Anesthesiology assumed full-time responsibility for radiologic procedure sedation at Monroe Carell Jr. Children’s Hospital at Vanderbilt.

To provide a consistent patient and family experience, the Division of Pediatric Anesthesiology, which had been providing sedation for radiologic procedures two days a week, assumed the service full-time. At the same time, the Division began offering sedation service six days a week in order to expand access.

“It was a definite challenge, but I actually relished it, and I still do,” said Dr. Chin, who serves as the Pediatric Anesthesiology Division’s liaison to the Department of Radiology. “I was excited to come here and help build something like this.”

Dr. Chin, had previously managed anesthesia for radiologic procedures at Texas Children’s Hospital. Based on that experience, he decided the first focus should be on providing consistent training — tailored to the unique out-of-OR setting — to all the pediatric anesthesiologists and certified registered nurse anesthetists who would provide the sedation services. At the same time, he was concerned about efficiency now that sedated radiologic services were available all week, 7:30 a.m. until 7:30 p.m.

“In medicine, any time you provide a new service or increase the hours for a service, it just gets busier and busier,” Dr. Chin said. “If you build it, they will come. Those services are filled quickly.” But given the costs, it is important that all of the allocated time is used to benefit patients.

Working alongside the Diagnostic Imaging Department at Children’s Hospital, Dr. Chin designed new systems of patient flow and scheduling, putting several processes in place so that preoperative assessments and scheduling became more effective.

“And now, most of the pre-ops are prepared beforehand. When patients come in, staff are able to interview them quickly and get the cases going,” Dr. Chin said. “We are constantly increasing patient flow, and in March and April of 2011 the highest numbers of sedated MRIs per month were performed.”

Jeff Palmucci, administrator for Diagnostic Imaging at Children’s Hospital says about 54% of all MRI exams are performed with sedation or anesthesia. While he’s confident that from a parent’s perspective, the high level of care has remained consistent, the scheduling improvements led by Dr. Chin have been favorably noticed by the staff.

Volume has been increasing steadily. Between July 2010 and June 2011, an average of 218 sedated MRI cases per month were performed, as compared to a monthly average of 203 sedated MRI cases from July 2009 to June 2010. But numbers don’t tell the whole story. Dr. Chin also measures success in the fact that his team is keeping patients and their families calm and happy during what can be a frightening and confusing experience for a young child.

“We’re all pediatric specialists, so we know how to deal with kids’ anxiety,” said Dr. Chin. “We also involve the hospital’s child life specialist if a patient or a family needs comfort.”

“Dr. Chin has brought a wealth of knowledge with him as he has helped lead the Anesthesiology involvement in Radiology,” Palmucci said. “We are appreciative of his approachability and consistent concern for the quality and safety of the care delivered to our patients. Dr. Landsman (Division Chief for Pediatric Anesthesiology) has been equally supportive in leading the extension of hours of coverage throughout the week, as well as on Saturdays. Both are wonderful assets to our hospital.”

The increased role of the Division of Pediatric Anesthesiology in radiologic services offered at the Children’s Hospital has been a welcome challenge for Peter Chin, MD.
As demand for pediatric cardiac anesthesia services at Monroe Carell Jr. Children’s Hospital at Vanderbilt continues to grow, the anesthesiologists providing those services are committed to ensuring that the quality and safety of patient care is never compromised, and even improved as more patients are served.

In fact, one of the biggest accomplishments of the Division of Pediatric Cardiac Anesthesiology in 2011 was to tackle the problem of unnecessary blood transfusions and wasted blood products. The Division’s effort reduced the number of transfusions by anesthesiologists in pediatric cardiac operating rooms by an average of 40%. (See story on page 31.) The group plans on tackling more quality improvement issues, and they will be tapping into archived patient data to guide their actions.

“This is one of our initiatives for the coming year, to use that data to improve patient care,” said Division Chief Suanne Daves, MD. “We will be looking for outliers, in areas like length of intubation and central line complications, in order to make intelligent decisions to improve patient care.”

Growing demand for pediatric cardiac anesthesia services led to the addition of Gina Whitney, MD, a graduate of the Vanderbilt Pediatric Anesthesiology Fellowship, to the Division’s faculty. Demand for services is expected to continue increasing, in part due to the addition of a new pediatric cardiac surgeon at Children’s Hospital in February 2011.

Children with heart defects represent a complex group of patients whom often require intensive surgical repairs to thrive or even survive into adulthood. The Division of Pediatric Cardiac Anesthesiology was formed in 2007 to support the growth of the program that cares for these patients at the Children’s Hospital. The Division’s faculty provide intraoperative and catheterization laboratory anesthesia care, in addition to participating in postoperative ICU management. Two faculty members, Gina Whitney, MD, and Suanne Daves, MD, are also board certified in Critical Care. Both Whitney and Daves are also members of the Pediatric Cardiac Critical Care Division and split their time between caring for pediatric cardiac patients in the operating room and in the cardiac critical care unit.

“The ability to continue care through the entire perioperative period has positively impacted the intraoperative management of our cardiac patients,” added Daves. “For example, the operative and critical care teams developed a ‘Hand-Over’ protocol that facilitates communication of intraoperative information to the ICU team. The second part of this process improvement project, ‘Hand-Over Part II,’ will aim to standardize the physical presentation of the critically ill neonate between the ORs and ICUs.”

Members of the Pediatric Cardiac Anesthesiology Division also team with surgeons for highly specialized procedures such as placement of Berlin Heart devices. The device is similar to other left ventricular devices (LVADs) used in adult cardiac patients but is much smaller.

The pediatric cardiac anesthesiologists work closely with nurse anesthetists trained in cardiac anesthesia care who have many years’ experience working with these patients. The Division also trains pediatric and cardiothoracic clinical anesthesia fellows. The Division also provides expert assistance and consultative services for children with congenital heart disease and undergoing non-cardiac surgery/procedures.

In the 2011-2012 academic year, several faculty members participated in the annual meetings of the Society of Cardiovascular Anesthesia, the Society for Pediatric Anesthesia, and the Congenital Cardiac Anesthesia Society, and the Division’s members are actively involved in education and quality improvement at the national level.
When Gina Whitney, MD, a new faculty member in the Division of Pediatric Cardiac Anesthesiology, noticed a disturbing trend in the overuse of transfusions and wastage of blood products in critically ill pediatric patients, she decided to tackle the issue. Partnering with fellow Pediatric Cardiac Anesthesiologist Brian Donahue, MD, Dr. Whitney began a quality improvement project, examining past transfusion practice, conferring with fellow clinicians, and consulting with the Vanderbilt Blood Bank to identify drivers of excessive transfusion.

What Drs. Whitney and Donahue learned is that delays in getting test results back to the bedside often led to empiric management of bleeding patients, resulting in patients receiving blood products that they really didn’t need. Based on their findings, the team developed and refined a transfusion protocol that was implemented at Monroe Carell Jr. Children’s Hospital at Vanderbilt in January 2011. The effect on blood product utilization has been dramatic. Transfusion of blood products by anesthesiologists in the pediatric cardiac operating rooms has declined by an average of 40%. Improving upstream transfusion practice in the OR has also resulted in a reduction in blood product utilization during the first 12 hours in the intensive care unit.

“The biggest users of blood products are cardiac centers,” said Dr. Daves. “This has been a multidisciplinary, collaborative effort to improve care and reduce waste, and it already has made a huge impact. It’s been noticed hospital-wide, and we hope it will make an impact regionally, and even nationally.”

The next phase of the project incorporates improved point-of-care testing in the ORs and ICUs. By using thromboelastography (TEG) at the bedside, caregivers can quickly pinpoint the exact cause of a bleeding problem and respond appropriately. Excited by the change they’ve already made in one critical facet of pediatric anesthesia care, the team is planning more expansive quality improvement efforts, working in conjunction with Director of Perioperative Data Systems Research Jesse Ehrenfeld, MD, and Medical Director of Perioperative Informatics Brian Rothman, MD.

Department Chair Warren Sandberg, MD, PhD, summarizes the effort: “This is one of the ‘big deals’ in anesthesiology – to use our own data to drive real-time, continuous quality improvement. Every day our tools should help us be a little better than yesterday.”
The Vanderbilt Preoperative Evaluation Center (VPEC) continues to earn resounding kudos from the patients that come through its doors for evaluation before undergoing surgery at Vanderbilt University Medical Center. In 2011 – for the third year in a row – the service received a Professional Research Consultants, Inc. patient satisfaction award, the coveted 5-Star Award for Overall Quality of Care. This means the center scored at the 90th – 99th percentile based on 2010 calendar year results and as compared to similar centers nationwide. The award was given to the VPEC site at Vanderbilt Health at One Hundred Oaks.

"VPEC faculty and staff perform comprehensive patient assessments and consult with our patients’ primary care physicians, specialists, and surgeons,” said Russell Kunic, FNP-BC. “We are able to make decisions regarding the need for preoperative testing to assess the patients’ overall risk for surgery. Once the patient report is completed at VPEC, it becomes part of the patient’s electronic medical record and is accessible by any Vanderbilt medical provider with Internet and security access.”

