Dear reader:

Thank you for taking the time to review our UNC Department of Anesthesiology Annual Research Report for the 2010-2011 academic year. I hope that this annual summary of our projects and products provides you with a better understanding of our work and some sense of our research environment.

An outstanding environment for transformative research is a rare thing. I believe that our department is fortunate to be experiencing a "Golden Age", where conditions are ideal for performing work which improves patient outcomes and substantively advances patient care. The numbers support this: since 2009, the Department has experienced a 277% increase in NIH funding.

This department environment is achieved by three primary factors. First, we are fortunate to have gathered together an incredible group of people. Second, these individuals excel at working together in collaborative, multidisciplinary teams. Research is truly a team sport. The effective collaboration of these outstanding individuals accounts for our success, and we are fortunate that our numbers continue to grow. Finally, we have a Chair who fully embraces the mission and commitment of the University to provide service to our citizens through excellence as one of the world’s great research universities. Dr. Zvara has provided the infrastructure and leadership necessary for transformative research, even during very challenging economic times.

I believe we have great things ahead, and I encourage you to check back often and keep up with our Department research activities via monthly updates on our website: http://www.med.unc.edu/anesthesiology/research. If you have any questions regarding our research or work, don't hesitate to email me any time at smclean@aims.unc.edu.

Sincerely,

Samuel McLean, MD, MPH
Vice Chair, Research, Department of Anesthesiology
Attending Physician, Department of Emergency Medicine
University of North Carolina, Chapel Hill, NC 27599-7010
email: smclean@aims.unc.edu
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Areas of Departmental Research Focus

1. Pain and Related Health Outcomes (TRYUMPH Program)
   a. Project CRASH (R01AR056328, PI McLean)

   Project CRASH is a prospective cohort study examining genotypic and phenotypic characteristics associated with the development of acute and persistent pain related outcomes after motor vehicle collision. This study, currently in year 3 of 4, is funded by the National Institute of Arthritis and Musculoskeletal and Skin Diseases. Patients involved in motor vehicle collision are enrolled in the study at one of nine emergency department study sites in Michigan, Massachusetts, New York, and Florida. Over 900 patients have been enrolled in this study to date. Study participants complete a baseline assessment in the ED as well as a follow-up interview 6 weeks, 6 months, and 1 year following the motor vehicle collision.

2010-2011 Abstracts


2010-2011 Publications


b. Elderly CRASH (KL2RR025746, PI Platts-Mills)
The Elderly CRASH study is the first prospective study to comprehensively examine pain and functional outcomes in independently living older adults experiencing motor vehicle collision. The study enrolls patients over the age of 65 at the Project CRASH ED study sites. The Elderly CRASH study will provide a better understanding of risk factors for persistent pain and functional decline and potential interventions to prevent these outcomes in high risk individuals. This project is supported by Dr. Platts-Mills' career development award, awarded through UNC’s Translational and Clinical Sciences Institute.

2010-2011 Abstracts

2010-2011 Publications
c. BURN HELP Study (UNC CTSA & Jaycee Burn Center Foundation, PI McLean)

Achieving adequate pain control in hospitalized burn patients remains a substantial clinical challenge. The results of several pre-clinical studies suggest that propranolol may prevent catecholamine-induced hyperalgesia and improve pain outcomes. The BURN HELP Trial is a phase IIIB pilot randomized multi-centered, genotype-guided, placebo-controlled, double-blind trial of propranolol to reduce pain after major thermal burn injury. Patients with particular genotypes who were admitted to one of four major burn centers in the Burn TRYUMPH Research Network were enrolled.

2010-2011 Abstracts

d. The Women's Health Study (UNC CTSA, PI McLean)

The purpose of this study is to demonstrate the feasibility and safety of performing longitudinal evaluations of sexual assault survivors. The long-term goal of this work is to improve the care of sexual assault survivors, and to provide important information concerning the experiences of sexual assault survivors to law enforcement, Sexual Assault Nurse Examiner (SANE) nurses, and other medical providers. The Women’s Health Study Network includes 11 SANE care centers in North Carolina, South Carolina, Virginia, and Maryland.

2010-11 Abstracts


e. Pain Help Study (Mayday Fund, PI McLean)

The goal of the PAIN HELP Study is to assess the feasibility and potential merit of a large scale emergency department-based pharmacologic intervention trial to improve recovery in individuals with substantial pain in the early aftermath of motor vehicle collision. This study, which is currently in the development phase, will enroll patients who present to several emergency department centers.

f. Influence of Opioid Polymorphisms on Cancer Growth (PI Bortsov)

