



Washington University in St. Louis

SCHOOL OF MEDICINE

14th Annual

Research Training
Symposium and Poster
Session

October 8, 2019

Showcasing Basic, Clinical, and Translational
research projects by junior faculty, fellows,
residents, and training program students.

Washington University in St. Louis School of Medicine
14th Annual Research Training Symposium & Poster Session
October 8, 2019
Farrell Learning and Teaching Center

12:30 – 12:45 pm Connor Auditorium

Welcome and Opening Remarks

Victoria J. Fraser, MD

Adolphus Busch Professor of Medicine and Chair

Department of Medicine

Washington University in St. Louis School of Medicine

12:45 – 1:45 pm Connor Auditorium

Keynote Address

“Academic Activism and Clinical Research: Choosing the Right Time and the Right Place”

Michael Rutledge DeBaun, MD, MPH

Professor of Pediatrics and Medicine

Vice Chair for Clinical and Translational Research

J.C. Peterson Chair in Pediatric Pulmonology

Director, Vanderbilt-Meharry Center for Excellence in Sickle Cell Disease

Vanderbilt University School of Medicine

1:45 – 3:00 pm Connor Auditorium

Oral Presentations

1:45 – 2:00 pm	Quenten Hooker, PhD, MSCI Candidate
2:00 – 2:15 pm	Bronwyn Bedrick, MD, MSCI Candidate
2:15 – 2:30 pm	Patrick Lyons, MD, MSCI Candidate
2:30 – 2:45 pm	Dharushana Muthulingam, MD
2:45 – 3:00 pm	Laneshia Tague, MD, MSCI

3:00 – 5:00 pm FLTC Atrium & Hearth

Poster Presentations

3:00 – 4:00 pm	Poster Session I
4:00 – 5:00 pm	Poster Session II

This symposium is made possible by the Clinical Research Training Center (CRTC), a component of the Washington University Institute of Clinical and Translational Sciences (ICTS). The ICTS is part of a national consortium of medical research institutions, funded through the Clinical and Translational Science Awards (CTSA) that includes sixty medical research institutions in thirty states and the District of Columbia, working together to improve the way biomedical research is conducted across the country. The CTSA consortium shares a common vision to reduce the time it takes for laboratory discoveries to become treatments for patients, and to engage communities in clinical research efforts. It is also fulfilling the critical need to train the next generation of clinical researchers. The CTSA initiative is led by the National Center for Advancing Translational Sciences (NCATS) at the National Institutes of Health. The CRTC is supported by NCATS Grant Numbers UL1TR002345, KL2 TR002346, and TL1TR002344, Washington University in St. Louis School of Medicine, and Barnes-Jewish Hospital Foundation.

This symposium & poster session is co-sponsored by the Office of Medical Student Research, Washington University in St. Louis School of Medicine.

We gratefully acknowledge the support of Dr. David H. Perlmutter, Executive Vice Chancellor for Medical Affairs and Dean, Washington University in St. Louis School of Medicine.

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Programs Represented

Alpha Omega Alpha Honor Society (AOA)

Alpha Omega Alpha Honor Medical Society (AOA), a professional medical organization, recognizes and advocates for excellence in scholarship and the highest ideals in the profession of medicine. Each year, AOA grants more than \$575,000 to medical students and faculty for awards, projects, and prizes that recognize outstanding commitment and dedication to caring for others and providing high quality health care. The Carolyn L. Kuckein Student Research Fellowship honors Carolyn L. Kuckein, long-time administrator of AOA and an honorary member of the society.

Website: <http://alphaomegalpha.org/>

Alzheimer's Disease T32 NIH Training Grant

Short-term Alzheimer and related dementias training positions.

Program Director: Joy Snider, PhD

American Association of Neurological Surgeons Established by the Neurosurgery Research and Education Foundation (AANS/NREF)

The American Association of Neurological Surgeons (AANS) is the organization that speaks for all of neurosurgery. The AANS is dedicated to advancing the specialty of neurological surgery in order to promote the highest quality of patient care. The Neurosurgery Research and Education Foundation (NREF) was created in 1980 by the AANS to support research and education efforts that enhance and confirm the critical role neurosurgeons play in improving lives. The NREF offers the Medical Student Summer Research Fellowship to medical students working in a neurosurgical laboratory and mentored by a neurosurgical investigator who is a member of AANS.

Website: <http://www.aans.org/>

American Association of Thoracic Surgery (AATS)

The Summer Intern Scholarship program was established in 2007 to introduce the field of cardiothoracic surgery to first and second year medical students in a North American medical school with the goal of broadening their educational experience by providing an opportunity to spend eight weeks during the summer (June thru September) working in an AATS member's, cardiothoracic surgery department. The Scholarship is funded and administered by the AATS Graham Foundation and provides a grant of \$2,500 to the successful applicants for their living expenses during the eight weeks of training at the selected host institution. Additionally, successful applicants receive complimentary registration to the Annual Meeting.

Website: <http://aats.org/aatsimis/AATS/Scholarships/Summer%20Intern%20Scholarship.aspx>

Center for Health Economics and Policy

The Center for Health Economics and Policy encourages the development of evidence-based research focused on improving health and disseminates this work to policymakers and other stakeholders.

Program Directors: Timothy D. McBride, PhD, MS and Karen Joynt Maddox, MD, MPH

Website: <http://publichealth.wustl.edu/centers/health-economics/>

Clinical Research Training Center (CRTC) Advanced Summer Program for Investigation and Research Education

(ASPIRE) ASPIRE provides undergraduate students with an eight-week (June and July) mentored research opportunity at Washington University School of Medicine. The program is designed to immerse young investigators in clinical and translational research and also includes didactic sessions and seminars for three hours of undergraduate academic credit.

Program Director: Jay F. Piccirillo, MD, FACS

Website: <http://crtc.wustl.edu>

Clinical Research Training Center (CRTC) KL2 Career Development Awards

The KL2 Career Development Awards Program at Washington University in St. Louis provides high-quality, multidisciplinary training in clinical and translational research to promote the career development of future clinical investigators. The program is comprised of postdoctoral scholars and junior faculty committed to multidisciplinary clinical research. KL2 Career Development Awards provide financial support and benefits that allow scholars to focus on mentored, multidisciplinary research, supplemented by applicable coursework.

Program Director: Victoria Fraser, MD; **Program Co-Director:** Dominic N. Reeds, MD

Website: <http://crtc.wustl.edu>

Clinical Research Training Center (CRTC) K12 Paul Calabresi Career Development Awards in Clinical Oncology

The K12 Career Development Awards in Clinical Oncology at Washington University in St. Louis provides high-quality, multidisciplinary training in clinical and translational research to promote career development for future clinical investigators. The goal of the K12 Paul Calabresi Career Development Awards for Clinical Oncology is to train a new generation of highly skilled investigators with specialized expertise who will be well prepared to lead cancer research. The K12 Clinical Oncology program supports the development of postdoctoral scholars and junior faculty through patient-oriented cancer research training, curricula, and mentored projects.

Program Director: Ramaswamy Govindan, MD

Website: <http://crtc.wustl.edu>

Clinical Research Training Center (CRTC) Master of Science in Applied Health Behavior Research (AHBR)

The Master of Science in Applied Health Behavior Research (AHBR) focuses on the skills required for the design, management, and evaluation of health behavior programs and research studies involving human participants. Our students and graduates are engaged in research in academic, clinical, and community settings. The program provides a practical opportunity to cultivate new skills for career engagement and advancement. Students gain a wider perspective of how health behaviors impact medical care and clinical outcomes through coursework, exemplary instructors, and classmates with different backgrounds, experiences, and perspectives.

Program Director: Amy McQueen, PhD

Website: <http://crtc.wustl.edu>

Clinical Research Training Center (CRTC) Master of Science in Clinical Investigation (MSCI) Degree Program

The MSCI Degree Program at Washington University is designed as a one to three year full- or part-time degree program for young investigators committed to pursuing academic careers in clinical research. The unique program combines didactic coursework with mentored research and career development opportunities and provides students with the knowledge and tools to excel in the areas of clinical investigation most relevant to their careers.

Program Director: David K. Warren, MD, MPH

Website: <http://crtc.wustl.edu>

Clinical Research Training Center (CRTC) Postdoctoral Mentored Training Program in Clinical Investigation (MTPCI)

The CRTC Postdoctoral Mentored Training Program in Clinical Investigation (MTPCI) provides multidisciplinary clinical and translational research training to promote the career development of junior faculty and postdoctoral fellows by helping them become clinical and translational researchers. Through didactic coursework, structured mentorship, and interactions with a diverse peer group of trainees, the MTPCI enables Scholars to learn how to: develop effective research projects, utilize human subjects in clinical trials, collect, analyze and summarize data, apply epidemiologic principles and tools, consider relevant ethical and legal issues, write grants and manuscripts, and compete for research funding.

Program Director: Patricia Cavazos-Rehg, PhD

Website: <http://crtc.wustl.edu>

Clinical Research Training Center (CRTC) TL1 Predoctoral Interdisciplinary Clinical Research Training Program

The CRTC TL1 Predoctoral Interdisciplinary Clinical Research Training Program provides career development for medical and allied healthcare students through didactic coursework, mentored training, work-in-progress research discussions, journal clubs, and conferences. This program supports a select group of trainees as they embark on patient-oriented research careers by teaching them how to: design and conduct clinical research, analyze data, consider relevant ethical and legal issues, write manuscripts and grants, develop and present scientific posters, and compete for research funding.

Program Director: Jay F. Piccirillo, MD, FACS

Website: <http://crtc.wustl.edu>

Clinical Research Training Center (CRTC) TL1 Translational Sciences Postdoctoral Program (TSPP)

The objective of the TL1 Translational Sciences Postdoctoral Program (TSPP) at Washington University is to demystify the processes of commercialization of translating research findings, including studying the methods to disseminate and implement new findings. The scope of the TL1 program is translational science from bench-to-bedside and bedside-to-bench research. The program has the broad ability to include research projects in late stage preclinical, first-in-human, clinical, translational, patient-oriented research, population health and community engagement, and biomedical informatics.

