



# SLEEPY TIMES

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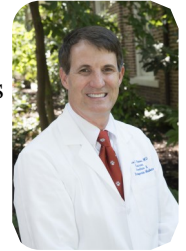
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## MESSAGE FROM THE CHAIRMAN: IT'S A SMALL WORLD AFTER ALL -SCOTT T. REEVES, M.D., MBA

In July, Dr. Eric Nelson and I traveled to Dar es Salaam, Tanzania, along with a group representing the MUSC Heart and Vascular Center (Drs. Eric Powers, Peter Zwerner and Bennie Van Bakel). The purpose of the trip was to continue our work to educate anesthesiologists and cardiologists at the newly opened Jakaya Kikwete Cardiac Institute, named after the 4<sup>th</sup> President of Tanzania, Jakaya Kikwete. This time, we had a very unique opportunity to participate and lecture during the second ever East African Cardiology Conference, which consisted of some 200 participants from Tanzania, Kenya, Ethiopia, Uganda, South Sudan, and other countries.



Eric spent a day working along side Dr. Mike Valentine, Incoming President of the American College of Cardiology, putting in cardiac pacemakers. He lectured on *Perioperative Pacemaker Management* during the conference. Afterwards, Dr. Valentine asked for Eric's slide set, indicating just how well the presentation was received. Eric also led a workshop on the *Essentials of Cardiopulmonary Bypass and Cardiac Emergencies*. I lectured on *The Anesthesia and Surgical Management of Off*

*Pump CABG*. Off pump surgery ultimately becomes the preferred method for bypass grafting in resource poor countries due to the difficulties of getting disposable supplies such as bypass circuits.

This trip was especially rewarding as we got to see first hand the progress that has been made since we first started the "train forward" concept with our partner, Madaktari Africa (<http://www.madaktari.org>), in 2008. Initially, there were only 10 anesthesiologists and 2 cardiologists in the whole country of 50 million people. Now, there are 35 anesthesiologists and 16 cardiologists with new active residency and fellowship training programs. Finally, the Tanzania Minister of Health, the Honorable U. Mwalimu, announced that they would begin building a free-standing pediatric hospital with pediatric cardiac capabilities within 24 months, adjacent to the adult cardiac institute. This would be a huge achievement but would require significant educational support from the West and MUSC in particular. After the meeting was over, I realized just how far we have come, both in distance and in meeting the needs of this East African country. It truly is a small world after all.



## CLAUDIA OXNER SIMMONS, M.D., ENDOWED CHAIR IN ANESTHESIA AND PERIOPERATIVE MEDICINE CREATED



Dr. Claudia Oxner Simmons was born in Leesville, South Carolina on August 13, 1931. She was the only child of the late Geneva and Woodrow Oxner.

Dr. Oxner graduated from Newberry College and the Medical College of South Carolina in Charleston and was the first woman doctor from Batesburg-Leesville. Out of a class of 69 graduates, only three were women with Claudia being the youngest member of the class. With her hard work and determination, Claudia won respect and recognition of her classmates, as well as her coworkers and business partners. She loved her profession and felt that her happiness came from the medical field to which she was devoted. After graduating from the Medical College, she extended her education to Anesthesia, being one of the first anesthesiology residents at what is now the Medical University of South Carolina (MUSC). She worked at Asheville Anesthesia Associates in Asheville, North Carolina for her entire career.

Dr. Oxner was admired by many and showed great strength, humility, kindness, and grace throughout her life. She was very kind and had compassion for every human being that came her way. She touched many lives during her career. She remained connected to her Alma Mater and left a significant contribution to the Department of Anesthesia and Perioperative Medicine following her death on March 11, 2016. The proceeds will be utilized by the department to fund an endowed chair in her honor.

## RESEARCH CORNER

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# Original Article

## Identifying workflow disruptions in the cardiovascular operating room

T. N. Cohen,<sup>1</sup> J. S. Cabrera,<sup>2</sup> O. D. Sisk,<sup>1</sup> K. L. Welsh,<sup>1</sup> J. H. Abernathy,<sup>3</sup> S. T. Reeves,<sup>4</sup>  
D. A. Wiegmann,<sup>5</sup> S. A. Shappell<sup>6</sup> and A. J. Boquet<sup>7</sup>

*1 Doctoral Student, 2 Graduate Student, 6 Chair, 7 Associate Professor, Department of Human Factors, Embry-Riddle Aeronautical University, Daytona Beach, Florida, USA*

*3 Professor, 4 Professor and Chair, Department of Anesthesia and Perioperative Medicine, Medical University of South Carolina, Charleston, South Carolina, USA*

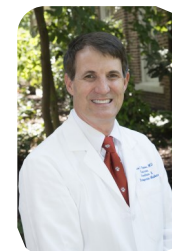
*5 Associate Professor, University of Wisconsin–Madison, Madison, Wisconsin, USA*

### Summary

The objectives of this study were to identify the frequency and nature of flow disruptions in the operating room with respect to three cardiac surgical team members: anaesthetists; circulating nurses; and perfusionists. Data collected from 15 cases and coded using a human factors taxonomy identified 878 disruptions. Significant differences were identified in frequency relative to discipline type. Circulating nurses experienced more coordination disruptions ( $\chi^2$  (2, N = 110) = 7.136,  $p < 0.028$ ) and interruptions ( $\chi^2$  (2, N = 427) = 29.743,  $p = 0.001$ ) than anaesthetists and perfusionists, whereas anaesthetists and perfusionists experienced more layout issues than circulating nurses ( $\chi^2$  (2, N = 153) = 48.558,  $p = 0.001$ ). Time to resolve disruptions also varied among disciplines ( $\lambda$  (12, 878) = 5.186,  $p = 0.000$ ). Although most investigations take a one-size fits all approach in addressing disruptions to flow, this study demonstrates that targeted interventions must focus on differences with respect to individual role.