To ensure that patients undergoing scheduled procedures are properly evaluated and that all necessary labs and other patient information are in hand, VPEC offers a free evaluation and consultation service. This better ensures patient safety and helps present surgical delays and cancellations. The inpatient arm of VPEC completed more than 5,000 preoperative assessments in 2010. Also in 2010, VPEC clinicians evaluated more than 18,000 patients in clinic, or approximately 60% of all on-campus adult surgical patients.

VPEC’s main location at Vanderbilt University Hospital has 11 exam rooms and is conveniently located adjacent to outpatient labs and radiology on the first floor of The Vanderbilt Clinic. VPEC’s second location was added in 2009 at the Vanderbilt Health at One Hundred Oaks campus. This location has seven exam rooms and is also adjacent to outpatient labs and radiology services. VPEC has received several significant industry accolades including the 2009 Top Performer Award given by Professional Research Consultants, Inc. VPEC is frequently consulted by other hospitals wanting to improve their preoperative processes.

VPEC is comprised of 30 total staff, including 19 nurse practitioners, one of the largest single groups of nurse practitioners at Vanderbilt. VPEC’s Medical co-directors are Vanderbilt Anesthesiologists Susan Calderwood, MD, and Annemarie Thompson, MD. Russell Kunic, FNP-BC, is the manager of patient care services.
The Veteran’s Affairs Anesthesiology Service provides perioperative patient care services to more than 7,000 veterans annually at the Veterans Administration Medical Center in Nashville and the Alvin C. York campus in Murfreesboro, Tennessee. The Service provides anesthesia care for the full range of surgical procedures including cardiac and thoracic surgery; orthopedic procedures including joint replacements; major vascular, neurosurgical, ENT, ophthalmic, urologic, plastic, bone marrow, and transplant surgeries.

In addition, sedation services are provided in several out-of-OR sites, including electro-convulsive therapy, diagnostic and therapeutic radiology procedures, pulmonary procedures, cardiac catheterization, and gastroenterology services. The Service also provides primary coverage for the surgical intensive care unit, acute and chronic pain management, emergency airway management, cardioversion, and transesophageal echocardiography.

“Even though 80% of our surgical patients are ASA3 and 4, our morbidity and mortality rate is lower than the national average,” said Veteran’s Affairs Anesthesiology Service Chief Ann Walia, MBBS. “We have 85% on-time first-case starts, and we meet or exceed all Medical Center and national performance measures.

We have a great team here, and they work hard to provide excellent care to our veterans.”

In addition to patient care, education and training of senior anesthesiology residents and fellows, the VA Service also educates critical care and emergency room physicians and other allied personnel. The VA anesthesiology staff also teach the Introduction to Anesthesia and Basic Airway Course for third-year medical students throughout the year. Additionally, first-year medical students are provided summer internship opportunities where they gain their first exposure to patients and learn to establish intravenous access, airway management, and invasive pressure monitoring techniques.

Areas of academic interest in the Division include airway management, ultrasound-guided regional anesthesia, ischemia-reperfusion injury and coronary artery disease in liver transplant recipients, and anesthesia practice pattern variations in liver transplantation. These have resulted in several national and international presentations and publications.

The Division, led by Dr. Walia, MBBS, is staffed by 19 anesthesiologists, 14 certified registered nurse anesthetists, three nurse practitioners, three residents and a critical care fellow.
The educational programs of the Vanderbilt Department of Anesthesiology are highly sought after and the proof is in the numbers. In the 2011 National Residency Match, the Department received 798 applications for 15 positions. After interviewing 122 outstanding medical students, the program successfully filled all 15 positions from the top 40 students on its Match list, including five of the top ten. The National Residency Matching Program Report continues to rank our program in the top quartile of all U.S. anesthesia residency programs for key quality indicators: number of positions offered and recruiting efficiency, AOA membership (33%), mean USMLE Step 1 score (232) and mean USMLE Step 2 score (247).

The extensive education and training programs offered by the Department of Anesthesiology integrate scientific and clinical advances with current clinical practice to prepare students, residents, fellows, and faculty for productive careers as clinicians, academicians, and scientists. Our physician educators are nationally and internationally recognized as leaders in their fields, and the Department successfully encourages residents to enter academic anesthesia and develop careers focused on advancing knowledge in the specialty.

The Department’s desirability as a specialty within the School of Medicine has also improved due to increased exposure of students throughout all years of their training. Exposure to anesthesia begins in the College Advisory system in which Associate Program Director Michael Pilla, MD, serves as a College Mentor, continues in the third year Critical Care Skills Course, and concludes with third- and fourth-year anesthesia clerkships. Many medical students also participate in research mentored by Anesthesiology faculty. Informal, as well as formal, mentorship by faculty and residents has improved the understanding and appreciation of the specialty. These efforts have led to an increase in Vanderbilt medical students planning careers in anesthesiology, from six graduates in the class of 2011 to more than 15 students in the current third-year class.

office of educational affairs

Vanderbilt Anesthesiology’s training program currently enrolls 61 resident physicians, 17 clinical fellows and three research fellows. Anesthesiology clerkships introduce medical students to anesthesia and critical care, as well as provide valuable critical skills training. Residents and fellows benefit from comprehensive training in all subspecialty disciplines of clinical anesthesiology, critical care, and pain management. The residency training program includes the following experiences:

• Perioperative patient management
• Regional anesthesia and acute pain management
• Critical care
• Comprehensive experiences in subspecialties including:
  o Anesthesia for General Surgery
  o Anesthesia for Orthopedic Surgery
  o Anesthesia for Urologic Surgery
  o Anesthesia for Gynecological Surgery
  o Anesthesia for Plastic & Burn Surgery
  o Anesthesia for Endocrine Surgery
  o Anesthesia for ENT & Ophthalmologic Surgery
  o Transplantation Anesthesia
  o Cardiac Anesthesia
  o Vascular/Thoracic Anesthesia
  o Pediatric Anesthesia
  o Pediatric Cardiac Anesthesia
  o Chronic Pain Management
  o Ambulatory Anesthesia
  o Obstetric Anesthesia
  o Neuroanesthesia

Another major factor in attracting residents, fellows and faculty is the strength of the Department’s subspecialties. Areas which have greatly expanded in recent years to include more targeted educational opportunities include regional anesthesia, critical care medicine and pain medicine. In 2010-2011, there were 17 clinical fellowships offered in critical care, pain management, pediatric anesthesia, regional anesthesia, cardiothoracic anesthesia, obstetric anesthesia, as well as three research fellowships.

“We realized five or six years ago that we wanted to enhance the quality of fellowships, as well as appropriately expand the number of positions,” said Algren. “That was one of several reasons why we have kept the size of the residency class constant. Five years ago, we had six or seven fellows, now we have 17.”

The Office of Educational Affairs is led by Dr. John Algren and includes Associate Program Director Jane Easdown, MD; Associate Program Director Michael Pilla, MD; and four administrative staff members.
The Vanderbilt Anesthesiology Department provides a full calendar of educational opportunities for anesthesiologists and other medical professionals. Our medical education offerings include:

**For Medical Students**

**Critical Care Skills Week:** Week-long workshop conducted quarterly for third-year medical students to prepare them to recognize and manage critical problems encountered in clinical practice. This training includes hands-on education using simulation skill stations at Vanderbilt Medical School’s Center for Experiential Learning and Assessment (CELA). Critical Care Skills Week also includes lectures by departmental faculty.

**Medical Student Conferences:** Daily discussions lead by faculty members on selected topics for third- and fourth-year medical students assigned to anesthesiology clerkships.

**For Interns**

**Boot Camp:** Workshops held during orientation, as well as periodically throughout the year, focusing on developing specialized skill sets essential to anesthesia and perioperative care.

**Intern Conferences:** Introduction to Anesthesia Seminars, Matrix Seminars, practice-improvement discussions, organized using the Healthcare Matrix, and Basics of Anesthesia lectures.

**For Residents**

**Fundamentals of Anesthesia:** Daily conferences for CA-1 residents on fundamental concepts and principles of anesthesiology.

**Subspecialty Conferences:** Conferences coordinated by individual divisions of the department, including Pediatric, Obstetric, Cardiothoracic, Critical Care and Multispecialty Anesthesia.

**Senior Seminars:** Seminar series for senior residents focused on problem-based learning and preparation for Oral Exams.

**Professional Development Conferences:** Resident conferences focused on elements of subspecialty selection, career paths, and business practices related to perioperative anesthesia.

**Resident Practice Assessment & Improvement:** Monthly conferences focused on developing an understanding and application of quality improvement processes to group, as well as individual, clinical anesthesia practice.

**For All**

**Journal Clubs:** Informal meetings in which current medical articles pertaining to the specialty are summarized and reviewed. Journal Clubs are held by specific divisions of the department, including Multispecialty, Pediatric, Cardiothoracic, Critical Care and Pain Medicine.

**Academic Development Conferences:** For fellows, residents and faculty on topics related to educational theory and practical aspects of classroom and clinical teaching, mentorship, etc.

**Grand Rounds:** Formal lectures held on Friday mornings featuring recognized experts in the field of anesthesia, perioperative medicine or pain medicine.

**Mortality & Morbidity Conferences:** Monthly conferences focused on case studies with the goal of improving future patient care. Each quarter, Perioperative M&M Conferences also include surgical specialties and nursing services to better facilitate the exploration of cases and the exchange of ideas.