Program Director: Jay F. Piccirillo, MD, FACS

Website: <http://crtc.wustl.edu>

Dames Fellowship

The Dames Fellowship supports a medical student to conduct summer research in cell biology and physiology.

Program Director: Koong-Nah Chung, PhD

DeNardo Education and Research Foundation Grant

The purpose of the DeNardo Education and Research Foundation is to support education and research in the health sciences, broadly defined, with preference for activities that relate to the field of medicine. DeNardo Summer Research Scholars will be engaged in basic and clinical research during the summer following their first year of medical school. The program gives medical students hands-on laboratory research experience with outstanding investigators and helps prepare them for careers in academic medicine.

Program Director: Koong-Nah Chung, PhD

Eli Lilly & Company Grant

Lilly strives to create and deliver innovative medicines that enable people to live longer, healthier and more active lives. As a component of this goal, Lilly is committed to supporting projects that promote excellence in patient care and provide valuable information to the medical and patient advocacy communities. The Lilly grant helps train Meharry Medical College students in the Washington University in St. Louis School of Medicine's (WUSM) Summer Research Program. The benefits of the partnership include: 1) Exposing the Meharry medical students to cutting-edge science at WUSM; 2) Benefiting our WUSM faculty's research; 3) Enhancing the culture of diversity at WUSM; and 4) Increasing the pipeline of under-represented medical students into our residency programs.

Program Director: Koong-Nah Chung, PhD

Website: <http://www.lilly.com>

Epharmix and Clinical Research and Innovation Student Program (CRISP)

The Epharmix and Clinical Research and Innovation Student Program (CRISP) is an educational partnership between medical students initiating clinical research and innovation and the Office of Medical Student Research at Washington University in St. Louis. With faculty guidance medical students plan, construct, and complete clinical research (e.g. research on mobile health) to improve the quality, efficiency, and accessibility of health care. CRISP provides an elective (*Clinical Research and Innovation*) and online lectures to first-year medical students, complimenting Sling Health, the student-run biotechnology incubator that provides resources and mentorship to Washington University students.

Program Director: Brian Gage, MD

Website: <https://mdstudentresearch.wustl.edu/find-a-project/programs/crisp/>

Foundation for Barnes-Jewish Hospital Student & Faculty Award

The mission of the Foundation for Barnes-Jewish Hospital Student & Faculty Award is to provide financial support to help the hospital fulfill its purpose. Funds are used to support medical research, patient care, education, and community service projects that otherwise would not be available to the hospital.

Website: <http://www.barnesjewish.org/Giving/Grants-Administration>

Infectious Diseases Society of America Foundation (IDSA)

The Infectious Diseases Society of America (IDSA) represents physicians, scientists and other health care professionals who specialize in infectious diseases. IDSA's purpose is to improve the health of individuals, communities, and society by promoting excellence in patient care, education, research, public health, and prevention relating to infectious diseases.

Website: <https://www.idsociety.org>

Institute for Public Health Summer Research Program

The eight-week program offers experience in the fields of public and global health research (especially infectious diseases and pediatrics) and is open annually to national and international students who are currently enrolled at the time of participation in the program, or are matriculating in the fall as full-time college undergraduates, graduate students, or medical students at a U.S.-based university. Students participate in research in a lab or field-based setting, and further their interest in public health or global health. They are guided by Faculty Mentors from across Washington University in St. Louis. The program includes mandatory didactic sessions and seminars, and is an opportunity to establish a career-building network. Participants are expected to pursue their research training full time, defined as 40 hours per week, and also attend all program events (if based in St. Louis). The eight-week program concludes with student presentations at the research symposium.

Program Director: William G. Powderly, MD

Website: <https://publichealth.wustl.edu/resources/summer-research-program/>

Japanese Medical Society of America Fellowship (JMSA)

The JMSA is dedicated to promoting the exchange of medical and educational information between the US and Japan, as well as in providing valuable medical information to the general public.

Website: <https://www.jmsa.org/student-members-merit/scholarships/>

Kuchnir Scholar Summer Research Fellowship

The purpose of the Kuchnir Scholar Summer Research Fellowship is to support research in basic and clinical research during the summer following the first year of medical school. The program gives medical students hands-on laboratory research experience with outstanding investigators and helps prepare them for careers in academic medicine.

Program Director: Koong-Nah Chung, PhD

Mallinckrodt Institute of Radiology Summer Research Program (MIRSRP)

The Mallinckrodt Institute of Radiology Summer Research Program offers undergraduate and medical students an opportunity to conduct research in the following aspects of radiological sciences research: Magnetic resonance imaging, Magnetic resonance spectroscopy, Positron emission tomography, X-ray computed tomography, Contrast agent development, Diagnostic radiology, Molecular imaging, Nuclear medicine, Radiopharmaceutical development, Neuroscience imaging, Cardiovascular imaging, Optical imaging, and Ultrasound.

Program Director: Vijay Sharma, PhD

Website: <https://www.mir.wustl.edu/research/summer-research-program>

Master of Population Health Sciences (MPHS)

The Master of Population Health Sciences (MPHS) Degree Program equips clinicians and clinical doctorates with the advanced research methods skills needed to design clinical outcomes research, interpret results and apply findings to improve clinical effectiveness. MPHS students establish a wide network of mentors and collaborators by interacting with Washington University medical and public health faculty who are renowned for their teaching, patient care and ongoing cutting-edge research around the world. With no research thesis requirement, the degree can be obtained in as few as ten months, which allows students to easily integrate the training into a clinical career, including during the medical school, residency and fellowship years. The Washington University in St. Louis School of Medicine MPHS Program is one of a few in the country and one of the only in the Midwest that offers population health-based research methods training for clinicians.

Program Director: Graham Colditz, MD, DrPH

Website: <http://www.mphs.wustl.edu/>

Master of Public Health (MPH)

Our program focuses on understanding problems and creating solutions. We prepare students to succeed in public health across the professions: in hospital administration, epidemiology and biostatistics, research, policy, or working at the intersection of the social determinants of health. Our curriculum transcends the boundaries of academic disciplines to teach you to think broadly about complex public health issues. Our collaborations across Washington University, including the School of Medicine, create opportunities for multifaceted research and practice.

Website: <https://brownschool.wustl.edu/Academics/Master-of-Public-Health/Pages/default.aspx>

MDS

The One-Year Research without Degree Program is available to all Washington University medical students. Students who wish to take advantage of this program should select a research mentor at Washington University and obtain permission to work with the mentor for one year. The arrangement should then be approved by the mentor and by the associate dean for medical student research through the application process.

Program Director: Koong-Nah Chung, PhD

Website: <http://mdstudentresearch.wustl.edu/find-a-project/programs/year-long-research/>

Meharry Medical College, Office of the President

Located in Nashville, Tennessee, Meharry Medical College is one of the nation's oldest and largest historically black academic health science centers dedicated to educating physicians, dentists, researchers, and health policy experts. The Meharry Medical College Office of the President grant helps train Meharry Medical College students in the Washington University in St. Louis School of Medicine's (WUSM) Summer Research Program. The benefits of the partnership include: 1) Exposing the Meharry medical students to cutting-edge science at WUSM; 2) Benefiting our WUSM faculty's research; 3) Enhancing the culture of diversity at WUSM; and 4) Increasing the pipeline of under-represented medical students into our residency programs.

Website: <https://home.mmc.edu/>

Movement Science Program (MSP)

The Movement Science Program (MSP) is an integral member of one of the world's largest academic biomedical research institutions; collaboration occurs with nearly every department in the School of Medicine, as well as with colleagues in biomedical engineering, psychology, and biology. Researchers lead studies in a comprehensive array of topics from the basic physiological mechanisms of tissue injury to studying health interventions at the community level. Investigations involve subjects across the life span. The MSP is supported by NIH training grant T32HD007434.

Program Director: Catherine Lang, PT, PhD

Website: <https://pt.wustl.edu>

NASA Fellowship

Each year the NASA Fellowship Program seeks student-authored and independently conceived graduate research proposals responding to a NASA Research Opportunity listed in the solicitation. The NASA Fellowship is designed to support NASA STEM Engagement objectives and to provide academic institutions the ability to enhance graduate-level learning and development.

Website: <https://www.nasa.gov/stem/fellowships-scholarships/index.html>

Otolaryngology NIH T32 Physician Scientist Program (PSP)

This training program provides a pathway directing medically trained individuals toward a successful research career in academic otolaryngology. This research experience is offered at two levels. At the first level, medical students are selected to participate in this program for approximately three months during the summer. Mentored research projects for medical students are conducted by selected trainees to stimulate a general interest in research and specific interest in otolaryngological research. At the second level, residents accepted into the 7-year "Advanced Physician Scholars Program" by a special residency match mechanism perform mentored research in depth, in a contiguous two-year period, free of clinical responsibilities. Funding for this program is provided by a National Institutes of Health (NIH)-National Institute on Deafness and Other Communication Disorders (NIDCD), Ruth L. Kirschstein National Research Service Award (NRSA) Institutional Research Training Grant (T32) entitled "Development of Clinician/Researchers in Academic ENT," 5T32DC000022-22.

Program Director: Jay F. Piccirillo, MD, FACS

Website: <http://oto.wustl.edu/Education/ResidentEducation/PhysicianScientistProgram.aspx>

Psychiatry K12 Career Development Awards Program in Drug Abuse and Addiction

The Psychiatry K12 Career Development Awards Program in Drug Abuse and Addiction, at Washington University in St. Louis, supports clinicians with multi-disciplinary mentored training in the area of drug abuse and addiction with a focus on genetics. This program provides financial support and benefits that allow scholars to focus on research, supplemented by applicable coursework.