Dr. Abernathy



Dr. Reeves

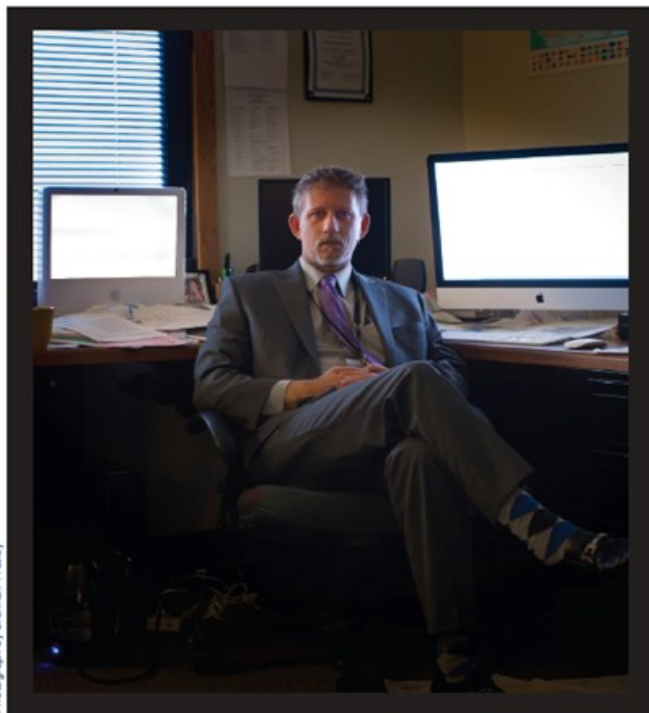


## RESEARCH CORNER CONTINUED...

## PAIN ON THE BRAIN

## Electrical stimulation of neural networks may reduce pain after surgery

BY SVER AUNE



Photograph by Brennan Wesley

**Dr. Jeffrey Borckardt** led a study of tDCS for postoperative pain

Researchers at MUSC are developing a method to treat pain that may partly replace opiate narcotics. Transcranial direct current stimulation (tDCS) works by stimulating areas of the brain that interpret and respond to pain.

Many orthopaedic surgery patients rely on opioids for pain management after surgery, and they often already take medication for chronic pain. Their physicians are interested in reducing the risks of side effects and addiction from prolonged opioid use.

**Jeffrey J. Borckardt, Ph.D.**, a psychologist in the MUSC Department of Psychiatry and Behavioral Sciences, studies how pain signals travel through neural networks once they reach the brain. According to Borckardt, pain signals activate the sensory cortex—which locates the pain; the limbic system—which generates emotions about pain; and the pre-frontal cortex—which enables conscious intellectual decisions about pain's meaning. By applying low electrical current to these areas, tDCS could stimulate the parts of the brain that govern our conscious reaction to pain.

Once the pre-frontal cortex has been located, a device that looks like a wired shower cap is placed on a patient's head and fitted with electrodes. In a typical session of tDCS, very low amplitude current is applied for 20 minutes. Because the current is so low, tDCS does not actually cause neurons to fire. "We're not firing networks, we're just facilitating or inhibiting natural network activity with tDCS," Borckardt said. "It makes it easier or harder for them to fire depending upon stimulation parameters."

In a study published in the May 2016 issue of the journal *Spine* (doi: 10.1097/BRS.0000000000001525), Borckardt reported that four sessions of tDCS in the 28 hours following surgery were enough to reduce self-administration of hydromorphone by 23%. Tingling was the most common side effect. For the study, Borckardt enlisted the help of **Scott T. Reeves, M.D.**, Chair of the MUSC Health Department of Anesthesia and Perioperative Medicine, and MUSC Health orthopaedic surgeon **John A. Glaser, M.D.**

These results support the possibility that how a person thinks about his or her pain can have real consequences on the pain itself, according to Borckardt. "If you have a very realistic, non-fatalistic, optimistic view of what's going on in your body and why, all of these cognitive circuits in the pre-frontal area can really turn the volume down on how bad pain is," said Borckardt. For this reason, tDCS might be yet more effective when coupled with psychotherapy for pain.

Borckardt, who refers to several of his clinical partners as "anesthesiologist champions" for their ability to facilitate his research with surgery patients, has also teamed up with **Robert D. Warters, M.D.**, an anesthesiologist in the MUSC Health Department of Anesthesia and Perioperative Medicine and Chief of Service in the Ralph H. Johnson Veterans Affairs Medical Center. Together, they are recruiting patients for a large phase 2 clinical trial using tDCS coupled with psychotherapy in veterans with chronic lower back pain (NCT02483468), and using tDCS for postoperative pain among veterans undergoing total knee arthroplasty (NCT02241967).

Borckardt is also actively recruiting patients for clinical trials of tDCS in pain perception (NCT01860950) and pain in fibromyalgia (NCT02723175). To determine the eligibility of a patient for a tDCS clinical trial, contact Brittan Carter at (843) 792-3659.

## U.S. NEWS & WORLD REPORT NAMES TOP HOSPITALS IN SOUTH CAROLINA BY: LAUREN SAUSSER, POST & COURIER

The Medical University of South Carolina was again named the top hospital in the state by U.S. News and World Report. Five specialties at MUSC, including cancer, gynecology and urology, also ranked nationally among the best programs in the United States.

“These rankings reflect not just reputation but patient outcomes, teaching the next generation of care providers, developing new innovations to improve health, and health care leadership,” said Dr. Patrick Cawley, CEO of Medical University Hospital, in a prepared statement.

MUSC’s ear, nose and throat department ranked 14th best in the country — the highest score among the hospital’s specialties. Dr. Paul Lambert, director of MUSC’s otolaryngology and head and neck surgery department, praised his team. “It is a tangible testament to the dedication and work ethic of our incredible faculty — physicians, scientists, audiologists, advanced practice providers, nurses and administrative staff,” Lambert said in a written statement. “We are pleased with our recognition by U.S. News & World Report, but equally delighted with the record number of MUSC departments and divisions — adult and pediatric — also recognized. The future of our institution is indeed bright.”