**Special Courses & Workshops**

**Fundamentals of Critical Care Support (FCCS):** A multidisciplinary, two-day comprehensive course addressing fundamental management principles for the first 24 hours of critical care. This course is held at CELA and sponsored by the Society of Critical Care Medicine. The course is directed by members of the Anesthesiology Department’s Critical Care Division and includes instructors from multiple specialties at Vanderbilt University Medical School.

**Regional Anesthesia Workshops:** Taught by faculty members with particular expertise in regional anesthesia, these lectures and demonstrations teach regional anesthetic techniques, with an emphasis on ambulatory surgical procedures. In addition to neuraxial anesthetics, attendees gain proficiency in peripheral nerve block techniques, such as brachial plexus, interscalene, ankle, and popliteal blocks.

**Pediatric and Adult Airway Workshops:** Taught as weekend CME courses at the Center for Experiential Learning and Assessment (CELA). Partial task airway trainers are provided, as well as full-scale simulations of difficult airway management situations.

**Transesophageal Echocardiogram Workshops:** Feature individualized and group instruction using cardiac and TEE simulation tools and intraoperative recordings to improve the understanding of real-time monitoring of cardiac function.
The Department recognizes outstanding clinical trainees, faculty educators and investigators through annual awards, and the following residents and faculty were honored:

**Resident Awards**

**Acute Pain Service – Stephen Badger, MD, left, with Raj Gupta, MD**

**Regional Anesthesia – Greg Schnepper, MD, left, with Randall Malchow, MD**

**Cardiothoracic Anesthesia - Amanda Lorinc, MD, left, with Annemarie Thompson, MD**

**Neuroanesthesia, Obstetrical Anesthesia, Pain Medicine – Shane Volney, MD, left, with Letha Mathews, MD**

**Critical Care Medicine, Multispecialty Anesthesia, Pediatric Anesthesia – Justin Sandall, DO, left, with Lee Parnley, MD**

**Vice Chair Award for Outstanding Scholarship – Tom Austin, MD, left, with Matt Weinger, MD**
Residency Class of 2011
Front row, left to right: Department Chair Warren Sandberg, MD; PhD; Residency Program Director John Algren, MD; Associate Program Director Michael Pilla, MD. Second row, left to right: Loren Hemachandra, MD; Andrew Korzyniowski, MD. Third row, left to right: Robert Isaak, DO; Frederick O’Donnell, MD; Humphrey Lam, MD. Fourth row, left to right: Joel Chang, MD; Amanda Lorinc, MD; Shane Volney, MD. Fifth row, left to right: Stephen Badger, MD; Gregory Schnepper, MD; and Justin Sandall, DO. Not Pictured: Associate Program Director Jane Easdown, MD; Lindsey Tucker, MD; Tom Austin, MD; and Todd Barbosa, MD.

Faculty Awards

Golden Apple Awards: Curtis Baysinger, MD; Raj Gupta, MD; Doug Hester, MD

Volker I. Striepe Teaching Award: Ram Pai, MD

BE Smith Mentorship Award: Jerod Denton, PhD
Major translational research initiatives at Vanderbilt are moving discoveries from the bench to the bedside, and our scientists are working to transform both health care and health care delivery. In academic year 2010, Vanderbilt University School of Medicine faculty across all disciplines received more than $445 million in external funding for research. The Vanderbilt Department of Anesthesiology is a key contributor to the institution’s standing, as it is consistently ranked one of the top extramurally funded research programs in the nation. The Anesthesiology Department received more than $2.6 million in awarded National Institutes of Health grants in federal fiscal year 2010.

The Department is unique among academic departments for having a strong, multifaceted approach to research including:

- A strong Basic Science Research Division focusing on ion channel physiology and pain mechanisms.
- The Perioperative Clinical Research Institute which provides all support services needed for successful clinical research.
- Best-in-class anesthesia and perioperative information systems, with complete control of application development and a dedicated team of analysts devoted to making electronic data widely available to investigators and quality improvement teams. These systems are managed by Perioperative Informatics, an institutional entity co-directed by Brian Rothman, MD.
- The new Perioperative Data Systems Research (PDSR) group, under Jesse Ehrenfeld, MD, MPH, which is actively leveraging historical data, with the goal of generating research hypotheses and new protocols to positively impact patient safety.
- Several statisticians within our faculty with expertise in experimental design and complex analyses of large datasets.
- The Center for Research and Innovation in Systems Safety (CRISS) which serves as an institution-wide resource for basic and applied research in healthcare informatics, patient safety and clinical quality, and designs and evaluates informatics user interfaces, care processes and medical technology across Vanderbilt University Medical Center.

In addition to providing a solid research infrastructure, the Department of Anesthesiology places a strong emphasis on faculty and fellow career development in academic anesthesiology. Active mentoring programs pair young investigators with experienced scientists in both basic and clinical research. For example, the Department’s B.H. Robbins Scholars Program provides a mentored research experience that culminates in a two-year clinical and research fellowship experience. Scholars may request to participate in clinical or basic science fellowship training or pursue additional formal education (e.g., Master of Science in Clinical Investigation, Master of Public Health, or other degree programs) offered at Vanderbilt during the latter part of the program.

Read more about the Vanderbilt Department of Anesthesiology’s specific research strengths on the following pages.
The major focus of the Basic Science Research Division is the study of the physiology, pharmacology, and cell biology of ion channels, transporters, and receptors. These membrane proteins are involved in functions as diverse as shaping the cardiac action potential, salt and water homeostasis in the kidney, hormone and neurotransmitter release, modulation of synaptic transmission, and the gating/processing of pain signals. Because the disruption of each of these physiological processes has a significant impact on human health, research in the Basic Science Research Division addresses the translational missions of the National Institutes of Health and of private biomedical research-oriented foundations. Currently, there are two major themes that cut across multiple laboratories: drug discovery and the study of pain mechanisms.

Three laboratories within the Basic Science Research Division are actively pursuing drug discovery for clinically relevant ion channel and transporter targets. This work is sponsored by the National Institutes of Health Molecular Libraries Probe Center Network. Dr. Sabina Kupershmidt’s research interests are focused on potentially lethal arrhythmias (acquired Long QT Syndrome) related to unintended inhibition of the hERG K+ channel, an important contributor to cardiac re-polarization. Her group developed a high-throughput screen to identify compounds that prevent hERG inhibition by therapeutic compounds administered for non-cardiac conditions. Many compounds in the drug discovery pipeline fail to reach clinical trials or have been pulled off the market because of their unpredictable interactions with hERG and are therefore likely to cause cardiac arrhythmias. From a screen of approximately 250,000 small chemicals, the Kupershmidt lab identified a compound that prevents the development of cardiac arrhythmia triggered by a known hERG antagonist in a rabbit model. Kupershmidt is mentoring BH Robbins Scholar Amanda Lorinc, MD.

The lab of Eric Delpire, PhD, devised a screen to identify potent and specific inhibitors of a transporter, KCC2, involved in modulating inhibitory neurotransmission. By pumping Cl− ions out of neurons, this K-Cl cotransporter maintains a low intracellular Cl− concentration, strengthening inhibitory GABA- and glycine-mediated inhibition. This cotransporter is therefore involved in preventing hyper-excitability and the development of epileptiform activity. After developing a fluorescence-based methodology to visualize the activity of KCC2, Delpire’s group also screened the 250,000 compound library and identified multiple inhibitors and some putative activators of KCC2 (Delpire et al. Proc Natl. Acad.

Work in the laboratory of Jerod Denton, PhD, is aimed at developing potent and selective small-molecule inhibitors and activators for members of the inward rectifier family of potassium (Kir) channels. His group recently performed a high-throughput screen for modulators of the renal outer medullary potassium channel, ROMK (Kir1.1), which is involved in salt and water reabsorption in the kidney tubule and putative target for a novel class of diuretic. Their work has led to the discovery of the first small-molecule inhibitors of ROMK (Lewis et al., Mol. Pharmacol., 76: 1094-1103, 2009; Bhave et al., Mol. Pharmacol., 79: 42-50, 2011). These compounds are being used to map small-molecule binding sites in the ROMK channel structure and to determine whether ROMK is a viable therapeutic target for the treatment of hypertension. Dr. Denton’s group was also recently awarded a Grand Challenges in Global Health grant from the Foundation for the National Institutes of Health to develop chemicals to induce “kidney” failure in the mosquito Anopheles gambiae to help fight malaria. Dr. Denton mentors BH Robbins Scholar Dan Lonergan, MD.

The lab of Eric Delpire, PhD, devised a screen to identify potent and specific inhibitors of a transporter, KCC2, involved in modulating inhibitory neurotransmission. By pumping Cl− ions out of neurons, this K-Cl cotransporter maintains a low intracellular Cl− concentration, strengthening inhibitory GABA- and glycine-mediated inhibition. This cotransporter is therefore involved in preventing hyper-excitability and the development of epileptiform activity. After developing a fluorescence-based methodology to visualize the activity of KCC2, Delpire’s group also screened the 250,000 compound library and identified multiple inhibitors and some putative activators of KCC2 (Delpire et al. Proc Natl. Acad.