Program Director: Laura J. Bierut, MD

Website: <https://crtc.wustl.edu/programs/junior-faculty/psychiatry-k12-program/>

David F. Silbert Summer Fellowship (Silbert)

In his memory, the David F. Silbert Summer Fellowship was set up to support short-term research internships for medical, graduate, or other students interested in his area of research. Dr. Silbert's research focused on genetic biochemical and/or biophysical approaches to the study of specific membrane lipids in signal transduction pathways and in the assembly and function of eukaryotic cell membranes. Since his death from cancer in 1997, a number of biophysical techniques have been developed that address these issues. These techniques include, but are not limited to, state-of-the-art fluorescence methods, structural determination using NMR or x-ray methods and computational approaches. All these techniques are directed towards understanding the role of macromolecular interactions in cellular function. It is now clear that membrane lipids and membrane proteins are functionally involved in all aspects of the regulation of cellular processes and that these processes must be studied at the level of macromolecular function.

Program Director: Linda Pike, PhD

Siteman Cancer Center Leah Menshouse Springer Summer Opportunities Program at Barnes-Jewish Hospital and Washington University School of Medicine

The Leah Menshouse Springer Summer Student Program at the Siteman Cancer Center provides opportunities for undergraduate, premed and medical students enrolled at Washington University or other accredited universities to work on cancer research projects during the summer. Opportunities range from basic laboratory research to clinical research to prevention/control and population research.

Program Coordinator: Rachel Sorensen

Website: <http://www.siteman.wustl.edu/summerprogram.aspx>

Summer Medical Education Research Fellowship (SMERF)

The Summer Medical Education Research Fellowship (SMERF) supports medical students to conduct summer research in medical education.

Program Director: Koong-Nah Chung, PhD

Summer Opportunities Abroad Program (SOAP) WUSM Global Health and Medicine (GH&M)

The WUSM Global Health and Medicine (GH&M) brings together students and physicians at Washington University who are interested in international health. GH&M aims to promote understanding of global health by enabling medical students to experience firsthand its locales, modes of delivery, disparities, and cultural manifestations. GH&M organizes the Global Health Symposium each spring, as well as regular discussion lunch meetings with students and faculty. In addition, the group coordinates Spring Break community service trips for the first and second year medical classes. GH&M offers financial and logistical assistance to students who wish to gain healthcare experience abroad and helps interested students find mentors within the university.

Program Directors: Gary Weil, MD; Cynthia Wichelman, MD

Website: <https://globalhealthandmedicine.wustl.edu/>

T32 NIH NIDDK Diabetes Training Grant

The goal of the program is to expose medical students to career opportunities in basic or clinical research related to diabetes and related metabolic diseases.

Program Director: Clay Semenkovich, MD

Website: <https://www.vumc.org/niddk/>

T35 NIH NHLBI Training Grant

This program is designed to provide medical students with a hands-on research experience. This can be a first-time experience or a project related or unrelated to research done as an undergraduate. Excellent mentors from a broad range of basic and clinical sciences are available in research areas related to heart, lung and blood diseases and disorders. A Washington University Summer Research Fellowship can provide a strong background for application to the masters and MD/PhD (MSTP) degree programs, can lead to abstracts at meetings and to publications, and can be important for applications for competitive residencies.

Program Director: Koong-Nah Chung, PhD

Website: <http://mdstudentresearch.wustl.edu/find-a-project/programs/summer-research/>

Washington University in St. Louis, Office of the Provost

Washington University in St. Louis, Office of the Provost helps train Meharry Medical College students in the Washington University in St. Louis School of Medicine's (WUSM) Summer Research Program. The benefits of the partnership include: 1) Exposing the Meharry medical students to cutting-edge science at WUSM; 2) Benefiting our WUSM faculty's research; 3) Enhancing the culture of diversity at WUSM; and 4) Increasing the pipeline of under-represented medical students into our residency programs.

Program Contact: Koong-Nah Chung, PhD

WUSM Dean's Fellowship

This program is designed to provide medical students with a hands-on research experience. This can be a first-time experience or a project related or unrelated to research done as an undergraduate. Excellent mentors from a broad range of basic and clinical sciences are available. A Washington University Summer Research Fellowship can provide a strong background for application to the masters and MD/PhD (MSTP) degree programs, can lead to abstracts at meetings and to publications, and can be important for applications for competitive residencies.

Program Director: Koong-Nah Chung, PhD

Website: <http://mdstudentresearch.wustl.edu/find-a-project/programs/summer-research/>

Abstracts for Oral Presentations

Alphabetically by Presenter

Bedrick, Bronwyn

Funding Program: CRTC TL1 Predoctoral Interdisciplinary Clinical Research Training Program

Doctoral Program of Study: Medicine

Institution: Washington University School of Medicine

Research Department: Obstetrics and Gynecology

Mentors: Emily S Jungheim, MD, MSCI; Molly J Stout, MD, MSCI

Access to Buprenorphine Care in Pregnancy: Minimizing Barriers for Patients

Bedrick BS, O'Donnell C, Hernandez J, Carter E, Kelly J, Stout MJ

Introduction: Opiate Use Disorder (OUD) in the United States has reached epidemic incidence with disproportionate rates of mortality in pregnant women. Although treatment for OUD is available and demonstrated as safe and effective for decreasing maternal and obstetric morbidity, there are many barriers to accessing these services. We aimed to contact all of the buprenorphine and methadone providers listed on the Substance Abuse and Mental Health Administration (SAMHSA) website to map and describe the treatment availability for pregnant patients in Missouri (MO) and Illinois (IL).

Methods: This is a cross-sectional phone survey study of all providers listed on the SAMHSA website for MO and IL. Individual providers listed on the website were contacted at the phone number listed on the SAMHSA website and a standardized series of questions regarding availability of new patient appointments, treatment for pregnant women, and availability of methadone or buprenorphine were asked. We used descriptive statistics to describe availability of treatment in our region and geocoding to map the locations of providers available to pregnant women.

Results: A total of 1,366 buprenorphine providers were listed on the SAMHSA website, 457 (33.5%) in MO and 909 (66.5%) in IL. 59% of listed numbers were unable to be reached either due to wrong number, not in service, or three attempts made without success. After removing duplicate numbers and multiple providers within the same practice there were a total of 562 unique practices. 54.8% were accepting new patients and 39.7% accept pregnant patients. An appointment was available within 1 week 60% of the time. There were 98 methadone outpatient treatment programs (MOTP) listed in MO (n=16) and IL (n=82). The majority of MOTP were able to be reached (85.7%) and the majority of those were accepting new patients (92.9%) and pregnant patients (79.8%). When examining the geographic locations of both buprenorphine and MOTP providers, there are clusters near cities, sporadic availability in rural areas, and large rural areas with no access to treatment.

Conclusions: Barriers to receiving opiate use disorder treatment in pregnancy may include difficulty contacting and locating providers who treat OUD. Addressing administrative barriers to care including clearer and more direct lists and contacts for active providers and clinics may facilitate treatment for patients with opiate use disorder. Additionally, "care deserts" occur predominantly in rural areas and may be barriers for patients in these regions.

Hooker, Quenten, MS

Funding Program: CRTC TL1 Predoctoral Interdisciplinary Clinical Research Training Program

Doctoral Program of Study: Physical Therapy

Institution: Washington University School of Medicine

Research Department: Physical Therapy

Mentors: Linda Van Dillen, PhD; Susan Stark, PhD; Michael Harris, PhD

Consistent Differences in Lumbar Spine Alignment Between Chronic Low Back Pain Subgroups During Functional and Clinical Sitting Tests

Hooker QL, Roles K, Lanier VM, Van Dillen LR

Introduction: Altered lumbar spine alignment may contribute to the persistence of chronic low back pain (CLBP). Prior data support classifying individuals with CLBP based on subgroup-specific differences in lumbar alignment, as outcomes are further improved using classification-based treatment. To date, these subgroup differences in lumbar alignment have only been reported on during select clinical tests. Therefore, additional work examining the consistency of these findings across multiple functional and clinical tests is warranted. The purpose of this study was to examine lumbar alignment for a functional test of preferred sitting and clinical tests of flexed and extended sitting in 2 CLBP subgroups.

Methods: 154 participants with CLBP were examined by a physical therapist, who used a standardized exam to classify the individuals into rotation (Rot) and rotation with extension (RotExt) subgroups based on the Movement Systems Impairments (MSI) Classification System. Participants performed a functional test of preferred sitting followed by clinical tests of maximum flexed and extended sitting performed in random order. For all 3 conditions, the participant was seated on a stool with no armrests or backrest. 3D marker coordinate data were collected using a motion capture system. Sagittal plane lumbar curvature angle (LCA), defined as the angular distance between T12, L3, and S1 markers was calculated. Effect sizes (e.g. Cohen's d) and independent samples t-tests were calculated for LCAs between MSI classifications for each test.

Results: There was a small effect between CLBP classifications for preferred [Rot = -3.3 deg (-5.2 – -1.4); RotExt = -6.1 deg (-8.3 – -4.0), d = 0.30, p = 0.05], flexed [Rot = 8.1 deg (6.5 – 9.7); RotExt = 4.5 deg (2.6 – 6.4), d = 0.48, p < 0.01] and extended [Rot = -22.3 deg (-24.5 – -20.0); RotExt = -24.9 deg (-27.5 – -22.3), d = 0.25, p = 0.11] sitting.

Conclusions: There was a consistent trend for the Rot subgroup to demonstrate more lumbar flexion than ExtRot across preferred, flexed, and extended sitting. Results highlight the need to use subgroup-specific alterations in alignment patterns to guide the treatment of functional tasks limited to the CLBP condition.

Lyons, Patrick, MD

Funding Program: CRTIC Postdoctoral Mentored Training Program in Clinical Investigation (MTPCI)

Institution: Washington University School of Medicine

Research Department: Medicine

Mentors: Marin Kollef, MD; Brian Gage, MD, MSc

Development and Validation of an Electronic Early Warning System for Oncology Inpatients

Lyons PG, Klaus J, McEvoy CA, Westervelt P, Gage BF, Kollef MH

Introduction: Electronic Early Warning Systems (EWS) designed to identify and prevent clinical deterioration among general ward patients, although promising, are limited by false positive alerts. We recently showed that oncology ward patients clinically deteriorate more frequently than general inpatients, suggesting that an oncology-specific EWS specific might offer improved positive predictive value. Thus, we aimed to derive and validate an EWS for oncology ward patients using electronic health record data.