Roper Hospital and Bon Secours St. Francis Hospital tied for second place in the state with Providence Hospital in Columbia and AnMed Health in Anderson. Spartanburg Regional Medical Center and McLeod Health in Florence tied for sixth place. Other Charleston hospitals, including East Cooper Medical Center, Trident Health and Roper St. Francis Mount Pleasant Hospital, were not named.

U.S. News & World Report publishes separate adult and pediatric hospital rankings every summer, as well as a national best hospitals list, state-specific lists and specialty-specific lists. This year, the media company named the Mayo Clinic in Rochester, Minn., the best in the country. None of the South Carolina hospitals made the Top 20 national Honor Roll. Last week, the federal government [published star ratings](#) for overall hospital performance. Roper Hospital and Bon Secours St. Francis Hospital earned five out of five stars. Medical University earned two.

Schipp Ames, a spokesman for the S.C. Hospital Association, cautioned patients against choosing their provider based on one ranking alone. He said different groups use various calculations to grade quality and safety. “It can be extremely confusing for consumers,” Ames said. “Patients for so long have just relied on their physician to kind of determine where they’re going to go next. But now, with cost coming more into play ... that’s part of the reason you’re seeing such a rise in these rankings — to guide consumers about where they’re going to spend their money.”





## STRIKING A BALANCE FOR PATIENTS IN PAIN

BY: DR. RYAN NOBLES



"Opioids Killed Prince."

The statement on a mainstream news site struck me in large, bold lettering. The tragedy is another high-profile reminder of the dangers of one of the most commonly prescribed medications in our society.

Prince was found with fentanyl in his system. Fentanyl is typically used in IV form for surgical procedures and outpatient procedures, but it can also be used in patch form in an outpatient setting for chronic pain. For severe cancer pain, the medication is also available as an under-the-tongue spray or lozenge. High doses of the medication can be fatal, especially if mixed with other opioids or if it is escalated too rapidly.

The media seem to be portraying Prince as a victim of forces out of his control, and it appears he was seeking the treatment of an addiction specialist in the days before his death. However, as a pain medicine physician, I was concerned with how Prince ended up in the tragic situation.

Was Prince's fate another example of physician negligence, or was this an example of a wealthy patient manipulating the health care system? No matter what the underlying cause, it is an important opportunity to discuss the role of opioids in health care and educate patients and other doctors on their appropriate use.

In 2012, over 259 million prescriptions were written for opioids. From 1999 to 2014, more than 165,000 patients died from opioid overdose. In 2011, more than 420,000 emergency department visits were attributed to opioid misuse. All these reported numbers reflect the growing problem of opioids in our country.

The Centers for Disease Control and Prevention released a set of [guidelines](#) in early 2016 addressing the use of opioids in the outpatient setting and analyzing studies of opioids from the last several years to develop the set of recommendations. The most eye-opening results from the CDC document reveal that there are no studies that prove opioids reduce pain scores and improve patient function in the long term (more than one year).

Also, long-term use of opioids leads to the patient developing a physical and psychological dependence over time and can result in fatal side effects like difficulty breathing, leading to death. However, the CDC recognizes that opioids can be useful for certain patients in certain situations. Sometimes a patient has other medical conditions that prevent the use of other commonly prescribed medications for pain like anti-inflammatories, nerve modulating medications and muscle relaxants. In those situations, opioids may be an appropriate option if the patient and physician discuss the limitations and risks of the drugs.

## STRIKING A BALANCE FOR PATIENTS IN PAIN BY: DR. RYAN NOBLES CONTINUED...

There have been recent changes in South Carolina to improve physician awareness of how patients are using opioids and improve education for both physicians and patients. On June 6, 2014, South Carolina Governor Nikki Haley signed Senate Bill 840 into law. The new law requires all dispensers of opioids (pharmacies) to report prescription monitoring data daily. The data is reported in SCRIPTS, the South Carolina Reporting and Identification Prescription Tracking System.

The SCRIPTS database shows information for controlled substance prescriptions, including the prescriber and dispenser of the substances. SCRIPTS is available to all physicians who prescribe opioids, and the use of the system is recommended under the new CDC guidelines. SCRIPTS allows physicians to monitor how many prescriptions a patient has received and monitor for patterns of misuse. The new law also requires physicians to obtain further education related to the prescription and monitoring of controlled substances. MUSC has hosted the new educational course and will continue to give physicians in our area the chance to advance their understanding of opioid medications.

In the [pain clinic at MUSC](#), we continue to use opioids for selected patient populations. Each patient is assessed individually for candidacy for opioid prescription. Some pain disease states, like fibromyalgia, have been shown in the literature to not improve with opioid therapy, and we seek to educate patients with these diagnoses to try other avenues of treatment.

If opioids are used, we provide the patient with a pain contract with clear agreements and guidelines for the prescription medication. We use urine drug screening to ensure the medications are being taken appropriately. We are following the new CDC guidelines and performing the necessary documentation to stay in compliance with the new South Carolina laws.

A difficult reality for some patients is the understanding that we cannot always completely cure their pain, and it may be necessary to live with some degree of pain. Opioids are dangerous medications, and the benefits of their use are sometimes outweighed by the magnitude of potential side effects, including difficulty breathing, sedation and even death.

Patients can be advocates in their care and be informed of the type of training their physician has received. We encourage patients to discuss with their physicians the goals of treatment with opioid medications as well as a plan of action when the dose exceeds levels recommended by the CDC. Patients may also request an evaluation by a pain medicine physician.

It is sometimes difficult for a patient to discern the appropriate type of physician to seek out among the deluge of misinformation regarding qualifications in the pain medicine specialty. There are multiple boards that grant certification to physicians in the field of pain medicine, including the American Board of Anesthesiology, the American Board of Interventional Pain Physicians and the American Board of Pain Medicine.

Each board requires a certain amount of experience in pain medicine and requires the physician to complete a written certification exam. The American Board of Anesthesiology additionally requires the physician to have completed an additional 12 months of training in an American College of Graduate Medical Education-accredited fellowship program prior to certification with a written exam.