This line of departmental research examines the potential influence of biologic pathways involving the mu-opioid receptor on cancer survival. One recently completed study examined the association between genetic variations in the mu-opioid receptor and breast cancer survival among women in the North Carolina Breast Cancer cohort. If opioid pathways involving the mu-opioid receptor influence tumor growth and cancer survival, then genetic variations which influence of the function of the mu-opioid receptor should be associated with cancer survival. The results of our recent study suggest that this may be the case. Dr. Bortsov will present the results of this study at the 2011 ASA Annual meeting in Chicago.
g. Pain After Common Surgeries in Children: Laparoscopic Appendectomy (PI McLean)

Little research has examined pain outcomes after common surgical procedures in children. This study examined pain outcomes among children undergoing laparoscopic appendectomy. Among 186 children undergoing laparoscopic appendectomy who were evaluated in this study, 1 in 3 children experienced substantial postoperative pain on the day of surgery, and 1 in 5 children continued to have substantial pain the next day. Commonly available clinical and demographic characteristics were poor predictors of substantial postoperative pain. Further studies of pain outcomes after common surgical procedures are needed. Several posters were presented from this work at the 2010 ASA meeting. Dr. Maggie Tomecka, a CA-1 anesthesiology resident at UNC, was first author of the manuscript reporting the results of this study, which will be published in the journal *Pediatric Anesthesia*.

2010-2011 Abstracts


2. **N.C. Children’s Center for Clinical Excellence**

a. **Project TICKER (Agency for Healthcare Research and Quality 1R18HS019638, PI Willis)**

Project TICKER is a collaboration between various service units within UNC Health Care. The specific aims are to:

1. Implement a robust communication and teamwork foundation for the general care of the inpatient pediatric congenital heart disease service line using a tailored training program, TeamSTEPPSTM.

2. Design and implement Integrated Clinical Pathways (ICP) for two of the most common congenital heart disease diagnoses using the specific teamwork tools of TeamSTEPPS and evidence-based standardized care throughout the entire hospital stay.

The project involves a partnership among the service units (i.e., pediatric intensive care, children’s intermediate cardiac care, newborn critical care, and the operating room), ancillary support teams (nutrition, pharmacy, patient- and family-centered care specialists, chaplain), medical teams (cardiothoracic surgery, pediatric cardiac anesthesia, cardiology, pediatric critical care, neonatology) and pediatric congenital heart disease patients and their families.

At completion of teamwork training, study staff will work with frontline staff, patients, and families to develop ICPs. ICPs are patient care plans designed to improve quality by decreasing unnecessary variations in care and standardizing best practices for a specific patient population. They will design and implement the ICPs in consultation with program management, clinical experts, patients, family advisors, and frontline staff.

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*Dr. Tina Willis, MD, at an initial Project TICKER meeting*
b. Partnering with Families to Implement Family-Centered Care (2010-11 Dance Marathon Grant, PI Willis)

Using the Family-Centered Care model, the aims of this project were to improve the level of patient and family satisfaction through measurable results. The core concepts in family-centered care include (1) Dignity and Respect, (2) Information Sharing, (3) Participation, and (4) Collaboration.

The impact of creating a family-centered care program in the PICU to support families of children with life-threatening diseases or injury is tremendous. Partnering with families and bringing them into all aspects of care provides some control to families who feel helpless when they are supposed to be the primary caregiver and supporter of their children. The psychological stress suffered by families with critically ill children is well known and can be dramatically improved by this type of program.

Partnering with families involved several strategies throughout the project. In the beginning, family members of recent PICU patients were recruited to serve as family advisors. They participated as members of the IPCC advisory committee, attended focus groups, or served on teams to develop policies and materials. A feedback survey was developed that was distributed to all families following their child’s stay in the PICU. Two policies have been developed with family advisors. The Parking and Meals Assistance will continue to serve families in need through at least the next fiscal year with remaining grant funds. Through the PICU Family Update policy, we established the expectation that every family of a PICU patient should receive a daily update from a doctor and a nurse.
3. Cardiovascular Research Program (NHLBI R01HL083362, PI Xu)

The goal of the cardiovascular research program is to contribute new knowledge which will lead to novel interventions to prevent or limit myocardial ischemia/reperfusion injury. Focus areas within the research program include investigating the roles of mitochondria, zinc, and glycogen synthase 3β (GSK-3β) in adenosine A2 receptor activation-induced cardioprotection at the time of myocardial reperfusion. Experimental approaches include rat and mouse heart perfusion, molecular and cell biology, confocal imaging, and RT-PCR.