Work in the laboratory of Jerod Denton, PhD, is aimed at developing potent and selective small-molecule inhibitors and activators for members of the inward rectifier family of potassium (Kir) channels. His group recently performed a high-throughput screen for modulators of the renal outer medullary potassium channel, ROMK (Kir1.1), which is involved in salt and water reabsorption in the kidney tubule and putative target for a novel class of diuretic. Their work has led to the discovery of the first small-molecule inhibitors of ROMK (Lewis et al., Mol. Pharmacol., 76: 1094-1103, 2009; Bhave et al., Mol. Pharmacol., 79: 42-50, 2011). These compounds are being used to map small-molecule binding sites in the ROMK channel structure and to determine whether ROMK is a viable therapeutic target for the treatment of hypertension. Dr. Denton’s group was also recently awarded a Grand Challenges in Global Health grant from the Foundation for the National Institutes of Health to develop chemicals to induce “kidney” failure in the mosquito Anopheles gambiae to help fight malaria. Dr. Denton mentors BH Robbins Scholar Dan Lonergan, MD.

The lab of Eric Delpire, PhD, devised a screen to identify potent and specific inhibitors of a transporter, KCC2, involved in modulating inhibitory neurotransmission. By pumping Cl− ions out of neurons, this K-Cl cotransporter maintains a low intracellular Cl− concentration, strengthening inhibitory GABA- and glycine-mediated inhibition. This cotransporter is therefore involved in preventing hyper-excitability and the development of epileptiform activity. After developing a fluorescence-based methodology to visualize the activity of KCC2, Delpire’s group also screened the 250,000 compound library and identified multiple inhibitors and some putative activators of KCC2 (Delpire et al. Proc Natl. Acad.

Work in the laboratory of Jerod Denton, PhD, is aimed at developing potent and selective small-molecule inhibitors and activators for members of the inward rectifier family of potassium (Kir) channels. His group recently performed a high-throughput screen for modulators of the renal outer medullary potassium channel, ROMK (Kir1.1), which is involved in salt and water reabsorption in the kidney tubule and putative target for a novel class of diuretic. Their work has led to the discovery of the first small-molecule inhibitors of ROMK (Lewis et al., Mol. Pharmacol., 76: 1094-1103, 2009; Bhave et al., Mol. Pharmacol., 79: 42-50, 2011). These compounds are being used to map small-molecule binding sites in the ROMK channel structure and to determine whether ROMK is a viable therapeutic target for the treatment of hypertension. Dr. Denton’s group was also recently awarded a Grand Challenges in Global Health grant from the Foundation for the National Institutes of Health to develop chemicals to induce “kidney” failure in the mosquito Anopheles gambiae to help fight malaria. Dr. Denton mentors BH Robbins Scholar Dan Lonergan, MD.

The lab of Eric Delpire, PhD, devised a screen to identify potent and specific inhibitors of a transporter, KCC2, involved in modulating inhibitory neurotransmission. By pumping Cl− ions out of neurons, this K-Cl cotransporter maintains a low intracellular Cl− concentration, strengthening inhibitory GABA- and glycine-mediated inhibition. This cotransporter is therefore involved in preventing hyper-excitability and the development of epileptiform activity. After developing a fluorescence-based methodology to visualize the activity of KCC2, Delpire’s group also screened the 250,000 compound library and identified multiple inhibitors and some putative activators of KCC2 (Delpire et al. Proc Natl. Acad.
Sci. 106: 5383-5388, 2009). The laboratory is currently following-up on some of these compounds examining their structure-function relationship and biological effects. Dr. Delpire mentors BH Robbins Scholar Tom Austin, MD.

Another interest in the Basic Science Research Division is the study of pain and pain mechanisms. Leading the effort in translational work bridging the basic and clinical sciences is Stephen Bruehl, PhD, who studies endogenous pain modulatory systems, links between these systems and psychological factors, and mechanisms contributing to chronic pain and pain-associated cardiovascular comorbidities. Work in his lab has identified pain-related alterations in interacting cardiovascular-pain modulatory systems that contribute to enhanced pain responsiveness (Bruehl et al., Pain 2010; 149: 57-63) and may elevate future risk for both chronic pain (Walker et al., Pain 2010; 150: 568-572) and hypertension (Chung et al., Pain 2008; 138: 87-97). Work in Bruehl’s lab also explores how endogenous opioid pain inhibitory systems are intertwined with brain mechanisms underlying regulation of negative affect (Bruehl et al., Psychosom Med, in press) and how these opioid systems are altered by persistent pain (Bruehl et al., Pain 148:167-171, 2010). He is also collaborating with Dr. Denton to identify variants in the gene encoding a G protein-coupled Kir channel (GIRK) that may influence opioid modulation of pain pathways. Dr. Bruehl mentors BH Robbins Scholar Patrick Henson, DO.

The lab of Kevin Currie, PhD, studies the regulation of voltage-gated calcium channels and neurotransmitter/hormone release. N-type calcium channels are expressed on presynaptic nerve terminals of primary afferent nociceptors and play key roles in pain transmission. Currie’s lab investigates how neuromodulators, inflammatory mediators, and drugs alter channel function (Currie, Channels 4: 497-509; 2010) and transmitter release (Yoon et al, J Neurophysiol 100: 2929-392008; 2008; Jewell et al, Mol Pharmacol 79, 987-996; 2011). This includes dissecting the cellular mechanisms by which gabapentin acts. Gabapentin is commonly used to treat chronic neuropathic pain, but acute perioperative dosing can also exert analgesic effects and blunt intra-operative hemodynamic perturbations. Another focus of the Currie lab is the sympathoadrenal stress response, in particular release of catecholamines and neuropeptides from adrenal chromaffin cells. In addition to prominent effects on the cardiovascular system, sympathoadrenal hormones have also been implicated in some chronic pain and hyperalgesic states (e.g. CRPS). This project includes recent collaborative efforts with Dr. Franz Baudenbacher in the Department of Biomedical Engineering to develop novel microfluidic “lab-on-a-chip” devices for analyses of neurosecretion. Dr. Currie mentors BH Robbins Scholar David Todd, MD.

The Delpire laboratory’s involvement in pain research includes examining the role of ion co-transport mechanisms in the modulation of GABA and glycine neurotransmission in the terminals of primary afferent fibers and in spinal cord neurons. The presynaptic terminals of primary afferent fibers are loaded with Cl anions through a secondary active transport mechanism (NKCC1) that pumps Cl into the cell against its electrochemical gradient equilibrium potential. High Cl allows depolarization of the terminals upon GABA release and presynaptic inhibition. On the postsynaptic side, a different transporter, KCC2, pumps Cl out of the cell strengthening GABA and Glycine inhibition. Dr. Tom Austin, BH Robbins Scholar in the Delpire laboratory, devised a method of implanting intrathecal catheters in mice for the delivery of novel compounds targeting the postsynaptic transporter. The study showed that inhibition of KCC2 shortened the response to heat-evoked nociceptive signals (Austin and Delpire, Anesth. Analg. In press). BH Robbins Scholar Dr. Daniel Lonergan is working with Dr. Denton to develop the first chemical activators of mu-opioid receptor-activated GIRK channels to explore its therapeutic potential in the management of pain.

Together, the members of the Basic Science Research Division of the Department of Anesthesiology pursue a mutually complementary and collaborative program of research whose goal is to create new knowledge leading to improved practice in anesthesiology. Moreover, the Division provides critical mentorship to a new generation of anesthesia clinician scientists who will help bind the basic science and clinical missions of the Department together even more effectively.
BH Robbins Scholars Excel with Publications, Presentations


Daniel Lonergan, MD, was the second author on a review titled “Small-Molecule Modulators of Inward Rectifier K+ Channels: Recent Advances and Future Possibilities” published in Future Medicinal Chemistry 2010 May;2(5):757-74. Co-authors of the review article were Research Fellow Gautam Bhave, MD, Brian A. Chauder, PhD; and Jerod S. Denton, PhD, who is Dr. Lonergan’s mentor. Dr. Lonergan presented his research at the American Society of Anesthesiologists 2010 Annual Meeting, and he also received the Resident Travel Award from the Association of University Anesthesiologists in 2010. Dr. Lonergan joined the faculty of the Division of Pain Medicine in 2011 and is continuing his work in Dr. Denton’s lab on the role of ion channels in the modulation of pain. Additionally, he is pursuing clinical research projects which explore the implications of opioid-induced hyperalgesia in the chronic pain population and will present an abstract titled “Utilizing a standardized opioid withdrawal protocol for intentional intrathecal pump detoxification” at the 2011 American Society of Anesthesiologists Annual Meeting. Dr. Lonergan has also restructured clinical documentation in the pain center to improve clinic workflow and establish a searchable database for quality improvement and hypothesis generation.

BH Robbins Scholars Excel with Publications, Presentations

“...” 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 Scholars program is co-directed by Jerod Denton, PhD, and Pratik Pandharipande, MD, MSCI, and has 11 participating scholars. During the 2010-11 academic year, BH Robbins Scholars realized the rewards of their diligence. Following is an update on their progress and many achievements.

Benjamin Howard Robbins, MD, the Department of Anesthesiology’s first Chair and a noted physician-scientist.