Opioids can be beneficial medications if used appropriately with a clear understanding of their risks and limitations. Better communication between patients and their physicians will help to prevent tragedies like Prince's death in the future.



A label on this fentanyl package says the drug is only for pain requiring opioid medicine around the clock.

## TRAVEL + LEISURE MAGAZINE NAMES CHARLESTON 'BEST CITY IN THE WORLD' BY: WARREN WISE, POST & COURIER

Charleston is on top of the world.

For the first time ever, readers of Travel + Leisure magazine voted the Holy City No. 1 on the planet in the tourism periodical's World's Best City ranking. It's also the first time a U.S. destination earned the honor. Readers also selected Charleston as the No. 1 city in the U.S. and Canada for the fourth consecutive year.

The magazine announced the findings on its website Wednesday and on NBC's "Today Show." The recognition for one of the city's biggest industries comes slightly more than a year since Charleston was rocked by the mass shootings at Emanuel AME Church that left nine people dead. The South was well-represented in the World's Best rankings. Nearby Savannah came in at No. 9. New Orleans ranked No. 7. No other U.S. cities made the magazine's Top 15 list.

Charleston took top marks in the categories of sights/landmarks, culture/arts, restaurants/food, people/friendliness, shopping and value, scoring 91.66 overall. "Charleston is a remarkably dynamic place, so it's no surprise that it has achieved its highest ranking ever in our survey as this year's best city in the world," Travel + Leisure editor Nathan Lump said.

"The city has managed to preserve all the qualities for which it is widely known — a prime coastal setting, historic architecture and friendly locals — while also nurturing a creative culture that is making it one of the most notable destinations for those who seek out interesting restaurants, bars and shops that highlight a dedication to distinctive craft."



The magazine said on its website, "In addition to historic battle-grounds and jasmine-scented streets, Charleston is home to award-winning hotels ... and restaurants. Antebellum charm, excellent boutiques, and the beautiful waterfronts at Sullivan's Island and Folly Beach make this city one of the most beloved in the U.S. — and now, the world." The accolade will no doubt continue to draw people to Charleston, a seaside city with a growing port, cruise ships, and major industries such as Boeing, Volvo and Mercedes-Benz. Since 2012, the first year the city picked up the No. 1 city in the U.S. and Canada from the magazine's readers, Charleston's tourism economy grew 14 percent to \$3.68 billion last year, according to the Office of Tourism Analysis at the College of Charleston. "This award is a testament to the vitality of Charleston as a world-class destination," said Dan Blumenstock, chairman of the Charleston Area Convention and Visitors Bureau and director of hotel operations for Fennell Holdings.

"The area's tourism and hospitality community has enjoyed positive growth over the past four years, due in part to the numerous awards bestowed on the Charleston area," he said. "We look forward to continued and responsible economic impact as a result of the No. 1 city in the world ranking." In addition to the top ranking, The Spectator Hotel in downtown Charleston garnered the prize for No. 1 hotel in the continental U.S. and No. 2 in the world. "With the hotel only having opened less than a year ago, we are truly honored to be recognized by the readers of Travel + Leisure as the No. 1 Top City Hotel in the 2016 World's Best Awards in the categories of rooms and facilities, service, location, value and design," said Michael Tall, president and chief operating officer of Charlestowne Hotels.

The Travel + Leisure nod is not the first time Charleston has landed on top of a travel magazine's survey. In 2012, readers of Conde Nast Traveler named Charleston the top city in the world, and for the past five years the city took home No. 1 in the U.S., though Conde Nast changed the categories last year to make Charleston the top small city in the United States.

Angela Drake, president of the Ansonborough Neighborhood Association, called the Travel + Leisure accolade "fabulous" and tipped her hat to the city's tourism leaders for selling the Charleston brand to the world, but she also said the city must work hard to maintain what makes it special. "We need to continue to preserve the quality of life we have, and we need to continue to work together to do that," Drake said. She believes top travel destination awards for the city such as the Travel + Leisure honor will likely attract more visitors. "The cat's out of the box," she said of Charleston's allure. "There is always going to be change. It's just how we adapt to that change. We want to grow in a measurable way so that the quality of life can be maintained. All of the neighborhood associations work together with the city, whether it's studying hotel growth, Airbnbs or tourism as a whole."



## WELCOME NEW FACULTY TO THE DEPARTMENT!



Dr. Patrick Britell is very excited to continue his career at MUSC. He rejoins us this year as an Anesthesiologist and Critical Care Neurointensivist after spending the last two years at MUSC completing fellowships in both Critical Care Anesthesia and Neurocritical Care. Pat grew up in Los Angeles and graduated Pitzer College in 2000 with a degree in English and World Literature. After spending several years as a firefighter and paramedic in LA, he attended Albany Medical College in 2006. During medical school, he spent several months at MUSC, but finally ended up doing his internship and residency in Anesthesia at the University of Miami/Jackson Memorial Hospital. Pat is joined at MUSC by his wife, Ashley, who is an attending in the Department of Internal Medicine. Together they live in Mt Pleasant with their four year old son, Anderson, and are expecting a new baby in October. Pat spends his free time running, cycling, and playing golf.

Dr. Brad Eastman is excited to join the Critical Care Division. He was born and raised in West Virginia. He obtained his BS degree in Biology from West Virginia University in 2005 and his Doctor of Osteopathic Medicine from West Virginia School of Osteopathic Medicine in 2011. Brad completed his internship at Charleston Area Medical Center in Charleston, WV, and his residency at Allegheny General Hospital in Pittsburgh, PA. While in undergrad and medical school, he was a member of the WV Air National Guard, where he had the opportunity to serve in Operation Enduring Freedom and Operation Iraqi Freedom. Brad recently completed a critical care fellowship here at MUSC and is happy to have the opportunity to stay on as faculty. He and his wife, Julie, enjoy spending time outdoors with friends and family.