Methods: This was a retrospective cohort study at Barnes-Jewish Hospital, a 1,300-bed academic hospital with a 138-bed cancer pavilion. We included 21,219 consecutive oncology ward hospitalizations from January 1, 2014, to June 30, 2017. The primary outcome was clinical deterioration (composite of ward death and transfer to the intensive care unit [ICU]). In a random 70% sample of admissions, we used discrete-time logistic regression within 6-hour time windows to fit an elastic net (EN) penalized model to predict clinical deterioration. Potential predictor variables included patient characteristics, vital signs, lab values, and medications. We repeated 10-fold cross-validation 5 times in the derivation sample to fit EN penalties and ensure model stability before evaluating model performance in the remaining 30%. We compared the model to the Modified Early Warning Score (MEWS) – a common ward-based EWS – using the area under the receiver-operating-characteristic curve (AUROC).

Results: We evaluated 21,219 admissions from 9,058 patients, producing 587,652 time windows. The composite outcome occurred in 1,965 windows: 1,425 ICU transfers and 540 ward deaths. The new model contained 69 variables and more accurately detected clinical deterioration (AUROC 0.81, [95% confidence interval (CI) 0.79-0.83]) than the MEWS (AUROC 0.60, 95% CI 0.58-0.62, $p < 0.001$).

Conclusions: We developed and validated an EWS for oncology inpatients which was more accurate than a commonly used existing tool. The model requires prospective evaluation and testing of associated interventions (e.g., rapid response activation) to determine if real-time use can improve oncology patient outcomes.

Muthulingam, Dharushana, MD, MS

Funding Program: Psychiatry K12 Career Development Awards Program in Drug Abuse and Addiction

Institution: Washington University School of Medicine

Research Department: Medicine

Mentors: Frederick L Altice, MD, MA; Laura Bierut, MD

Criminal Justice History for Individuals With Opioid Use Disorder (OUD) Presenting to a Community Substance Use Treatment Center and Intention for Medication for Addiction Treatment (MAT)

Muthulingam D, Madden LM, Barry DT, Altice FL

Introduction: The OUD epidemic is especially concentrated in the criminal justice system (CJS). Overdose is the leading cause of mortality among incarcerated individuals transitioning to the community and many initiate treatment involuntarily from CJS requirements. MAT can significantly reduce the risk of death and relapse in this transition period, but the characteristics of this transitioning population are not well known. Identifying characteristics is the first step towards increasing uptake of MAT, which is a key clinical translation goal. Aim: in this preliminary analysis of a survey study of MAT preferences, we compare patients with OUD and differing CJS experiences presenting to initiate care at a large community substance use treatment center.

Methods: Participants were eligible if age ≥ 18 , met criteria for OUD, and were presenting for care initiation. Survey included summary of treatment options and queried demographics, experience, and preferences. Chi-squared test compared categorical variables.

Results: Of 195 individuals with OUD presenting to start care, 64.1% had history of incarceration, of whom 54% had been incarcerated 30 days prior to presentation. Of all, 24% had been legally compelled to treatment. Those with any incarceration history were more likely to be men, Hispanic, and MAT-experienced (24.6% vs 15%, $p=0.025$). Those recently incarcerated were more likely to be black and less likely to have injected (27.4% vs 40.3%, $p=0.0298$). Those who had been legally required to present for treatment were more likely to be men and had less intention to start MAT (78.7% vs 85.1%, $p=0.0492$).

Conclusions: Most of those presenting for OUD care in our study have an incarceration history, half of whom, recently. A quarter of new OUD patients had been legally ordered to present to care. Remote incarceration had higher likelihood of injection behavior, while those with civil commitment were less likely to intend MAT initiation, indicating unique risk factors and suggesting tailored counseling strategies are warranted. Next steps should evaluate motivations, preferences, and barriers to care to better target counseling and outreach for this high-risk population.

Tague, Laneshia K, MD, MSCI

Funding Program: CRTC KL2 Career Development Awards

Institution: Washington University School of Medicine

Research Department: Medicine

Mentors: Ramsey Hachem, MD; Roger Yusef, MD, MPH

Association Between Allograft Ischemic Time and Adverse Outcomes Following Lung Transplantation

Tague LK, Cherikh W, Lehman RR, Chambers D, Yusef R, Hachem RR

Introduction: Efforts to increase the number of viable donors, such as ex vivo lung perfusion and donation after circulatory death, are likely to significantly alter allograft ischemic time distributions. As such, understanding the impact allograft ischemia has on short and long-term outcomes will be key in determining best practices going forward.

Methods: We conducted an ISHLT database study of adult bilateral lung transplant recipients between January 1, 2006 and June 30, 2016. We evaluated for an association between first and second lung ischemic time and short- and long-term outcomes post-transplant. We also performed regression modeling to evaluate factors associated with prolonged ischemic time.

Results: 13,183 recipients were included in the final analysis. Prolonged first but not second lung ischemic time was associated with decreased unadjusted 30-day survival (log-rank $p=0.048$) and higher rates of treated acute rejection in the first post-transplant year ($p<0.0001$). Both were associated with prolonged index hospital length of stay ($p<0.0001$ and $p<0.001$, respectively). Multivariable analyses revealed that both first and second lung ischemic times were significantly associated with 1-year survival ($p=0.009$ and $p=0.023$, respectively), although this was no longer the case at 5 years. Freedom from BOS was higher in patients with longer first and second ischemic lung times ($p<0.001$ for both). Recipient age, male gender, prior life support, prior cardiac/lung surgery, donor age and cause of death and transplant type (repeat vs. primary) and geographic location were all significantly associated with longer total allograft ischemic time.

Conclusions: First allograft ischemic time appears more strongly associated with increased 30-day and 1-year mortality as well as prolonged index hospitalization and increased acute rejection in the first year. This suggests that, in bilateral lung recipients, first lung ischemic time is more clinically relevant to allograft and patient outcomes

Abstracts for Poster Session
Alphabetically by Training Program and Author

Alpha Omega Alpha Honor Society (AOA)

55 Kim, Dongyeon

Funding Program: Alpha Omega Alpha Honor Society (AOA); WUSM Dean's Fellowship

Research Program: Summer Research Program

Doctoral Program of Study: Medicine

Institution: Washington University School of Medicine

Research Department: Orthopaedic Surgery

Mentors: Lindley Wall, MD, MSc; Charles Goldfarb, MD; Regis O'Keefe, MD, PhD

Treatment of Congenital Radial Longitudinal Deficiency: An International Survey

Kim DJ, Cogsil TE, Goldfarb CA, Wall LB

Introduction: The treatment of radial longitudinal deficiency (RLD) is highly variable without clear guidelines in the literature. The current study aimed to investigate variability in treatment approaches for the thumb and forearm in RLD patients amongst congenital hand surgeons.

Methods: An online survey was distributed to 105 self-identified North American pediatric hand surgeons and 23 international pediatric hand surgeons. The survey was developed by the authors after consideration of the controversies in RLD treatment. Variations in diagnostic approach, timing of treatment, surgical indications and surgical techniques were presented in a 21-question survey utilizing focused clinical cases.

Results: 74 (response rate: 57.8%) surgeons completed the survey. 81% of surgeons prefer the flexor digitorum superficialis transfer for Type 2 hypoplastic thumbs with others using the abductor digiti minimi transfer. 94% and 100% of surgeons favored pollicization for Type 3B and Type 4 hypoplastic thumb, respectively. Of note, all surgeons who chose thumb reconstruction (6%, 4 surgeons) for Type 3B hypoplastic thumb practice internationally. When performing pollicization, 50% of surgeons strove for 1000 rotation tip-to-tip when placing the pollicized index finger for a pinch while 38% preferred >1200 and 12% preferred 80-900. Lastly, nearly half of the surgeons stated they would not recommend pollicization for a patient with an absent thumb if the index finger was stiff and if the patient utilized ulnar prehension as their primary functional pattern. 90% of surgeons preferred observation for the Type 1 radius. Type 2 treatment preferences were highly variable with the most common response being radius lengthening for 29% of surgeons. For Type 3/4 radius deficiency, surgeons were closely divided between soft tissue release with bilobed flap and centralization (42% and 36%, respectively). If wrist radial deviation could not be passively corrected, 63% would use an external fixator for soft tissue distraction before centralizing. Ulnar prehension functional pattern changed treatment for 45% of surgeons in Type 3/4 radius.

Conclusions: This study provides an update on current treatment preferences amongst surgeons with expertise in congenital hand anomalies. Treatment remains highly variable and prospective studies with long term objective and subjective outcomes are necessary to change treatment patterns.

Alzheimer's Disease T32 NIH Training Grant

49 Joseph, Amulya

Funding Program: Alzheimer's Disease T32 NIH Training Grant

Research Program: Summer Research Program

Doctoral Program of Study: Medicine

Institution: Washington University School of Medicine

Research Department: Neurology

Mentors: John Morris, MD; Suzanne Schindler, MD, PhD

Cerebrospinal fluid soluble TREM2 levels are lower in African Americans

Joseph AR, Schindler SE, Morris JC

Introduction: African Americans (AAs) are at higher risk for Alzheimer Disease (AD) dementia than non-Hispanic whites (NHWs). This may be the result of complex differences in socioeconomic, psychosocial, and environmental factors. However, biological factors such as inflammation, vascular disease, and genetic differences linked to ancestry may also contribute to this disparity. The pathophysiological hallmarks of AD dementia are amyloid beta plaques and tau neurofibrillary tangles. Triggering receptor expressed on myeloid cells 2 (TREM2) is an innate immune receptor expressed on microglia with high affinity for amyloid beta. TREM2 variant carriers are at higher risk for developing AD dementia and cerebrospinal fluid (CSF) soluble TREM2 (sTREM2), a cleavage product of TREM2, is elevated in individuals with early symptomatic AD. Taken together, these data suggest that TREM2 may mediate the inflammatory response in the pathophysiology of AD. This study sought to investigate racial differences in TREM2 in AAs and NHWs.