BH Robbins Scholar Dan Lonergan, MD, is mentored by Jerod Denton, PhD, and his investigations focus on the role of ion channels in the modulation of pain.
BH Robbins Scholar Robert David Todd, MD, presents his research on the mechanisms of gabapentin (neurontin) action. Part of the scholars’ time is dedicated to presenting his or her work both orally and through academic papers.

Patrick Henson, DO, published a review titled “Complex Regional Pain Syndrome: State-of-the-Art Update in Current Treatment Options” in Cardiovascular Medicine 2010 Apr;12(2):156-67 with his mentor Stephen Bruehl, PhD. Dr. Henson also received a National Institutes of Health Clinical and Translational Science Award for his project studying the fMRI findings in patients with chronic knee pain and has begun enrolling in his clinical trial. Dr. Henson began a Critical Care Medicine Fellowship in 2011.

David Todd, MD, gave an oral presentation at the 2010 meeting of the American Society of Interventional Pain Physicians (ASIPP) on the mechanisms of action of gabapentin. He is concluding further experiments and working to publish the findings of his BH Robbins project along with his mentor Kevin Currie, PhD. Dr. Todd has joined the faculty in the Chronic Pain Medicine Division and is the principal investigator for multiple clinical research projects in the Chronic Pain arena. His clinical research interests include: the treatment of complex regional pain syndrome with adjuvants to sympathetic blockade, intrathecal opioid detoxification, and the analgesic implications of buprenorphine maintenance during the peripartum period.

Heidi Smith MD, MSCI was the first author on a validation study “Diagnosing delirium in critically ill children: Validity and reliability of the Pediatric Confusion Assessment Method for the Intensive Care Unit.” Crit Care Med. 2011 Jan;39(1):150-7. Her ongoing studies, in collaboration with pediatric psychiatry and critical care, include validation of a delirium monitoring instrument for children under the age of five, an observational study evaluating executive dysfunction in critically ill children, an implementation study of delirium monitoring in critically ill children, and an epidemiological study evaluating the prevalence, risk factors and outcomes associated with delirium in critically ill patients. Dr. Smith is mentored by Pratik Pandharipande, MD, MSCI from the Department of Anesthesiology, and Wes Ely, MD, MPH, of the Department of Medicine’s Division of Allergy, Pulmonary and Critical Care.

Thomas Austin, MD, published a review article, “Kinase regulation of Na⁺-K⁺-2Cl⁻ cotransport in primary afferent neurons.” Delpire E, Austin TM. J Physiol. 2010 Sep 15;588(Pt 18):3365-73. His original research for his BH Robbins project, “Inhibition of KCC2 in mouse spinal cord neurons leads to hyper-sensitivity to thermal stimulation” has been accepted for publication in Anesthesia & Analgesia.

Dr. Austin presented this topic at the Association of University Anesthesiologists national meeting in 2011 and won the Association’s resident travel award. This abstract has also been accepted for oral presentation at the American Society of Anesthesiologists 2011 Annual Meeting. Dr. Austin is mentored by Eric Delpire, PhD.

Amanda Lorinc, MD, is continuing her research on a novel compound which has been shown to reduce dofetilide-induced dysrhythmias in isolated rabbit hearts. This work has important implications for moderating dysrhythmias caused by QT prolongation. Dr. Lorinc presented her research at the Association of University Anesthesiologists meeting in 2011. Her research was also presented by her mentor, Sabina Kupershmidt, PhD, and co-investigators at the Biannual Meeting of the Swiss Society for Pharmacology and Toxicology in Zurich, Switzerland, at the Aurora Biomed Ion Channel Retreat, in Vancouver, Canada, and at the Denis Escande Symposium in Nantes, France.

Elizabeth Lee, MD, is investigating how major medical interventions impact adolescents and pre-teens socially, cognitively and behaviorally. She is presently enrolling patients into her study cohort of patients with scoliosis; a preliminary report has been accepted for presentation at ASA 2011. Dr. Lee is mentored by John Algren, MD.

Carrie Menser, MD, is researching the impact of surgical procedures and pain management in the pediatric palliative care population. Her academic interests include the impact of the perioperative environment and pain management in children with special needs. She is mentored by Gretchen Purcell Jackson, MD, PhD, of the Department of Pediatric Surgery.

Joseph Schlesinger, MD, will soon begin his BH Robbins Scholars project and is looking at the plasticity of the temporal binding window in physicians and non-physicians and the relationship of visual-auditory interactions in human sensorimotor processing and vigilant reaction time. He is mentored by Mark Wallace, PhD, Director of the Vanderbilt Brain Institute.
Key Clinical Research Studies 2010-2011

John Algren, MD Pediatric Anesthesia NeuroDevelopment Assessment Study (PANDAS) Pilot Information Retrospective Review (Site PI)

Tom Austin, MD Anesthetic Management of Newborns for Embolization of Vein of Galen Malformations

Curtis Baysinger, MD Comparative Effects of Vasopressin and Oxytocin on the Human Fetoplacental Circulation

Julian Bick, MD Validation of a Transesophageal Echocardiography Simulator

Anesthetic Management for Combined Thoracoscopic and Catheter Approaches for the Treatment of Atrial Fibrillation

Frederick “Josh” Billings, MD Effect of Short-term Atorvastatin use on Acute Kidney Injury

James Blair, DO Peri-Anesthetic Imaging of Cognitive Decline (PAICOD): Prospective Pilot Study

Susan Calderwood, MD Assess Utilization of Cardiology Referrals in Preoperative Clinic

Elizabeth Card, RN Prevalence of Delirium in the Post Anesthesia Care Unit

Jason Daune, MD Accuracy of Malignant Hyperthermia Diagnosis in Hospital Discharge Records

Brian Donahue, MD Thrombin Generation Phenotypes in Children with Congenital Heart Disease: A Pilot Study

Jesse M. Ehrenfeld, MD, MPH Impact of Health Literacy on Perioperative Outcomes

Association Between Methylphenidate Use and Emergence from Anesthesia Retrospective Study Examining Progression of Anesthesia Resident’s Skills

Central Line Placement Under Ultrasound: Is Routine Chest X-ray Warranted?

Predictors of Post-Operative Deterioration

Effect of A Novel Electronic Blood Ordering System on Patient Outcomes

Association of SCIP Compliance with use of an Anesthesia Information Management System

A Prediction Model for Estimating PACU Length of Stay

Automatic Prediction of Perioperative Events

Dan France, PhD Efficiency Evaluation of Mobile Clinical Information System

Andrew Franklin, MD An Open-label Extension Study to Assess the Long-term Safety of Twice Daily Oxycodone Hydrochloride Controlled-release Tablets

William R. Furman, MD Electrolyte Abnormalities in Surgical Patients with Renal Failure

Loren Hemachandra, MD, JD Operating Suite Efficiency: Minimizing the Need for a Dedicated Trauma Room

Patrick Henson, DO Perioperative Outcomes Associated with Angiotensin Blockade in Colorectal Surgery

Shannon Hersey, MD Perioperative Pulse Oximetry in Obstructive Sleep Apnea Patients in the Ambulatory Setting

Douglas Hester, MD Cost Containment of Anesthetic-related Intraoperative Costs

Chris Hughes, MD The Role of Endothelial Dysfunction in Intensive Care Unit Delirium and Long-term Cognitive Impairment

Effects of Early Rehabilitation on Endothelial Function and Delirium in the ICU

Steven Hyman, MD, MM Survey Evaluating Burnout, Health Status, Depression, Alcohol and Substance Use, and Social Support Among Webinar Participants

PeriOperative ISchematic Evaluation-2 (POISE-2) Trial (Site PI)

Tracy Jackson, MD Retrospective Comparison Study of Narcotic Prescriptions with the Prescription Monitoring Protection Database

Ira Landsman, MD Demographic Predictors of NPO Violations in Elective Pediatric Surgery

Radiographic Imaging for Potential Cervical Spine Instability in Patients with Down Syndrome

Jason Lane, MD Impact of a Change in AIMS to Ensure Compliance with SCIP Beta Blockade Guidelines

Elizabeth Lee, MD Post-Anesthesia Care in Children with Communication Disorders: Does Utilizing the r-FLACC Improve Quality of Care and Parental Satisfaction?

Stuart McGrane, MD Therapeutic Hypothermia after Cardiac Arrest due to Hemorrhage

Anne Miller, PhD Staff Perceptions of Change Management at VUMC: Pilot/Feasibility Study

Pratik Pandharipande, MD, MSCI Examination of the Independent Role of Delirium and Potent Sedatives and Analgesics in Long-term Cognitive Impairment and Functional Decline Following Critical Illness. (Site PI)


Meenal Patil, MD The EMP3OWER™ Study: Eon Mini™

Mias Pretorius, MD Inhibition of Lipid Peroxidation during Cardiopulmonary Bypass

Michael Richardson, MD Anesthesiology Resident Perspectives on Perioperative Mishaps

Amy Robertson, MD Risk Factors of Acute Renal Injury in the Immediate Postoperative Period after Orthotopic Liver Transplantation.