Dr. David Gutman was born in the former USSR, which then became Russia, and today is Ukraine. At the age of 4, his family immigrated to the United States and settled in New York City. David lived in Manhattan until middle school, when his family moved to suburbia on Long Island. His interest in medicine developed while volunteering for an EMS company. He went to undergrad and medical school in Brooklyn, NY. David's love of anesthesia developed early on and he never once doubted his decision. He was recruited to Charleston to pursue his passion in obstetrical anesthesiology with the under-construction Shawn Jenkins Children's Hospital and Pearl Tourville Women's Pavilion. David enjoys volleyball, fishing, fantasy football, reggae roots music, and Dachshunds. He lives in downtown Charleston with his wonderfully talented wife, Emma, and his one-and-half-year-old red dapple Dachshund named Maisy.

## NEW BABY IN THE DEPARTMENT!

**Please congratulate the Romeo family in celebrating the addition of Josephine Lily Romeo, born July 28, 2016, 20 inches and 7lbs, 4oz.!**





## DR. STEPHANIE WHITENER SELECTED AS NEW CRITICAL CARE FELLOWSHIP DIRECTOR!



Dr. Stephanie Whitener was born in Denver, Colorado and completed her undergraduate studies at Clemson University with a degree in biological science. She spent a year performing basic science research at the UNC Cystic Fibrosis center before entering medical school at UNC Chapel Hill. Stephanie did her intern year at Emory University in general surgery and went on to complete her anesthesia residency at Brigham and Women's Hospital in Boston, Massachusetts. She completed a fellowship in Anesthesia Critical Care at Massachusetts General Hospital and then spent almost two years working as an anesthesiologist and intensivist at Duke University. Stephanie has been at MUSC for almost two years, working in both the general ORs and the MSICU.

## CONGRATULATIONS TO DRs. RYAN GUNSELMAN AND CATHERINE TOBIN ON THEIR PROMOTIONS TO ASSOCIATE PROFESSOR!

Dr. Ryan Gunselman joined MUSC in 2010 after completing his residency at Case Western Reserve University (MetroHealth) in Cleveland, where he served as Chief Resident for the department. Prior to residency, Ryan completed a surgical internship at the Cleveland Clinic, medical school at the University of Cincinnati, and a pharmacy degree at The Ohio State University. He was more than happy to finally escape the arctic temperatures of the Midwest and get closer to family here in Charleston where his parents also reside. Since arriving at MUSC, Ryan has been on the Regional Acute Pain Service and has been active in resident education as well as hospital administration. He resides in Mt. Pleasant with his girlfriend, Khris, and their three furry children, Bentley, Daisy, and Lily. Ryan is honored to be a part of such a close-knit and productive department.



Dr. Catherine Dawson Tobin grew up in Florence, South Carolina and is the oldest of four children. Her father, uncle, and grandfather were orthopedic surgeons who had a great impact on Catherine at a young age and played a large part in her desire to become a doctor. After attending college at the University of North Carolina at Chapel Hill, Catherine moved to Charleston and has lived here ever since! She attended medical school (2001-2005), completed her anesthesia residency (2005-2009), and became a faculty member in 2009, all here at MUSC. Catherine started on the liver transplant team but has since transitioned to the ambulatory anesthesia team. She is the Director for the third year medical student anesthesia rotation and enjoys mentoring medical students. She teaches multiple courses at the simulation center, including Moderate Sedation to Non-anesthesiologist Physicians, ACLS, and Intern 101. Her passion is for anesthesia education and her primary research has been in simulation education.



Catherine lives with her husband, Terry, a technology sales executive at PhishLabs; her daughter, Lilly, a rising 1st grader; and her son, Tripp, who at 4-years-old keeps everyone on their toes and smiling. Their favorite weekend activity is going on family boat rides and having picnics on local islands. Catherine thanks her mentors and colleagues who have supported and encouraged her, including (but not limited to) Drs. Scott Reeves, Latha Hebbar, Jerry Reves, Matt McEvoy, Silvia Wilson, and John Schaefer. She looks forward to many more years at MUSC and seeing all the growth, innovation, research, and healing that will take place.

### HAVING FUN AT THE MUSC SHAWN JENKINS CHILDREN'S HOSPITAL AND PEARL TOURVILLE WOMEN'S PAVILION GROUNDBREAKING CEREMONY



### PLEASE JOIN US FOR THE 2016 LOWCOUNTRY HEART WALK!

#### 2016 Lowcountry Heart Walk



Saturday, September 24<sup>th</sup>

Liberty Square, Charleston SC

8 AM Activities | 9 AM Walk



#### Lowcountry Heart Walk

Please contact Dr. Carlee Clark or Jackie Fisher for more details or to join one of our departmental teams!

1 or 3 mile route options - leashed dogs and strollers are welcome!

Fun activities and heart health education for the entire family!

We have several options available for donations; every dollar counts! Stop by Jackie's office (SEI 302) to buy a Heart for \$1, a Heartstring for \$10, or a bracelet for \$3!

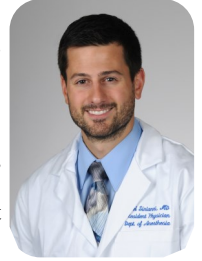
[www.lowcountryheartwalk.org](http://www.lowcountryheartwalk.org)



## RESIDUAL NEUROMUSCULAR BLOCKADE (RNMB) IN THE MAIN OR PACU: AN OBSERVATIONAL REPORT

BY: JOEL SIRIANNI, M.D. (MENTORS: D. STOLL, M.D, & L. HEBBAR, M.D.)

As a QI requirement for my residency training, I decided to a) investigate and report the incidence of RNMB in our PACU, b) provide a brief education on the topic, and c) provide recommendations to avoid RNMB and related complications.