Methods: This study utilized a cohort of community-dwelling older research participants enrolled in studies of memory and aging at the Knight Alzheimer Disease Research Center. Cerebrospinal fluid (CSF) was collected and assayed for sTREM2 from 91 African American individuals and 868 non-Hispanic white individuals.

Results: CSF sTREM2 concentrations were significantly lower in AAs following adjustment for relevant covariates (age, gender, APOE ϵ 4 carrier status, presence of dementia, years of education, family history; $p=0.0002$). AAs were more likely to be TREM2 coding variant carriers (15% versus 3%, $p<0.0001$), which was associated with lower CSF sTREM2 concentrations, and less likely to carry the MS4A4A minor allele (8% versus 37%, $p<0.0001$), which was associated with higher CSF sTREM2 concentrations. After controlling for these differences in carrier status, we found no difference in CSF sTREM2 concentrations between AAs and NHWs.

Conclusions: Given the critical role of TREM2 in the inflammatory stage of AD pathophysiology and its potential role in future treatments targeting inflammation, this study reveals the imperative for greater diversity in clinical trials.

48 Joseph, Benson

Funding Program: Alzheimer's Disease T32 NIH Training Grant; WUSM Dean's Fellowship

Research Program: Summer Research Program

Doctoral Program of Study: Medicine

Institution: Meharry Medical College

Research Department: Neurology; Washington University School of Medicine

Mentors: Eric McDade, DO; Jorge Llibre, MD, MSc; Randall Bateman, MD

Cardiovascular Contributors to Autosomal Dominant Alzheimer's Disease

Joseph B, McDade E, Llibre J

Introduction: Alzheimer's Disease (AD) is a disorder characterized by progressive loss of cognitive function. It is the leading cause of death in the elderly. A limitation in what is currently known about AD is how CVD modifies disease progression. The aim of this study is to compare the cognitive function and clinical biomarkers of patients with high and low cardiovascular disease burden (CDB). We hypothesize that patients with higher CDB will experience faster cognitive decline and more AD pathology.

Methods: A cross sectional study was conducted on 319 mutation carriers from the Dominantly Inherited Alzheimer Network. Patients were grouped based on their CDB (high vs low CDB group); using the Cardiovascular Disease Burden Scale.

Results: A sample of 319 patients with DIAD were included between the ages 18-69, 139 men and 180 women. There were 78 participants in the high CDB group (mean CDB score $2.4 \pm .63$), and 241 in the low group (mean CDB score 0.5 ± 0.5). Patients with high CDB performed similarly on cognitive assessments as patients with low CDB regardless EYO. Patients in the high burden group experienced worse cognitive performance with lower levels of CSF amyloid beta and total tau. Those with high CDB also experienced higher levels of atrophy when compared to those with low CDB at the same levels of CSF Tau and CSF pTau.

Conclusions: The results suggest that CDB influences AD pathology. Patients with high CDB experience smaller volumes in brain regions affected by AD. These patients experience more atrophy in these regions for the same level of pathology. Also, for the same level of CSF Tau and CSF pTau, patients with high burden experience more cognitive impairment, and perform worse on cognitive assessments. This suggests that patients with higher burden have less resistance to Alzheimer pathology. The mean age and EYO of the two groups differed significantly, which can serve as a confounding variable. Furthermore, the CDB scores were skewed to the left. Further studies would aim to have a normal distribution for CDB, and study patients with closer ages and EYOs. In patients with ADAD, the evidence supports that high CDB leads to increase susceptibility to Alzheimer pathology. Patients with high CDB experienced faster cognitive decline and higher rates of atrophy than patients with low CDB, at similar levels of pathology. Cognitive reserve provides one explanation of differential susceptibility and may aid in explaining the trend observed. Future directions include using a sample of sporadic AD patients or studying this population longitudinally. This would allow us to trace the pathophysiological changes as patients accumulate more cardiovascular disease.

114 Vallesarmand, Ashley

Funding Program: Alzheimer's Disease T32 NIH Training Grant; WUSM Dean's Fellowship
Research Program: Summer Research Program
Doctoral Program of Study: Medicine
Institution: Meharry Medical College
Research Department: Neurology; Washington University School of Medicine
Mentors: Joy Snider, MD, PhD

Effect of CSF Biomarkers on Diagnosis, Treatment and Management of Dementia

Vallesarmand AD, Snider BJ

Introduction: Alzheimer's Disease (AD) is a neurodegenerative condition characterized by the presence of amyloid beta plaques and neurofibrillary tangles, and progressive and irreversible cognitive impairment. In the last 20 years, assessment of AD-specific biomarkers in cerebrospinal fluid or using radiolabeled PET tracers has made it possible to detect AD brain changes in life, even before the onset of symptoms of the disease. The use of these biomarkers has been primarily in the research setting, although amyloid specific PET tracers and CSF biomarker testing are available in the clinical setting. As such, the aim of this study was to determine whether cerebrospinal fluid (CSF) biomarker results changed AD diagnosis, treatment or management in a dementia specialty clinical practice. We hypothesized that CSF biomarker results would alter diagnosis, treatment and management.

Methods: This study was a retrospective review of medical records of 79 patients seen at the Washington University's Memory Diagnostic Center between 2010-June 2019. Chi-square and t-test analysis were then performed on demographical information, psychometric test performance, clinical dementia rating, diagnosis, treatment and management before and after CSF analysis.

Results: Preliminary results revealed an overall change of 40%, 24% and 42% in diagnosis, management, and treatment of dementia in both groups of patients respectively.

Conclusions: There were some limitations as we were only able to thoroughly analyze 79 patients. We noted that patients who consented to having the lumbar puncture performed were slightly younger than average. There was also a noted lack of ethnic diversity. In the future, it may be beneficial to conduct a multicenter prospective study on the topic as well as perform more in-depth analysis on which patients had a definitive change in diagnosis to AD and a change in treatment and management specifically due to new diagnosis of AD.

115 Visani, Adrienne

Funding Program: Alzheimer's Disease T32 NIH Training Grant
Research Program: Summer Research Program
Doctoral Program of Study: Medicine
Institution: Washington University School of Medicine
Research Department: Radiology
Mentors: Tammie Benzinger, MD, PhD; Brian Gordon, PhD

Relationships between tau accumulation on Positron Emission Tomography and white matter integrity on Diffusion Tensor Imaging in preclinical and clinical Alzheimer's Disease

Visani AV, Gordon BA, Strain JF, Wang Q, Benzinger TLS

Introduction: Pathogenic hallmarks of Alzheimer's Disease (AD) include extracellular amyloid-beta plaques and intracellular neurofibrillary tangles of tau accumulating in stereotyped patterns, which can be visualized on PET imaging. Axonal instability and degeneration of white matter are hallmarks of AD, but how these changes are related to tau-driven neurodegeneration is unclear. The purpose of this study is to investigate the regional relationships between white matter abnormalities on DTI (such as decreasing fractional anisotropy, or FA) and tau PET imaging in cognitively normal, preclinical AD, and demented participants.

Methods: 100 participants at the Knight ADRC (aged 46-89) underwent DTI, tau and amyloid PET, and cognitive testing. We compared patterns of FA in AD patients (n=16) to those of cognitively normal individuals (n=84, 37 with amyloid PET positivity). Age-adjusted standardized uptake value ratios (SUVRs) in a set of regions known to discriminate normal aging and AD-like tau accumulation, age, sex, and years of education were used in voxelwise linear regression models to predict FA.

Results: AD patients had higher cortical tau PET burden in selected regions and diffusely decreased FA (excepting corticospinal and sensorimotor tracts) compared to cognitively unimpaired individuals. Our results indicate that tau in AD-signature regions, especially in the amygdala and lateral occipital cortex, predict decreased FA in posterior parieto-occipital and prefrontal white matter bilaterally. We expect the opposite relationship with mean diffusivity (MD), but this study is ongoing.

Conclusions: The results of this study suggest that there are relationships between tau and white matter abnormalities in distant regions and that these relationships may be robust even in preclinical AD. White matter changes in AD have been attributed to disruption of synaptic connections in atrophying grey matter, but tract degeneration might be instead a primary consequence of misfolded and hyper-phosphorylated tau propagating through the axon. Further studies will need to investigate if the spatial relationships between DTI and tau PET are still significant when accounting for concurrent grey matter atrophy.

**American Association of Neurological Surgeons Neurosurgery
Research and Education Foundation (AANS/NREF)**

47 Johnson, Gabrielle

Funding Program: American Association of Neurological Surgeons Established by the Neurosurgery Research and Education Foundation (AANS/NREF); WUSM Dean's Fellowship

Research Program: Summer Research Program

Doctoral Program of Study: Medicine

Institution: Washington University School of Medicine

Research Department: Neurosurgery

Mentors: David Limbrick, MD, PhD; Albert Isaacs, MD

Clinical signs drive occipital-cervical fusion with or without ventral decompression in Chiari I Malformation with Syringomyelia

Johnson GW, Isaacs AM, Yahanda AT, Crevecoeur TS, Strahle JM, Smyth MD, Park TS, Limbrick DD

Introduction: Posterior Fossa Decompression (PFD) is accepted as the primary treatment for Chiari I malformation (CM) and syringomyelia (SM), but there is limited guidance on management of CM+SM in the presence of complex craniovertebral junction (CVJ) anomalies. The objective of this study was to examine clinical, surgical, and radiological parameters in children undergoing treatment for CM+SM focusing specifically those with complex CVJ anomalies.