Brian Rothman, MD Utilization and Efficiency in the Obstetrics Suite

Steven Samoya, MD Number of Attempts for Successful Peripheral Intravenous Catheterization in Pediatric Surgical Patients

Post-Operative Tonsillectomy and/or Adenoidectomy Patient Outcome QI Project

Warren Sandberg, MD, PhD Pilot Implementation and Assessment of a Computerized Pre-anesthetic Assessment Tool

Heidi Smith, MD Delirium in Pediatric Critical Care: Validation of the Pediatric Confusion Assessment Method for the Intensive Care Unit (pCAM-ICU)

Pediatric Critical Illness: Implications for Long-term Cognitive Dysfunction and PTSD

Paul St. Jacques, MD Analysis of Vital Signs Documentation Patterns Comparing Patient Satisfaction to Patient Complaints in an Academic Anesthesiology Department

R. David Todd, MD Clonidine Use in Lumbar Sympathetic Blocks to Treat Complex Regional Pain Syndrome

Chad Wagner, MD Central Line-associated Bloodstream Infections after Landmark Versus Ultrasound-guided Placement

Ann Walia, MD Morbidity and Mortality in Patients with Coronary Artery Disease that Underwent Orthotopic Liver Transplantation

Matthew Weinger, MD Cost of Delayed Extubation: Evaluation of Intraoperative Decision Making

Creating Simulation-based Performance Assessment Tools for Practicing Physicians

Gina Whitney, MD A Multimodal Approach to Reduction in Transfusion for Children Undergoing Cardiac Surgery
Physician-Scientists Thrive at Vanderbilt

Tackling troubling issues that arise in clinical settings through the direct application of the scientific method is the best model for identifying practical solutions to quickly improve patient care. Because of this, Vanderbilt’s Department of Anesthesiology wholly supports clinician faculty who pursue translational research, providing Innovation Grants to partially fund research, providing physicians protected research time, encouraging collaboration both within and across specialty boundaries, and providing unique resources to ease the way through the many challenges inherent in the pursuit of translational research.

“Our department was founded in the 1940s by one of the leading physician-scientists of his time, Dr. Benjamin H. Robbins, and commitment to our physician-scientists remains strong,” said Department Chair Warren Sandberg, MD. “Being an academic physician is challenging in itself, but it is important that we nurture those physicians within our ranks that are also able to succeed in the research arena. Physician-scientists are invaluable to medical research and to our specialty because they bring a unique perspective of conducting scientific inquiry directly based on their experience with patients. Our deep stack of research publications is proof that our environment is fostering productive work.”

Three of our outstanding physician-scientists who are pursuing significant translational research in addition to their clinical duties are highlighted below.

Frederick “Josh” Billings, MD, an Assistant Professor in the Division of Anesthesiology Critical Care Medicine, is working to decipher mechanisms of and test therapies for perioperative organ dysfunction, namely acute kidney injury (AKI). His team has enrolled and studied 250 cardiac surgery patients in their ongoing randomized clinical trial, testing the hypotheses that short-term high-dose perioperative atorvastatin reduces the incidence of AKI following cardiac surgery and that intraoperative renal and systemic oxidative stress predicts and precedes clinical AKI. Dr. Billings, and fellow physician-scientist, Mias Pretorius, MD, recently published the discovery that plasma free hemoglobin is associated with intraoperative oxidative stress and AKI. Along with co-investigators, his group is attempting to better understand the epidemiology of delirium in varied clinical groups (Cardiovascular ICU, Trauma/ Burn ICU, and Pediatric ICU).

Pratik Pandharipande, MBBS, MSCI, an Associate Professor in the Division of Anesthesiology Critical Care Medicine, is a noted intensivist and physician-scientist, and the focus of his research is to improve the lives of millions of patients who develop life-threatening illnesses, such as sepsis. For these patients, his team’s research has documented an unmet need to mitigate ICU-associated brain injury (manifested acutely as delirium and chronically as cognitive impairment). After having demonstrated the iatrogenic role of commonly prescribed benzodiazepines in delirium through several cited publications, Dr. Pandharipande designed the MENDS study (JAMA 2007) that affirmed the hypothesis that changing sedation paradigms to alpha, agonists as compared to benzodiazepines, improved patient outcomes. A hypothesis-generating subgroup analysis of survival in septic patients, led to the development of his present RO1 application. Since completing MENDS, Dr. Pandharipande has been serving as site-PI for Vanderbilt’s ICU-Delirium and Cognitive Impairment Study Group’s 825-patient, NIH-funded multicenter study examining the independent role of delirium and potent sedatives and analgesics in long-term cognitive impairment and functional decline following critical illness, and as the PI on a 300-patient study evaluating the incidence, risk factors and outcomes associated with post-traumatic stress disorder (PTSD) in veteran and civilian populations.

Dr. Pandharipande is also involved in a number of projects related to understanding the pathophysiology of delirium including inflammation, amino acid perturbation and endothelial dysfunction. Along with co-investigators, his group is attempting to better understand the epidemiology of delirium in varied clinical groups (Cardiovascular ICU, Trauma/ Burn ICU, and Pediatric ICU).

Mias Pretorius, MD, an Associate Professor of Anesthesiology in the Division of Cardiothoracic Anesthesiology, and Associate Professor of Clinical Pharmacology, Department of Medicine, is pursuing research focused on investigating the mechanism and improving adverse outcomes following cardiac surgery. His group has specifically studied the effect of drugs on the activation of renin-angiotensin system, the kallikrein-kinin system and inflammation during cardiac surgery and its impact on fibrinolysis, oxidative stress, atrial fibrillation and acute kidney injury. Dr. Pretorius also is investigating the effects of acetaminophen on the oxidative stress response in patients undergoing cardiac surgery. The proposed studies will elucidate the contribution of heme proteins to the oxidative stress response and acute kidney injury following cardiac surgery and will help guide the development of new pharmacological strategies to reduce kidney injury. In 2011, Dr. Pretorius was promoted to Associate Professor with tenure.
The Vanderbilt Department of Anesthesiology has long been a national leader in the development and advancement of perioperative informatics, and there’s been an increased focus over the past year to strengthen the informatics initiatives at Vanderbilt. In addition to bolstering current efforts, the newly formed Perioperative Data Systems Research (PDSR) group is now actively leveraging a wealth of historical data, with the goal of generating valuable research and new protocols to positively impact perioperative care and safety.

“This department has always had a very strong commitment to informatics, and many notable accomplishments in the field,” said Department Chairman Dr. Warren Sandberg. “By bringing some key talent on board and by providing the faculty already here the dedicated time and necessary staff to expand and improve our informatics programs, we are looking forward to dramatically impacting our specialty, and patient care in total, through new research and technology.”

A combination of world-class research, active software development, and utilization of the latest clinical applications allows the department to drive the use of technology within anesthesiology to improve patient safety and quality. The department’s informatics initiatives are also linked with activities at both Vanderbilt University Medical Center and Vanderbilt University as a whole, creating an environment of collaboration. Advances in both research and clinical care are being facilitated by several faculty members in the department, many of whom have additional faculty appointments in the Department of Biomedical Informatics.

The two key groups affiliated with the department driving this effort are the PDSR group and Perioperative Informatics.

**Perioperative Data Systems Research**

The Perioperative Data Systems Research (PDSR) group, led by Jesse M. Ehrenfeld, MD, MPH, focuses on utilization of information technology within the perioperative environment to improve patient safety and the quality of care delivered. The multidisciplinary group currently manages more than sixty active clinical research projects and is working to develop methodologies for evaluating technology and information management systems within the operating room.

“There’s a lot of technology being developed in the marketplace, and it’s often difficult to sort out what the most appropriate solutions might be, whether it’s a new device, piece of software or ways to interpret data,” said Dr. Ehrenfeld. “Through the rigorous application of the scientific method, and through the kind of research our group is doing, it’s possible to understand how to apply technology in the most effective way and to find the right solutions so that our patients have the best outcomes possible.”

The Department of Anesthesiology has been a leader in the field of anesthesia information management systems (AIMS) development since the late 1990s. GasChart, the AIMS component of Vanderbilt Perioperative Information Management System (VPIMS), is part of an integrated system that covers the entire perioperative process including instrument and supply management, scheduling, and status displays. Because of the extensive effort that has been devoted to developing in-house intraoperative software, the PDSR group is able to call upon hundreds of thousands of historical intraoperative records, each containing detailed physiologic information.

The group’s clinical research projects span many areas, including development of real-time point-of-care notification systems, creating predictive models to allow patient risk-stratification, enhancing patient-provider communication, developing new models for delivery of medical care, and bringing personalized medicine into the operating room. The group’s active research projects include collaborations that extend across Vanderbilt and into a growing number of academic centers across the world. These centers include The University of Michigan, Harvard University, Thomas Jefferson University, and the Norwegian University of Science and Technology.

One recent quality improvement success, a collaboration between PDSR and Perioperative Informatics, has dramatically improved the care of diabetic patients by the implementation of automated notifications for intraoperative glucose monitoring at VUMC. For all diabetic patients and patients to whom insulin is administered, a pop-up screen in GasChart notifies clinical staff that the patient is diabetic or that they have received insulin during the pre-operative phase of care. Then, real-time notifications prompt additional glucose monitoring during surgery. Blood sugar levels are then measured in the operating room, ensuring that patients are monitored, to the best of clinicians’ ability, throughout the entire care process. Just months after implementation, this improvement has already led to a reduction in adverse events and improvement in patient-centered outcomes for hundreds of diabetic patients undergoing surgery.