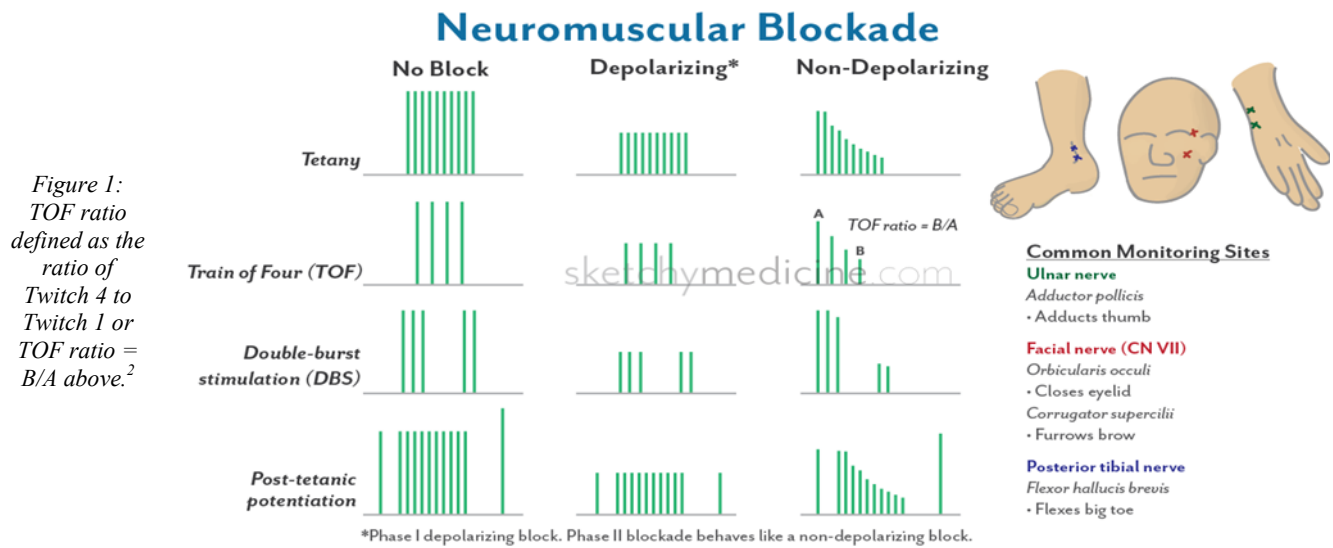


### Introduction:

Respiratory problems are the second most common postoperative complication in the PACU, second to PONV.<sup>1</sup> However, the morbidity associated with respiratory complications demands greater vigilance and usually immediate intervention. Airway obstruction, laryngospasm, airway edema, and residual anesthetic or neuromuscular blockade are all possibilities that could lead to potential hypoxemia and/or hypercarbia requiring airway manipulation including possible reintubation.

RNMB is defined as a Train of Four (TOF) ratio  $<0.9$  (used to be  $<0.7$ ) (Fig. 1).<sup>2</sup> In the PACU, RNMB has been shown to a) increase adverse respiratory events (including reintubation, decreased pulmonary function, impaired oxygenation/ventilation, pharyngeal dysfunction and increased risk of aspiration pneumonia), b) prolong length of stay, c) increase visual problems, d) cause unpleasant subjective symptoms of muscle weakness and e) overall decrease quality of recovery.

Most studies have demonstrated that as many as 40% of patients presenting to the PACU have RNMB.<sup>3,4</sup> Todd et al showed that when using objective monitoring in the OR, only 15% of pts had TOF ratio  $<0.9$  upon arrival to PACU vs  $>31\%$  when using subjective monitoring; more importantly there were no observed PACU reintubations when objective monitors were used over their 3 year study as opposed to 2-4 reintubations/year when using subjective measures prior to the trial.<sup>5</sup> There are several subjective clinical tests available to establish recovery from NMB which include 5-second head lift (most patients can do this at a TOF ratio of  $\leq 0.5$ ), strong grip strength, or normal tidal volumes while breathing spontaneously. Unfortunately these tests are subjective and hence prone to observer bias. They do not establish the objective standard of adequate reversal which as stated earlier is a TOF ratio  $>0.9$ .



RNMB is currently a topic of interest in anesthesia literature and research with several publications in the last year. The APSF Newsletter dated Feb. 2016 has 4 articles focused on RNMB.<sup>6</sup> Anesthesiology News published CME credit on this topic in Dec. 2015 and Feb. 2016. The ASA website has presented 3 CME videos on ensuring patient safety with NMBs in March 2016.<sup>7</sup> However, despite RNMB being recognized as a clinical problem in the PACU, there are no NMB monitoring guidelines endorsed by the ASA; neither quantitative nor qualitative NMB monitoring is mandated as part of the "Standards of Basic Anesthetic Monitoring."

TOF monitoring in our ORs is usually done with peripheral nerve stimulators (Fig. 2A). This however only gathers subjective data either through visual or tactile twitches. This is a problem as most clinicians can no longer detect if fade is present at TOF ratio  $>0.4-0.5$ . Therefore the assumption that seeing/feeling 4 strong twitches equates adequate reversal is not valid because in reality they may have a TOF ratio  $<0.9$ , i.e. RNMB.

### Methods:

This was an observational study I conducted during my time in the Main hospital PACU (4/4-5/1/16). Data was collected via chart review on patients ( $n=40$ ) that had received NMB in the OR. In addition, an objective TOF ratio was recorded within 15 minutes of patients coming to the PACU (Fig. 2B). The TOF-Guard acceleromometer was used to measure the response to ulnar nerve stimulation and provide a TOF ratio. Disclaimer, I didn't attempt to find personal provider practices but rather collect data as a whole from our department's practices at the main hospital.

## RESIDUAL NEUROMUSCULAR BLOCKADE (RNMB) IN THE MAIN OR PACU: AN OBSERVATIONAL REPORT CONTINUED...



A.



B.

Figure 2. A. Subjective Peripheral Nerve Stimulator.<sup>8</sup> B. Objective Peripheral Nerve Stimulator, TOF-Guard.<sup>9</sup>

### Results:

#### I. Reintubations

There were no reintubations in the 4 weeks of daylight shifts that I worked in the PACU. This includes all patients that came to the PACU and not just the patients that had objective monitoring with the TOF-Guard.