Methods: We analyzed the Park-Reeves Syringomyelia Research Consortium (PRSRC) database to examine clinical, surgical, and radiological parameters in children with tonsillar position ≥ 5 mm below McRae's line and syrinx diameter ≥ 3 mm who underwent PFD. Clivoaxial angle (CXA) $\leq 125^\circ$, pB-C2, basilar invagination (BI), and obex position (in mm, relative to McRae's line) were recorded. Complex CVJ was defined as CM+SM with CXA $\leq 125^\circ$, pB-C2 ≥ 9 mm, BI, or obex position below McRae's line.

Results: The above CVJ parameters were measured in 993 PRSRC participants with clinical and radiological data. Four-hundred seventeen participants were classified as having complex CVJ. Thirty-one participants went on to have occipital-cervical fusion (OCF) with or without ventral decompression (VD) at a mean of 4.3 ± 11.1 months after PFD. Participants with complex CVJ who underwent PFD but not OCF \pm VD had a similar clinical presentation, clinical response to surgery, and PFD revision rate as participants with normal CVJ parameters. Notably, compared to subjects with complex CVJ who underwent PFD only, those who required OCF \pm VD presented with worse bulbar signs ($p < 0.001$), ataxia ($p = 0.002$), cranial nerve deficits ($p < 0.001$), Romberg's sign ($p = 0.004$), and reflex abnormalities ($p = 0.001$).

Conclusions: Clinical findings including bulbar signs/cranial nerve deficits, gait ataxia, and reflex abnormalities drive the use of OCF \pm VD. In the absence of these clinical findings, individuals with CM+SM and complex CVJ have similar outcomes to those with CM+SM alone when undergoing PFD only.

American Association of Thoracic Surgery (AATS)

28 Finnan, Michael, MS

Funding Program: American Association of Thoracic Surgery (AATS); WUSM Dean's Fellowship

Research Program: Summer Research Program

Doctoral Program of Study: Medicine

Institution: Washington University School of Medicine

Research Department: Surgery

Mentors: Muhammad Masood, MD

Increased BMI is associated with better post-transplant survival at 1 year for patients bridged to transplant using continuous flow LVAD devices

Finnan M, Kotkar K, Damiano M, Pasque M, Moon M, Damiano R, Itoh A, Masood M

Introduction: Continuous flow LVAD (CF-LVAD) has revolutionized surgical treatment of end stage heart failure and bridged many critically ill patients to transplant. However, optimal indications for transplant among patients bridged with CF devices remain uncertain. Our study examines the association between BMI and post-transplant survival for CF-LVAD patients.

Methods: We performed a 30 year, single center, retrospective cohort analysis of all patients who underwent heart transplantation at BJH from 7/1/1988 to 6/30/2018. We excluded congenital, dual-organ, redo-transplants, and patients bridged with devices other than Heartmate II, HVAD, or Heartmate 3. The CF-LVAD cohort contained N=200 patients while the virgin chest cohort contained N=472 patients. Patients were stratified into 3 groups based on BMI: <25 ("normal"), 25-29.9 ("overweight"), and >29.9 ("obese"). We compared 30 day and 1 year survival for CF-LVAD vs. virgin chest patients. Survival was computed using Kaplan-Meier analysis and significance was determined by log-rank test.

Results: Among virgin chest transplants, patients with normal BMI had 30 day and 1 year survival of 99.5% and 95.9% respectively while obese patients survived 91.7% and 89.6% at the same intervals ($p=0.000$ and $p=0.031$). Survival was not significantly worse for overweight patients relative to obese patients, but their 30 day and 1 year survival was significantly worse than patients with normal BMI ($p=0.000$ and $p=0.000$). Among CF-LVAD patients, the opposite trend emerged. 30 day and 1 year survival for patients with normal BMI was 90.6% and 86.6% respectively while obese patients survived 98.6% and 97.3% ($p=0.034$ and $p=0.023$). Overweight patients did not survive significantly worse than obese patients at 30 days or 1 year ($p=0.175$ and $p=0.088$), but they also did not survive better than normal BMI patients ($p=0.378$ and $p=0.488$).

Conclusions: Our analysis suggests that larger patients may benefit from bridging with CF-LVAD more than patients with normal BMI. As CF-LVAD use expands, this observation may impact organ allocation. More work is needed to verify survival beyond 1 year and identify other factors that predict post-transplant survival among the CF-LVAD cohort.

CRTC KL2 Career Development Awards

No **Burnham, Jason, MD, MSCI**

Poster Funding Program: CRTC KL2 Career Development Awards

Institution: Washington University School of Medicine

Research Department: Medicine

Mentors: Graham Colditz, DrPH, MD, MPH; Stephanie Fritz, MD, MSCI

Telemedicine Infectious Diseases Consultation: Establishing an Implementation Framework and Preliminary Results

Burnham JP, Fritz SA, Colditz GA

Introduction: Up to 45% of US hospitals do not have access to infectious diseases (ID) physicians. Consultation with ID physicians has been shown to significantly reduce mortality for a range of infections. Providing access to ID expertise in underserved areas could substantially reduce mortality and improve other clinical outcomes. Telemedicine is one potential solution to these problems. The purpose of this study is to examine, feasibility, acceptability, and appropriateness of telemedicine ID consults, simultaneously tracking fidelity to evidence-based care and clinical outcomes of mortality and readmission.

Methods: Pilot study, hybrid type 2, studying clinical outcomes (mortality, readmission, hospital transfer) and implementation outcomes assessed by survey and chart review (feasibility, acceptability, appropriateness, fidelity to guideline-based care). Telemedicine ID consultations are carried out for patients at Missouri Baptist Sullivan Hospital with positive blood cultures and charts reviewed for 30 days after hospital discharge. Patients, physicians, and staff complete surveys for implementation outcomes.

Results: The practical, robust implementation and sustainability model (PRISM) was chosen as the framework for this study and its future scale-up. There have been 15 total positive blood cultures at Missouri Baptist Sullivan Hospital since the pilot began on 7/4/19, 4 of which were transferred before a consultation could be offered. Eight patients have had telemedicine ID consultation. The remaining 3 positive blood cultures were contaminated and therefore no consultation offered. Of eligible patients not transferred, recruitment rate was 100% (8/8). Average total time per consult was 52.8 minutes on day 1, 8.5 minutes on day 2. 30-day mortality was 0%, 30-day readmission rate 12.5% (n=1), hospital transfer rate 12.5% (n=1). Five patients (62.5%) completed the 12 question survey with 0 negative responses.

Conclusions: Telemedicine ID consultation at a single rural hospital has thus far been received as feasible, acceptable, and appropriate. Enrollment for the project continues.

No **Durkin, Michael, MD, MPH**

Poster Funding Program: CRTC KL2 Career Development Awards

Institution: Washington University School of Medicine

Research Department: Medicine

Mentors: Kevin Hsueh, MD; Margie Olsen, PhD; Hilary Babcock, MD, MPH

Antimicrobial Stewardship Programs in Missouri Hospitals: Facilitators, Barriers, and Complexity of Implementation

Durkin MJ, Sayood S, McKay V, Turabelidze G, Newland J, Babcock H, Warren D, Habrock T, Burnham J, Hsueh K

Introduction: Antibiotic stewardship programs (ASPs) in acute care hospitals reduce unnecessary antibiotic use and attendant complications. In the state of Missouri, all hospitals are required to have an ASP. Additionally, the Joint Commission mandates ASP implementation for accreditation based on core elements defined by the Centers for Disease Control (CDC). No studies have evaluated the uptake of ASP since the Missouri state law and Joint Commission mandate. Furthermore data are limited examining barriers to implementation across hospitals with variable resources. We evaluated ASP uptake across Missouri hospitals, assessed differences in program complexity, and identified barriers to implementation.

Methods: A 94-question survey was administered electronically in the spring of 2019 to 130 Missouri hospitals. Information was collected regarding implementation details of CDC-defined ASP core elements and tools used to overcome implementation barriers. Results were self-reported by the stewardship pharmacist, the director of pharmacy, or the person most familiar with antimicrobial stewardship if the former were not available.

Results: Preliminary results have been collected from 37 hospitals ranging in size from 15 to 1303 beds (IQR: 54, 274). 16% were critical access hospitals. 54% of hospitals had ASPs adherent to all 7 CDC core elements. Another 27% had implemented 6 of the core elements, with all of those reporting that they lacked a single pharmacist leader. All facilities had implemented at least some measures to improve antibiotic use, ranging from 4 to 13 measures. 45% of programs used state-based antimicrobial stewardship collaboratives, and 52% of those found such programs to be "very" or "extremely" useful.

Conclusions: All hospitals surveyed are performing ASP activities in concordance with Missouri state law. However, only half contain the 7 core elements required by the Joint Commission. Furthermore, ASP implementation and activities vary widely. While physician leadership was commonly defined, appropriate pharmacist support was frequently lacking. State-based collaboratives are the most widely used resource, and at least half who use them find them to be helpful.

No Granados, Andrea, MD

Poster Funding Program: CRTC KL2 Career Development Awards

Institution: Washington University School of Medicine

Research Department: Pediatrics

Mentors: Ana Maria Arbeláez, MD; Thomas Ferkol, MD; Antoinette Moran, MD

The Relationship Between Body Composition And Glucose Dysregulation In Youth With Cystic Fibrosis

Granados A, Beach EA, Patterson BW, Wallendorf M, Arbeláez AM

Introduction: Changes in body composition have been found to influence insulin sensitivity in the general population. Even though poor nutritional status is strongly linked to morbidity and mortality in patients with cystic fibrosis (CF), little is known about the effects of body composition in this population. We assessed if measurement of insulin sensitivity relates to changes in body composition and pulmonary function in clinically stable CF youth without known diabetes.

Methods: In a cross-sectional study, 45 adolescents and young adults (10 to 25 years of age) with CF and 8 healthy controls without CF, underwent body composition analysis using dual energy X-ray absorptiometry scan (DXA). Indices of insulin sensitivity (Matsuda index) and insulin secretion (ratio of the area under the curve for C-peptide to glucose (CP-iAUC/G-iAUC)) were calculated from a 2-hour oral glucose tolerance test. Pulmonary function tests were obtained on all subjects the day of the study visit.