“This is personalized medicine at its best,” said Ehrenfeld. “We went from concept to execution of this in a matter of months. This brings together all the things we do best – identifying an issue, building technology and ultimately improving the care our patients receive.”

**Perioperative Informatics**

Perioperative Informatics, a group co-directed by Brian Rothman, MD, Medical Director of Perioperative Informatics and Medical Director of Access and Administrative Operations, and Stephanie Randa, RN, CNOR, MHA, Administrative Director of Operative Services, is a hospital entity that develops and manages the clinical applications used within the perioperative setting. The Vanderbilt Perioperative Information Management System (VPIMS) application suite developed and commercialized by Vanderbilt includes GasChart for electronic anesthesia documentation, Vigilance which improves clinicians’ situational awareness, the iOS-based situational awareness...
mobile application VigiVu, and PatientTracker, for electronic nursing documentation during each perioperative phase of care.

“Our job is to solve known or previously unidentified issues related to workflow and system functionality while understanding how these two elements intersect,” said Rothman. “We are identifying unique solutions that improve patient safety, operating room efficiency, the quality and character of the data collected, staff workflow, and decrease cognitive workload on our staff through a combination of creative software design and development, with a particular focus on user interface.”

One Perioperative Informatics success has been the development of the Universal Protocol/Time Out (UP/TO), a scalable module for procedural areas to conduct Enterprise-compliant time outs. The module increases procedural area patient safety by compelling clinicians to follow a step-wise process confirming pertinent patient information, procedure type, and appropriate procedure preparation. This new module is currently in use at VUMC.

Another Perioperative Informatics initiative is an institution-wide hand hygiene monitoring application. With an institutional target of 95% hand hygiene compliance in patient care areas, a majority of the Department of Anesthesiology faculty members and certified registered nurse anesthetists have been trained as hand hygiene observers. To improve the process of compliance data collection, the Perioperative Informatics group created an iOS-based application that should provide a two-day data turnaround. Now in its pilot stage of implementation, the application will be available to 200 trained observers and any other staff with an iOS device throughout VUMC to quickly and accurately record hand hygiene observations.

“We anticipate that the number of observations will increase, the discrete data collection will ensure that observations result in hand hygiene improvement, and that hand hygiene performance is sustained,” said Rothman. “Instead of scribbling notes on paper that are then transcribed, this application allows you to do the observation in seconds, then you just move on.”

On a much larger scale, Perioperative Informatics is working toward data “interoperability” by providing patient information collected through VPIMS in a useful form to the institution. Contributing data to the Core Data institutional information database and the pharmacy database are examples of how doors are opening to exchange information throughout the continuum of patient care.

“The interoperability with the institution is necessary,” said Rothman. “Because we have such a large volume of Vanderbilt patients passing through our area, we see it as our vital mission to communicate data we collect to other care providers across the institution. Likewise, the availability of important care information when a patient receives care in the perioperative space is equally vital. We don’t focus on inbound or outbound data. We focus on bi-directional communication with all systems. That is our goal in the years to come.”

Taken together, the informatics effort in the Department of Anesthesiology seeks to close the loop, ensuring that patients are fully protected from harm and that known-good interventions are always executed. Because Vanderbilt ‘owns’ its information systems, both literally and figuratively, rapid cycle processes of hypothesis generation, pilot demonstration and full scale implementation of quality improvement projects is uniquely supported.
Navigating through countless regulations, mastering the nuances of grant writing, and properly managing finances in order to conduct clinical research is enough to fray the nerves of any fledgling investigator. To keep the process running smoothly, from initial concept to published research, the Department of Anesthesiology’s Perioperative Clinical Research Institute provides a full range of support services including regulatory management, data management, contracts management, biostatistics, bioinformatics, and financial oversight. The group also trains new investigators so they can grow to the point of having their own funded research that leads to major publications.

“We are here to facilitate the research process for our investigators,” said Clinical Trials Manager Damon Michaels. “We assist with compliance with federal, state and local regulations and other details so the investigator can focus on their science. The end goal is stronger research, with an eye toward publication in leading journals.”

Clinical research within the Department includes both industry-sponsored and investigator-initiated clinical projects and focuses 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 seek to answer clinically significant questions.

The PCRI oversees more than 60 active clinical trials, with many more studies in development. PCRI is directed by Dr. James Berry and Clinical Trials Manager Damon Michaels. The team consists of highly trained research professionals, including four research nurse specialists, one research assistant, two clinical trials associates, and one research analyst.

“It has been exciting to see the growth in clinical research since PCRI was founded in 2007,” said Michaels. “When I started, the Department was mainly focused on basic science research. We added industry-funded studies to help new investigators learn about the research process. As they’ve progressed in their research careers, our investigators have started constructing their own complex questions whose answers will improve the quality of patient care for years to come.”

In partnership with PCRI, the Vanderbilt Anesthesiology Clinical Research Advisory Committee (VACRAC) was formed in 2009 to promote and mentor clinical research within the Department. The committee supports new investigators in developing clinical research projects that will lead to publication and, if possible, extramural funding.

VACRAC mentors potential investigators throughout the research development process and creates opportunities for ongoing learning about research methods, proposal writing, IRB applications, data management and analysis, and presentation/publication skills. The committee also reviews new research proposals and regularly audits ongoing investigations for effectiveness and compliance with regulatory and safety guidelines. Committee members are James Berry (chair), Jonathan Schildcrout (co-chair), Pratik Pandharipande, Paul St Jacques, Brian Donahue, Curtis Baysinger, Jason Lane, Dan France, and Damon Michaels.

**PCRI-supported Nursing Research**

The Perioperative Clinical Research Institute includes four research nurse specialists, all practicing registered nurses with specialized training in conducting clinical research. The research nurse specialists provide support for clinical investigators, assisting in the design of clinical research, and ensuring the integrity and quality of clinical research trials. Over the past two years, the nurses’ role has expanded to the point that they have been presenting their research at national conferences and have published in the academic press.
“These individuals support our ongoing investigations, and their contributions are invaluable,” said Clinical Trials Manager Damon Michaels. “They are often the critical contact point ‘in the trenches,’ and are able to make sure nothing falls through the cracks or lags for any reason. They have been growing professionally so that they are more responsible, and are now producing their own research.”

The clinical research nurses are:

**Pamela Berry, RN, CCRP** A practicing registered nurse since 1978, Pamela’s nursing background includes OR, cardiac cath-lab, pediatrics and PACU/holding room. She has served as sub-investigator or key study personal in more than 28 clinical research studies at Vanderbilt involving drugs, devices, observational or survey studies. Her two ongoing studies focus on delirium or cognitive impairment. She has been working closely with Drs. Heidi Smith and Pratik Pandharipande in developing the Pediatric-CAM-ICU and its validation and implementation. She is working on one ongoing study on delirium or cognitive impairment. Donna is serving as secretary for the Middle Tennessee Society for PeriAnesthesia Nurses (TSPAN) and as Middle Tennessee Society for PeriAnesthesia Nurses (MTPSAN) Education Chair.

**Elizabeth Card, RN, CPAN, CCRP** A practicing registered nurse since 1990, Elizabeth’s nursing background includes ICU, CVICU, PACU, holding room, pediatrics, transplant and vascular case management. She has served as a sub-investigator or key study personnel in more than 45 clinical research studies at Vanderbilt involving drugs, devices, observational or survey studies. Her research includes two ongoing studies on delirium or cognitive impairment. Presently, Elizabeth serves as vice president for the Tennessee Society for PeriAnesthesia Nurses (TSPAN) and as Middle Tennessee Society for PeriAnesthesia Nurses (MTSPAN) Education Chair.

**Patricia Hendricks, RN** A practicing registered nurse since 1978, Patty’s nursing background includes ICU, PACU/holding room, cancer pain and symptom management therapies, and home health care. She has served as a sub-investigator or key study personnel in more than 15 clinical research studies at Vanderbilt involving drugs, devices, observational or survey studies. Her research includes two ongoing studies on delirium or cognitive impairment. Patty works exclusively with Dr. Billings on a study focusing on acute kidney injury and delirium following cardiac bypass surgery.

**Donna Nelson, RN, CAPA** A practicing registered nurse since 1980, Donna’s nursing background includes PACU, holding room, pediatrics, and labor & delivery. She has served as a sub-investigator or key study personnel in more than 15 clinical research studies at Vanderbilt involving drugs, devices, observational or survey studies. She is working on one ongoing study on delirium or cognitive impairment. Donna is serving as secretary for the Middle Tennessee Society for PeriAnesthesia Nurses (MTSPAN) for 2011.

---

**Abstract/Research Presentations by PCRI Nurses**

- **What goes bump in the light: A comparison of standard of care SpO2 readings versus “stealth” SpO2 readings on the post-op patient** Elizabeth Card, RN, CPAN; Donna Nelson, RN, CAPA; Lee Lancaster, MD; Mary Jeskey, RN; BSN, CPAN, Damon Michaels, BS, CCRP; James Berry, MD.