#### II. Intraoperative documentation of NMB

##### A. Monitoring

TOF was charted at least once per case in all BUT one case.

When repeat NMB was given, TOF was charted prior to the NMB 68% of the time.

The frequency of charting TOF ranged anywhere from 1-16 times per case (checked every 10 minutes vs once in >3 hours).

When reversal was given it was normally >8 minutes after the last dose of NMB.

TOF was charted prior to reversal in 57% of cases.

After reversal, TOF was charted 31% of the time.

After reversal, sustained tetany was charted 18% of the time.

##### B. Administration of paralytics and reversal agents

Reversal agent was used in all BUT two cases.

Reversal agent was administered with:

1 twitch (n=1),

2 twitches (n=3),

3-4 twitches (n=17).

The average dose of neostigmine ranged from 3-5 mg (30mcg-70mcg/kg) with a dose of glycopyrrolate of 0-1mg.

A full 5mg neostigmine reversal with 4 twitches was given 38% of the time.

Extubation ranged from 2-48 minutes after reversal with neostigmine with 12 extubations (30%) occurring within 10 minutes of giving reversal.

Sugammadex administered n=2.

#### III. TOF Guard findings in PACU

100% of patients had 4 twitches.

**The TOF-Guard showed RNMB (a ratio <0.9) in 33% of patients with 8% of all patients having <0.7 TOF ratio.**



## RESIDUAL NEUROMUSCULAR BLOCKADE (RNMB) IN THE MAIN OR PACU: AN OBSERVATIONAL REPORT CONTINUED...

### Conclusion:

*What positives can we take from this data?*

1. Our rate of RNMB at 33% is slightly lower than most studies reporting RNMB (keeping in mind that our n=40).
2. We use reversal after giving NMB almost 100% of the time and generally waited to give it until 3-4 twitches were present. Notably, Brull et al showed that without reversal agent a TOF ratio <0.7 is observed in as many as 20% of patients 2 hours after the administration of vecuronium.<sup>10</sup>
3. During my study there were no major respiratory events in the PACU including aspiration, laryngospasm, or the need for CPAP or reintubation.

*What are some areas of improvement and recommendations?* Though the incidence of RNMB of 33% is less than reported by other studies, there is room for improvement.

1. Systematic charting of TOF throughout the case (in relation to NMB re-dosing) as well as TOF charting before and after reversal (along with sustained tetany) might be areas for improvement. Most providers check twitches in the OR much more frequently than the records show, especially prior to and after reversal.
2. Communication with our surgeons regarding the remaining length of surgery and the need for paralysis can help attenuate re-dosing of paralytics just prior to conclusion of the case. With the current availability of sugammadex there is potential to significantly alter our incidence of RNMB. Brueckmann et al showed a reduction of RNMB from 43% of patients given neostigmine to 0% when using sugammadex.<sup>11</sup>

As my study was an observational study (n=40) with RNMB being assessed objectively only in PACU it is difficult to make formal recommendations. A larger sample size and a randomized controlled design looking at incidence of RNMB with intraoperative vs PACU objective monitoring of TOF ratio is warranted to make formal recommendations. Keep up the good work everyone!

### Educational pearls:

1. Most studies show it takes >10 minutes for the TOF ratio to become >0.9 with neostigmine reversal if you have 2-4 twitches.<sup>12</sup>
2. Experts recommend giving reversal agents at least 10-15 minutes prior to extubation. This time is also prolonged with concurrent use of sevoflurane/isoflurane vs propofol.
3. The facial muscles (orbicularis oculi/corrugator supercilii) most closely correlate with the diaphragm whereas the adductor pollicis correlates with pharyngeal muscles.<sup>13,14</sup> Four twitches at the facial muscles may only be 1 or 2 at the adductor pollicis. Thilen et al showed that monitoring at the eye muscles led to a 5-fold increase in RNMB. This is due to the fact that though the diaphragm has recovered, the pharyngeal muscles which maintain airway patency may still have RNMB. Per the Anesthesiology News CME, two facial twitches is considered a deep block still and likely corresponds to TOF 0 at the adductor pollicis; most would not reverse this and as such suggest using objective TOF monitoring in this case. When possible, stimulation of the adductor pollicis seems to be the safest bet. If it is not possible to monitor adductor pollicis during the surgical procedure, one should switch to it at the end of the case to assess adequacy of reversal.
4. Normothermia is also extremely important as this may reduce RNMB. Hypothermia not only affects the accuracy of NMB by reducing muscle strength but it also slows the metabolism of NMBs and increases their duration of action up to 2-fold with only 2°C decrease in temperature.
5. You don't always have to give full reversal with 4 twitches; see the Harvard TOF reversal guidelines based on ideal body weight and number of twitches (Fig. 3).<sup>15</sup> Of note, utilizing the qualitative method (as we do here) it is recommended that a reversal agent (albeit a smaller dose) be given even when 4 twitches (without fade) are present.
6. Additionally there is a ceiling effect to neostigmine. Doses >5mg are not recommended as a paradoxical block could ensue.

In conclusion, RNMB is a clinical entity. However, the utility and practicality of objective TOF monitoring (i.e. via the TOF-Guard) remains to be determined. It is expensive, cumbersome and is not very user-friendly. Also, it can only be used on the ulnar nerve. This notably small sample size suggests that our practice patterns are safe and it is hard to suggest that integration of an objective monitoring system would improve our outcomes. Hopefully this project has stimulated some introspection and review of personal practices while highlighting a few educational points.