Results: All patients had pancreatic insufficiency and a mean BMI z-score 1.53 ± 0.35 . Abnormal glucose tolerance (AGT) was highly prevalent (62%, n=32) in the CF group. No differences in body composition were observed between the AGT, normal glucose tolerance (NGT), or control group. However, lean body mass index (LBMI) z-score correlated positively with higher Matsuda index ($r=0.31$; $p=0.04$) and lung function including FEV1 %-predicted for age and FVC %-predicted for age ($r=0.36$; $p=0.013$ and $r=0.42$; $p=0.004$ respectively) in the CF group. Fat mass Index (FMI) z-score was negatively associated with Matsuda index ($r=-0.35$, $p=0.02$), and positively correlated with measure of insulin resistance (HOMA-IR) ($r=0.41$ $p=0.005$) and the CP iAUC/G iAUC ($r=<0.001$). Suggesting a compensatory mechanism of insulin secretion in the setting of insulin resistance.

Conclusions: The association found in this study between higher lean body mass and better insulin sensitivity and lung function in clinically stable patients with CF, highlights the importance of body composition in long-term outcomes in CF patients.

58 Kuroki, Lindsay, MD, MSCI

Funding Program: CRTC KL2 Career Development Awards

Institution: Washington University School of Medicine

Research Department: Obstetrics and Gynecology

Mentors: L Stewart Massad, MD; Matthew Kreuter, PhD; Graham Colditz, DrPH, MD, MPH

Addressing Unmet Basic Needs to Improve Adherence to Follow-up of an Abnormal Pap

Kuroki L, Kreuter M, Brown D, Leon A, Min C, Martin J, Hyon K, Ghreeb A, Liu J, Massad LS

Introduction: Inability to meet basic needs (BNs) such as food, shelter, and transportation may pose a barrier to cancer prevention procedures. We aimed to identify unmet basic needs among women with abnormal Pap results and to explore acceptability and effectiveness of a navigator to address these needs to improve adherence to initial colposcopy.

Methods: Indigent women were recruited from 9/2017-1/2019 from 2 academic colposcopy referral centers serving both rural and urban areas. BNs were assessed via phone survey prior to scheduled colposcopy visits and were considered unmet if unlikely to be resolved in the next month. Once 25 patients were enrolled at each site, allowing for protocol standardization, a navigator intervention was offered to participants who screened positive for at least 1 BN. Primary outcome was adherence to initial colposcopy visit.

Results: Among 100 women recruited, 59% had at least 1 unmet BN, with similar prevalence among urban vs. rural participants (median 1 vs. 1, $p=0.15$). Highest BNs included money for unexpected expenses (51%), utilities (19%), transportation (17%) and family needs (e.g., food, shelter, and clothing, 16%). Compared to the 4 months preceding study initiation, adherence to colposcopy improved from 50% (urban) and 51% (rural) to 94% and 76%, respectively. Women with 0 BNs were less likely to present for colposcopy than those with 1+ unmet BNs, regardless of navigator assistance (0 BN, 73%; no navigator/1+ unmet BN, 94%; navigator/1+ unmet BNs, 92%, $p=0.03$). Patients reported high acceptability (99%) of the BNs assessment. Of the 22 women who received navigator assistance, 95% reported the navigator was helpful and 70% felt the navigator helped them get to their clinic visit.

Conclusions: Most colposcopy patients face unmet BNs. Assistance from a BNs navigator is valued by patients and improves adherence to colposcopy. Patient phone reminders for colposcopy that include personalized assistance with unmet BNs may improve adherence at academic referral centers.

No Maiti, Baijayanta, MD, PhD

Poster Funding Program: CRTC KL2 Career Development Awards

Institution: Washington University School of Medicine

Research Department: Neurology

Mentors: Joel Perlmutter, MD; Tamara Hershey, PhD

Cognitive Correlates of Cerebellar Resting-State Functional Connectivity in Parkinson Disease - Spotlight Veers to the Vermis

Maiti B, Koller JM, Snyder AZ, Tanenbaum AB, Cassani AR, Norris SA, Campbell MC, Perlmutter JS

Introduction: Dementia affects as many as 80% of Parkinson Disease (PD) patients and is refractory to dopaminergic therapy suggesting involvement of other neurotransmitter systems or brain regions beyond the nigrostriatal pathway. The purpose of this study was to investigate the contributions of altered cerebellar resting-state functional connectivity (FC) to cognitive impairments in PD.

Methods: We conducted morphometric and FC-MRI analyses in 81 PD and 43 age-matched healthy controls using rigorous quality assurance measures. To investigate cerebellar FC in relation to cognitive status, we contrasted PD participants without cognitive impairment (Clinical Dementia Rating scale, CDR=0; n=47) versus participants with impaired cognition (CDR \geq 0.5; n=34). Comprehensive measures of cognition across the five cognitive domains were assessed for behavioral correlations.

Results: The PD participants had significantly weaker FC between the vermis and peristriate visual association cortex compared to controls that correlated with visuospatial functions and global cognition. The cognitively impaired PD group had significantly weaker FC between the vermis and dorsolateral prefrontal cortex that correlated with deficits in attention, executive functions and global cognition. No group differences in cerebellar lobular volumes or regional cortical thickness of the significant cortical clusters were observed. The baseline FC measures predicted subsequent rate of cognitive decline in a subset of PD participants.

Conclusions: These results demonstrate a correlation between cerebellar vermal FC and cognitive impairment in PD. Preliminary data suggests that vermal FC may be an early imaging biomarker of subsequent cognitive decline. The absence of significant atrophy insinuates this could be related to local pathophysiology such as neurotransmitter dysfunction, studies utilizing PET cholinergic measures of the vermis are underway to further investigate this. This could have substantial clinical impact by elucidating pathophysiologic bases of dementia in PD, identifying at-risk patients before these disabling symptoms manifest, and providing target of engagement of new drug therapies.

90 Patil, Sonal, MD, MSPH

Funding Program: CRTC KL2 Career Development Awards

Institution: Washington University School of Medicine

Research Department: Family and Community Medicine; University of Missouri School of Medicine

Mentors: Michael L LeFevre, MD, MSPH

Home Blood Pressure Monitoring in Cases of Clinical Uncertainty: A Pilot Study to Differentiate Appropriate Inaction From Therapeutic Inertia

Patil S, Wareg NK, Hodges KL, Smith JB, Kaiser MS

Introduction: Conventional clinic blood pressure (BP) measurements are routinely used for hypertension management and physician performance measures. Not intensifying treatment is appropriate inaction in certain contexts. Therapeutic inertia studies have used research quality clinic BPs or ambulatory BPs for BP outcomes. The aims of this pilot study are to 1) determine if treatment non-intensification is due to uncertainty of clinic BP or therapeutic inertia; 2) determine if clinical certainty, BP management, and physicians' hypertension metrics can improve by integrating home BP (HBP) readings into electronic health records (EHR); and 3) identify variables associated with elevated home BP averages.

Methods: We conducted a pre- and post-study of HBP monitoring in hypertensive patients with uncontrolled hypertension when physicians did not intensify hypertension management at the current visit and in the preceding four weeks. Home BP machines were loaned for 2-3 weeks. Average HBP was entered in EHR. Physicians were notified of average HBP. Outcomes measured were the proportion of patients with average HBP of <140/90, changes in BP management, change in physician's hypertension metrics, and factors associated with home-clinic BP differences.

Results: Average HBP was <140/90 in 66% of our 90 recruited patients. Physicians changed management in 19 of the 31 patients with HBP of \geq 140/90, and no treatment changes in 12 patients were due to contextual factors. Substituting HBP average for clinic BPs in 4% of patients from physicians' hypertension registry improved physicians' hypertension control rates by 3% to 5%. Higher body mass index and number of BP medications was associated with HBP of \geq 140/90. Clinic BP levels did not predict normal home BP range; 66% of patients with clinic BP >160/95 had home BP <140/90.

Conclusions: Documented home BP in cases of clinical uncertainty helped differentiate therapeutic inertia from appropriate inaction and improved physicians' hypertension metrics. A majority of physicians changed BP management when BP elevation was confirmed by HBP. Hypertension guidelines have not considered the impact of conventional clinic BP measurements on BP thresholds.

94 Raji, Cyrus, MD, PhD

Funding Program: CRTCL2 Career Development Awards

Institution: Washington University School of Medicine

Research Department: Radiology

Mentors: Tammie Benzinger, MD, PhD; Samuel Klein, MD; Beau Ances, MD, PhD, MSc

The Application of Machine Learning for Improved Diagnostic Identification of Alzheimer's Disease and its Prodromal Form, Mild Cognitive Impairment

Raji CA, Meysami S, Porter V, Merrill DM

Introduction: Alzheimer's Disease (AD) is the most common cause of dementia. Recommended clinical use of imaging has been limited to visual evaluations of MRI scans for the purposes of ruling out "organic" causes of dementia such as stroke or tumor. No role of imaging currently exists for identifying mild cognitive impairment (MCI), a proposed prodromal phase of AD. Development of FDA cleared quantitative software called Neuroreader allows for quantification of multiple brain regions. We evaluated the discriminative ability of automated volumetric data for identifying AD from MCI and controls.

Methods: Volumetric 1.5 and 3.0T MRI brain scans (n = 1143) were obtained from ADNI using standard protocols [5]. This cohort consisted of controls (n = 261), early mild cognitive impairment (EMCI, n = 310), late mild cognitive impairment (LMCI, n = 223), and AD (n = 349). Neuroreader was used to compute brain volumes. Machine learning was done using cross validated discriminant analysis algorithm in IBM SPSS Modeler (v. 18, Armonk, NY). Area under the curve (AUC) was generated for AD and MCI subgroups and feature selection used to identify predictive regions.