2010-2011 Abstracts


2010-2011 Publications
4. Collaborative Research Efforts

a. POISE II Study (Population Health Research Institute, Site PIs Kumar/Arora)

Major surgeries not involving the heart are common, and major heart problems during or after such surgeries represent a large population health problem. Few treatments to prevent heart problems around the time of surgery have been tested. There is encouraging data suggesting that small doses of Aspirin and Clonidine, which are two medications, given individually for a short period before and after major surgeries may prevent major heart problems. The POISE-2 Trial is a large international study to test if Aspirin and Clonidine can prevent heart attacks and deaths from heart problems around the time of surgery. From December 2010 through June 2011, UNC was third in enrollment for all sites world-wide.
5. Faculty and Resident Projects

a. Faces Study: Determining the Appropriateness of the Faces Pain Scale for Pain Assessment in Children 3-8 years Old in the Post Anesthesia Care Unit (Anesthesiology Research Fund, PI McGee)

The assessment of pediatric pain by self-report measures can be challenging, especially in the 3-8 year old population. The Faces scale is the most widely used self-report pain tool in this population, however its validity is questioned in this age group and its use has never been validated during the immediate post operative period. The primary aim of this study was to correlate the Faces scale with the FLACC scale in children age 3-8 during the immediate post anesthetic period. The second aim is to see if children ages 3-5 and 5-8 can participate with the Faces self-report pain assessment tool. An additional aim was to determine at approximately what time period after the anesthetic a child can appropriately participate in the Faces self report tool. Data were obtained by six research assistants over 7 months. The results of this study (n = 165) indicate that although a self-report pain score is the preferred method of evaluating patients’ pain, the results of this study question its use in children between 3-5 years of age. This supports the use of an objective pain scale, such as the FLACC scale, during the PACU period and should lead to a change in our hospital pain assessment policy and policies at other institutions across the country. Future studies are needed to design an age appropriate self-report pain assessment tool that can be used in the immediate postoperative period.

b. Steroid Study: A Comparison of Three Dosing Regimens of Glucocorticoids in Children Undergoing Cardiopulmonary Bypass to Determine Whether Two Doses and Earlier Administration are Superior to a Single Intraoperative Dose with Pump Prime to Improve Perioperative Outcomes (Anesthesiology Research Fund, PI McNaul)

The purpose of the study is to determine the optimal timing of methylprednisolone administration prior to cardiopulmonary bypass in children undergoing cardiac surgery with cardiopulmonary bypass (CPB). Children less than 5 years old undergoing cardiac surgery requiring CPB will be enrolled. This study is a single-center, randomized, double-blinded study with three experimental conditions: 1) Oral methylprednisolone 4 hours prior to and IV methylprednisolone 1 hour prior to CPB, 2) IV methylprednisolone 1 hour prior to CPB, 3) Methylprednisolone with CPB prime. Pre-, intra- and post-operative blood draws will be performed to assess standard markers of inflammation, and post-operative cardiopulmonary outcomes will be assessed. The study is approved by IRB and the enrollment is underway.
6. Clinical Trials Team

The Anesthesiology Clinical Trials team diligently works on numerous industry-sponsored clinical trials as well as investigator-initiated projects. The team provides full support in order to both initiate a clinical trial and to maintain the trial once it has started. They begin by assessing the feasibility of a clinical trial via questionnaires and collaboration with the prospective Principal Investigator. Once the trial is considered clinically feasible, they work to ensure a successful submission of the IRB application, including completing the application and maintaining IRB correspondence. They also coordinate with the department Grants Administrator, who assesses the financial feasibility of the clinical trial and also ensures financial support throughout the duration of the study. In addition, they maintain communication with the prospective sponsor to coordinate how to best follow the study protocol and to arrange any site visits.

The team also gives support during the screening process and communicates with the appropriate medical staff to ensure their cooperation with the study protocol. All necessary communications with Investigational Drug Services are also performed to coordinate successful delivery of any study drugs. Following patient enrollment, the team performs data collection and study assessments during the study period. The team also maintains regulatory documents throughout the duration of the clinical trial and beyond.
B. Department Research Products

1. Abstracts


2. Journals


3. Books


4. Grants

**Title:** Genetic Predictors of Acute and Chronic Musculoskeletal Pain After Minor MVC  
**Award Number:** R01AR056328  
**Sponsor:** National Institute of Arthritis Musculoskeletal Skin Disease  
**Project Dates:** 9/19/2008 - 8/31/2012  
**Principal Investigator:** Samuel McLean

**Title:** Effect of Adenosine A2 receptor activation on the mitochondrial death pathway  
**Award Number:** R01HL083362  
**Sponsor:** National Heart, Lung and Blood Institute  
**Project Dates:** 8/1/2006-7/31/2012  
**Principal Investigator:** Zhelong Xu

**Title:** Improving Patient Safety in a Pediatric Service Line  
**Award Number:** R18HS019638  
**Sponsor:** Agency for Healthcare Research and Quality  
**Project Dates:** 9/30/2010-9/29/2012  
**Principal Investigator:** Tina Willis

**Title:** Pain Help: Venlafaxine to reduce the development of persistent pain  
**Sponsor:** Mayday Fund  
**Project Dates:** 12/8/2010-12/7/2012  
**Principal Investigator:** Samuel McLean

**Title:** Partnering with Families to Implement Family-Centered Care in the PICU  
**Sponsor:** UNC Dance Marathon  
**Project Dates:** 7/1/2010-6/30/2011  
**Principal Investigator:** Tina Willis