- **Successful use of a novel format of postoperative ward monitoring** Mary Jeskey, RN, BSN, CPAN; Damon Michaels, BS, CCRP; Neal Sanders, PhD; Paul St. Jacques, MD.

- **Early Detection of a Blood Transfusion Reaction Utilizing a Wireless Remote Monitoring Device** Elizabeth Card, RN, CPAN; Alanna Goodman, MD; William Hardeman, BS; Mary Jeskey, RN; Leland Lancaster, MD; Jennifer Lee, MS; Donna Nelson, RN; Damon Michaels, CCRP, BS; Anne Miller, PhD; Paul St. Jacques, MD; Neal Sanders, PhD; Misty Skinner, CST; James Berry, MD.

- **Hyperalgesia: A little known condition in pain assessment and pain control** Donna Nelson, RN, CAPA; Elizabeth Card, RN, CPAN; Mary Jeskey, RN, BSN, CPAN; Jennifer Lee, MS; Randall Malchow, MD; Damon Michaels, CCRP, BS; Neal Sanders, PhD; James Berry, MD.

- **A Survey to Determine Nurse Adaptability to New Wireless Monitoring Technology on a Post-operative Unit** Mary Jeskey, RN, BSN, CPAN; Damon Michaels, CCRP, BS; Elizabeth Card, RN, CPAN; Donna Nelson, RN, CAPA; Neal Sanders, PhD; Paul St. Jacques, MD.

---

**PCRI Nurse Publications**

- **Card E, Nelson D, Jeskey M, Miller A. Early detection of a blood transfusion reaction utilizing a wireless remote monitoring device; Emerging technologies impact on patient care [Case Study]. Medsurg Nursing.** In press.


Scientific investigation is a top priority for the Vanderbilt Department of Anesthesiology, and communication of that work to the broader community is a key academic activity. The Department hosts an annual Research Symposium to highlight the work of our basic scientist investigators, physician-scientists, clinicians, research nurses and medical students conducting current research.

“The Research Symposium is one day for our researchers to truly shine,” said Eric Delpire, PhD, Director of Basic Science Research. “They are able to practice their presentation skills, highlight their most recent and exciting discoveries, and network with other basic science and clinical investigators within the Department. The event also provides an opportunity for the Department to recognize hard work through the annual research awards that are presented at the conclusion of the symposium.”

The day-long forum also includes the annual Benjamin Howard Robbins Lecture, presented in 2011 by noted investigator James C. Eisenach, MD, the FM James, III Professor of Anesthesiology, Departments of Anesthesiology and Physiology & Pharmacology, at Wake Forest University School of Medicine. Dr. Eisenach is also director of the Pain Mechanisms Lab at Wake Forest, as well as editor-in-chief of Anesthesiology. His research focuses on the neurophysiology and pharmacology of pain, with active laboratory and clinical research in projects involving labor pain, postoperative pain, and chronic neuropathic pain. For his lecture at Vanderbilt, Dr. Eisenach spoke on “Obstetric Pain — Acute, But Not Chronic.”

The following Department of Anesthesiology investigators received awards for their work in academic year 2010-2011:

- **Best Oral Presentation:** Heidi Smith, MD
- **Best Poster Presentation:** R. David Todd, MD
- **Roger England Award for Excellence in Support of Research:** Elizabeth Card, RN, CPAN
- **Pittinger Prize for Excellence in Basic Science Research:** Mias Pretorius, MD
- **Pittinger Prize for Excellence in Clinical/Translational Research:** Christopher Hughes, MD
- **Best Oral Presentation:** Heidi Smith, MD
James C. Eisenach, MD, director of the Pain Mechanisms Lab at Wake Forest University School of Medicine, at left, with Anesthesiology Department Chair Warren Sandberg, MD, PhD. Dr. Eisenach was the guest speaker for the 2011 Benjamin Howard Robbins Lecture which is held in conjunction with the annual Research Symposium.

Clinical Trials Manager Damon Michaels, far left, Research Nurse Donna Nelson and BH Robbins Scholar Dan Lonergan, MD, share their recent investigations at the 2011 Anesthesiology Research Symposium.

Thuy Nguyen, at left, and Rene Raphemot, investigators in the laboratory of Jerod Denton, PhD, present their research at the annual symposium.
Because of increasing scope and impact outside of the operating room and across multiple healthcare domains, Vanderbilt’s Center for Perioperative Research in Quality (CPRQ) was renamed in October 2010 as the Center for Research and Innovation in Systems Safety (CRISS). Directed by Matthew B. Weinger, MD, this institution-wide resource for human factors and systems design remains located within the Department of Anesthesiology and is an integral part of Vanderbilt’s Institute for Medicine and Public Health (IMPH), led by Robert Dittus, MD. The Center also includes the functions of Vanderbilt’s Center for Improving Patient Safety (CIPS).

To fulfill its mission of enhancing healthcare quality and safety, CRISS conducts basic and applied research in healthcare informatics, patient safety and clinical quality; designs, assesses and improves care processes, medical technology and electronic health record user interfaces; and utilizes state-of-the-art simulation facilities to test and analyze medical equipment and procedures.

Recent CRISS research activities include an Agency for Healthcare Research and Quality-funded study showing that a simulation-based training intervention enhanced the quality of handovers and communication between anesthesia providers and PACU nurses; a VA-funded study of 1,000 surgical cases that found that OR teams’ workload ratings were strongly associated with reported intraoperative events; and a VA-funded pilot study (PI: Jason Slagle, PhD) to measure internal medicine residents’ workload when on-call.

Ongoing research includes an NHLBI R21 grant (PI: Dan France, PhD) to model the factors that affect the ability of patients with acute coronary syndrome presenting to the emergency department to receive evidence-based care; a study funded by the Anesthesia Patient Safety Foundation (PI: Anne Miller, PhD) to implement and evaluate goal-directed care protocols in the cardiovascular ICU; and an National Library of Medicine-funded trial evaluating how the mode of clinical documentation (handwritten note, dictation, or electronic charting) affects the patient experience as well as the quality of the resulting note. Additionally, CRISS started an AHRQ-funded multicenter study to develop and deploy standardized simulation scenarios to evaluate the competence of board-certified physicians.

CRISS involvement with Vanderbilt University Medical Center operational initiatives in quality improvement range from participating in the review and analysis of most serious clinical events at VUMC, to re-engineering blood transfusion processes, improving clinician handovers, and enhancing compliance with perioperative timeouts and checklists.

For VUMC informatics, CRISS faculty and staff are integrally involved in user interface design and evaluation on numerous applications including Vanderbilt Outpatient Order Management (VOOM), a new outpatient lab and diagnostic test ordering system), StarPanel Customized Views (a new method of presenting EMR data for specialists), and tools that help track the status of lab results and facilitate surgical timeouts, anesthesia handovers and debriefings. A notable educational highlight, among CRISS faculty’s student mentoring and course conduct efforts, is the planned launch of a new undergraduate course in human factors engineering.

CRISS faculty and research fellow members include Director Matt Weinger, MD; David Afshartous, PhD; Shilo Anders, PhD; Arna Banerjee, MD; Daniel France, PhD; Richard Holden, PhD; Kevin Johnson, MD; Audrey Kuntz, EdD, MSN; Anne Miller, PhD; Ann Minnick, PhD, RN, FAAN; Laurie Lovett Novak, PhD, MHSA; Debbiane Peterman, PhD, MSN, RNC-NIC; Michael Pilla, MD; Neal Sanders, PhD; Jason Slagle, PhD; Theodore Speroff, PhD; Kim Unertl, PhD; and Gina Whitney, MD. CRISS staff includes Russ Beebe; Edward Byrd, MPH; Lori Kelly; Andrew Kline; Eric Porterfield, MS; and Christopher Simpson.

CRISS staff worked with members of Perioperative Informatics to develop a Universal Protocol/Time Out (UP/TO) at VUMC which increases patient safety by prompting clinicians – through easily followed visual check lists – to confirm important patient data.
Selected Publications, 2010 - 2011

The Vanderbilt Department of Anesthesiology produced three books, 59 book chapters, and more than 80 peer-reviewed publications during Academic Year 2010-2011. Selected publications are listed, with department authors denoted in bold text.

Original Manuscripts


Harvey S. For a classmate. Canadian Medical Association Journal, 2011 June 27. [Epub ahead of print]


Lindsley C, Lewis M, Weaver D, Delpire E. Discovery of a Highly Selective KCC2 Antagonist. Probe Reports from the NIH Molecular Libraries Program [Internet]. Bethesda (MD): National Center for Biotechnology Information (US); 2010.


**Books**


**Book Chapters**


Book reviews


Letters


Lay press


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 isn’t all about work. We know how to take that same energy and have a great time.

We gather together regularly for family-friendly events, including our Annual Department Picnic, events to welcome new residents, fundraisers for our Vanderbilt International Anesthesia program, and other fun activities throughout the year. Here are just a few images from our events.
Vanderbilt Department of Anesthesiology

2010-2011 ANNUAL REPORT

Vanderbilt Department of Anesthesiology
1211 21st Avenue South • Medical Arts Building, Suite 701 • Nashville, TN 37212

Patient Care • Scholarship • Education