Figure 3: Neostigmine reversal guide based on number of twitches.<sup>15</sup>

NEOSTIGMINE REVERSAL GUIDE			
Type of Monitoring		Neostigmine Dose (administer with anticholinergic)	
Qualitative	Quantitative	Ideal Body Weight (5 mg maximum)	70 kg patient
No twitch	No twitch	WAIT	WAIT
1 twitch	1 twitch	WAIT	WAIT
2-3 twitches	2-3 twitches	~50 mcg/kg	3 to 4 mg
4 twitches with fade	TOF ratio (<0.4)	~40 mcg/kg	2 to 3 mg
4 twitches without fade	TOF ratio (<0.4-0.9)	15 to 25 mcg/kg	1 to 2 mg
	TOF ratio (>0.9)	NONE	NONE
<b>Risk Factors for Residual Postoperative Paralysis</b>			
High total dose of neuromuscular blockade (>1.5 mg/kg rocuronium; >0.4 mg/kg cisatracurium)			
High dose neostigmine reversal (>60 mcg/kg)			
Always dose neuromuscular blockers and reversal/anticholinergic according to monitoring and clinical condition.			

## RESIDUAL NEUROMUSCULAR BLOCKADE (RNMB) IN THE MAIN OR PACU: AN OBSERVATIONAL REPORT CONTINUED...

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## PRE-OP CLINIC RETIREMENT CELEBRATION FOR ANNIE FRASIER



Annie Frasier, Patient Care Technician, long time MUSC employee, and beloved member of the Anesthesia Pre-Operative Clinic staff, retired in early August. Annie worked for MUSC for almost 24 years and held multiple job titles along the way. After working in the Transportation department, Annie moved on to assisting patients undergoing inpatient rehab. Annie later functioned as a PCT on 6 East prior to dedicating 14 years to the Pre-op Clinic. Annie is very active in the Charleston community and has dedicated her time and effort to numerous charitable events. She participates in the American Heart Association's Heart Walk every year and helps collect shoes, food, and other household items for those in need. The clinic staff celebrated Annie's time here at MUSC with a party in her honor. Annie will be greatly missed!

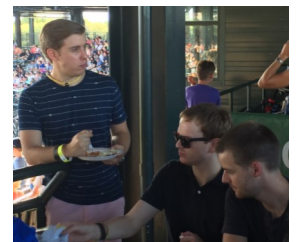


DEPARTMENT WELCOME PARTY AT THE RIVERDOGS GAME!





**DEPARTMENT WELCOME PARTY AT THE RIVERDOGS GAME!**



**GRAND ROUNDS FOR THE MONTH OF SEPTEMBER**



**“Morbidity & Mortality Conference:  
Challenging OB Cases”  
September 6, 2016  
Latha Hebbar, M.D., Professor  
Dept. of Anesthesia & Perioperative Medicine  
Medical University of South Carolina**

**“Can I Still Have an Epidural? ”  
September 13, 2016**

**Laura Roberts, M.D., Assistant Professor  
Dept. of Anesthesia & Perioperative Medicine  
Medical University of South Carolina**



**“Topic TBA”  
September 20, 2016  
Christopher Goodier, M.D., Assistant Professor  
Dept. of Obstetrics & Gynecology  
Medical University of South Carolina**

**“Programmed Intermittent Epidural Bolus (PIEB)”  
September 27, 2016**

**Benjamin Cobb, M.D., Assistant Professor  
Department of Anesthesiology  
University of North Carolina School of Medicine**







DEPARTMENT OF ANESTHESIA AND  
PERIOPERATIVE MEDICINE

Email: fisherja@musc.edu  
Phone: 843-792-7503  
Fax: 843-792-9314

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[HTTP://WWW.MUSC.EDU/ANESTHESIA](http://www.musc.edu/anesthesia)

### Future Events/Lectures

#### Intern Lecture Series

September 8th—Dysrhythmias, Dr. Nelson, SEI 314

September 22nd—Peripheral Vascular Disease, Dr. Nobles, SEI 314

#### CA 1 Lecture Series

September 7th—Adrenergic Agonists and Antagonists/Hypotensive Agents, Dr. Gonselman, CSB 429

September 14th—Local Anesthetics/Adjuncts to Anesthesia, Dr. Hebbar, CSB 429

September 21st—Anticholinergic Drugs/Cholinesterase Inhibitors, Dr. Stoll, CSB 429

September 28th—Spinal, Epidural, and Caudal Blocks, Dr. Doty, Sim Center

#### CA 2/3 Lecture Series

September 5th—Holiday (No Lecture)

September 12th—Pregnancy Associated Diseases, Dr. Warters, Moodle

September 19th—What's New in OB Anesthesia, Dr. Hebbar, Moodle

September 26th—Management of High Risk Parturients & Anesthetics Implications, Dr. Roberts, Moodle

#### Grand Rounds

September 6th—Morbidity & Mortality Conference, Dr. Hebbar

September 13th—Can I Still Have an Epidural?!, Dr. Roberts

September 20th—Topic TBA, Dr. Goodier

September 27th—Programmed Intermittent Epidural Bolus (PIEB), Dr. Cobb (UNC)



### I HUNG THE MOON

Please don't forget to nominate your co-workers for going 'Beyond the Call of Duty'. I Hung The Moon slips are available at the 3rd floor front desk, and may be turned in to Kim Pompey. Thank you!

**DJ Beckman, Anesthesia Tech**—Helping out with nights and weekends! Major help on the schedule! So appreciated!

**Macy Uebelhoer-Belt, Anesthesia Tech**—Helping cover weekend shifts that were available! Thanks!

**Lisa Crusenberry, Anesthesia Tech**—Helping to cover weekend shifts until a position is filled. Greatly appreciated!

**Treffle Beaupre, Anesthesia Tech**—Helping cover the weekend shifts! Much appreciated!

**Margaret Young, Anesthesia Tech**—Coming in early on several days when needed! Great teamwork!



**Lowcountry Heart Walk**  
Saturday, Sept 24, 2016  
Liberty Square

**Graduation 2017**  
Friday, June 23, 2017  
Founders Hall

## September 2016 Standard of the Month

Share ideas, knowledge and information required by my team and others to do their work.

**We Would Love to Hear From You!**

If you have ideas or would like to contribute to *Sleepy Times*, the deadline for the October edition will be September 16, 2016.