Results: Quantitative volumetric data separated AD from non-AD groups with AUC of 89%, 85% sensitivity, and 79% specificity. Automated volumetric data delineated LMCI from other groups with AUC of 72%, 70% sensitivity, and 62% specificity. EMCI was distinguished from LMCI, AD, and controls groups with AUC of 80%, 76% sensitivity, and 70% specificity. The most predictive regions delineating AD from MCI subgroups and controls are including total CSF volume, hippocampal asymmetry and temporal lobe volumes.

Conclusions: Quantified brain regions provide good diagnostic delineation of AD from MCI subgroups and normal controls. Overlap between LMCI and AD and EMCI and controls accounts in part of reduced diagnostic performance in MCI. Future studies will utilize longitudinal better for improved delineative power.

Oral Tague, Laneshia K, MD, MSCI

Talk Funding Program: CRTCL2 Career Development Awards

Institution: Washington University School of Medicine

Research Department: Medicine

Mentors: Ramsey Hachem, MD; Roger Yusem, MD, MPH

Association Between Allograft Ischemic Time and Adverse Outcomes Following Lung Transplantation

Tague LK, Cherikh W, Lehman RR, Chambers D, Yusem R, Hachem RR

Introduction: Efforts to increase the number of viable donors, such as ex vivo lung perfusion and donation after circulatory death, are likely to significantly alter allograft ischemic time distributions. As such, understanding the impact allograft ischemia has on short and long-term outcomes will be key in determining best practices going forward.

Methods: We conducted an ISHLT database study of adult bilateral lung transplant recipients between January 1, 2006 and June 30, 2016. We evaluated for an association between first and second lung ischemic time and short- and long-term outcomes post-transplant. We also performed regression modeling to evaluate factors associated with prolonged ischemic time.

Results: 13,183 recipients were included in the final analysis. Prolonged first but not second lung ischemic time was associated with decreased unadjusted 30-day survival (log-rank p=0.048) and higher rates of treated acute rejection in the first post-transplant year (p<0.0001). Both were associated with prolonged index hospital length of stay (p<0.0001 and p<0.001, respectively). Multivariable analyses revealed that both first and second lung ischemic times were significantly associated with 1-year survival (p=0.009 and p=0.023, respectively), although this was no longer the case at 5 years. Freedom from BOS was higher in patients with longer first and second ischemic lung times (p<0.001 for both). Recipient age, male gender, prior life support, prior cardiac/lung surgery, donor age and cause of death and transplant type (repeat vs. primary) and geographic location were all significantly associated with longer total allograft ischemic time.

Conclusions: First allograft ischemic time appears more strongly associated with increased 30-day and 1-year mortality as well as prolonged index hospitalization and increased acute rejection in the first year. This suggests that, in bilateral lung recipients, first lung ischemic time is more clinically relevant to allograft and patient outcomes.

CRTC Master of Science in Clinical Investigation (MSCI)

No **Guy, Daniel, MD**

Poster Funding Program: CRTC Master of Science in Clinical Investigation (MSCI) Degree Program

Institution: Washington University School of Medicine

Research Department: Medicine

Mentors: Brad Kahl, MD

A pilot study of acalabrutinib with bendamustine/rituximab followed by cytarabine/rituximab for untreated mantle cell lymphoma

Guy D, Bartlett N, Cashen AF, Fehniger T, Ghobadi A, Mehta-Shah N, Kahl BS

Introduction: Mantle cell lymphoma (MCL) is an incurable aggressive sub-type of non-Hodgkin lymphoma that is defined by translocation t(11;14) and over-expression of cycline D1. To date there is no standard induction regimen for MCL. Combination of chemotherapy and autologous stem-cell transplantation provide high response rates; however, most of the patients relapse and die from their disease. Washington University (Kahl PI) has piloted a regimen of bendamustine/rituximab with cycles of high dose cytarabine showing successful stem cell collection without unexpected toxicity. We now attempt to improve upon the results of the prior study by combining the tested chemotherapy with the novel agent acalabrutinib, a novel Bruton tyrosine kinase inhibitor that has shown impressive response rates in relapsed/refractory MCL. We hypothesize that adding acalabrutinib to chemotherapy will prove safe and increase complete response rates as well as minimal residual disease (MRD) negativity pre-transplant, thus improving clinical outcomes.

Methods: This is a single arm pilot study. Eligible patients aged 18-70 with untreated MCL who are eligible for autologous stem cell transplant will receive six 28-day cycles of treatment. Cycles 1-3 will consist of bendamustine and rituximab with the addition of acalabrutinib. Cycles 4-6 will consist of cytarabine and rituximab with the addition of acalabrutinib. After cycle 6, patients will undergo leukapheresis for stem cell collection. The purpose of this study is to determine the stem cell mobilization success rate. Secondary objectives include safety and tolerability, overall response rate, pre-transplant complete response rate, and the MRD negativity rate throughout and after completion of therapy.

Results: This is an ongoing study registered as NCT03623373 on ClinicalTrials.gov. Four patients (out of planned 15) have begun the study treatment. So far, the treatment has been well tolerated without unexpected toxicities. We hope to complete the study by 5/2021.

Conclusions: The current trial is a preparation for a larger ECOG-ACRIN intergroup trial; a randomized 3-arm phase II study, that has the goal of achieving a standard induction therapy for MCL in transplant eligible patients.

No **Massa, Sean, MD**

Poster Funding Program: CRTC Master of Science in Clinical Investigation (MSCI) Degree Program

Institution: Washington University School of Medicine

Research Department: Otolaryngology

Mentors: Jay Piccirillo, MD, FACS

Untreated Head and Neck Cancer: Defining the Natural History and Associated Patient Factors

Massa ST, Zolkind P, Lee JJ

Introduction: Effective counselling of newly diagnosed cancer patients requires an accurate prognosis for all treatment options, including the option for no treatment. The existing literature on the natural history of untreated head and neck cancers (HNC) is based on outdated, small studies. This study aims to inform HNC patients and providers with modern estimates of survival for untreated HNC using nationally representative data and to identify factors associated with not receiving treatment.

Methods: Adults with mucosal squamous cell carcinoma of the head and neck were identified from the Surveillance, Epidemiology, and End Results (SEER) database from 2004 to 2014. Median overall survival of untreated patients is reported, stratified by site and stage. Cause-specific survival was calculated using competing risk regressions and compared between treatment groups. Clinical and sociodemographic factors associated with lack of treatment were assessed with logistic regression models.

Results: The cohort of 87,844 patients included 6,477 (7.4%) untreated patients who survived a median of 12 months (95%CI:11-13 months). Median survival varied by site from 4 (hypopharynx) to 21 months (larynx), and by stage from 18 (III) to 3 months (IVc). Untreated patients showed a higher mortality rate from non-cancer causes, especially in the first months after diagnosis (6.5% vs 1.6% at 5 months). Lack of treatment was associated with advanced age (OR 1.05, 99%CI: 1.04-1.05), black race (1.27, 1.06-1.53), unmarried status (single 2.01 1.71-2.36), lack of private insurance (uninsured 1.82, 1.41-2.33), and metastatic disease (2.89, 2.30-3.61).

Conclusions: Survival of untreated HNC is dismal. Quantifying the substantial variation by tumor site and stage can improve prognostic counselling for patients considering palliation. Some factors associated with no treatment may represent a patient's deliberate decision when considering their overall prognosis and goals. However, higher rates of no treatment among poor, racial minorities may be driven by healthcare disparities and requires further investigation.

No McHenry, Scott, MD

Poster Funding Program: CRTC Master of Science in Clinical Investigation (MSCI) Degree Program

Institution: Washington University School of Medicine

Research Department: Medicine

Mentors: Nicholas O Davidson, MD; Greg Sayuk, MD; Yikyung Park, PHD

The Novel Dallas Steatosis Index Accurately Identifies Nonalcoholic Fatty Liver Disease in the Primary Care Setting

McHenry S, Park Y, Browning JD, Sayuk G, Davidson NO

Introduction: Nonalcoholic fatty liver disease (NAFLD) affects one-quarter of the world population and predisposes to cardiometabolic and liver-related complications. Current guidelines do not recommend screening due to an as-yet unclear cost-benefit. A clinical prediction rule to risk-stratify patients for further evaluation of hepatic steatosis and fibrosis might inform screening recommendations. We developed a clinical prediction tool for NAFLD using predictors that are routinely available in primary care using a more sensitive and specific diagnostic strategy than previously published models.

Methods: The Dallas Heart Study is a multi-ethnic, population-based, probability sample with liver fat quantification performed by 1H MR spectroscopy with recruitment in 2002 and 2007. After excluding greater than moderate alcohol use, NAFLD was diagnosed in subjects with >5.5% liver fat. The Dallas Steatosis Index (DSI) was generated using logistic regression and internally validated with 10-fold cross validation. The DSI's discrimination was compared to previously published risk models by the C-statistic, net reclassification index and decision curve analysis.

Results: 2,139 subjects (median age 44 years, median BMI 28 kg/m², 54% female, 32% non-Hispanic white, 47% African American) met the inclusion/exclusion criteria with 661 (31%) having NAFLD. Using only routine predictors (medical diagnoses, race/ethnicity, sex, age, ALT, glucose, triglycerides), the DSI demonstrates good discrimination (C-statistic 0.824; optimism corrected 0.814). At a threshold of >20% risk, half of patients would avoid being screened while still maintaining a sensitivity of 90%. The DSI had superior discrimination and net benefit compared to the previously published risk scores (Figure 1).

Conclusions: The DSI accurately identifies patients with NAFLD using clinical predictors readily available to primary care physicians. This prediction model can also be used in epidemiologic studies and appears to outperform established risk models. Next steps in model development include external validation, outcome validation and the use of the DSI to promote a cost-effective NAFLD screening program.

No Osbun, Joshua, MD

Poster Funding Program: CRTC Master of Science in Clinical Investigation (MSCI) Degree Program

Institution: Washington University School of Medicine

Research Department: Neurology

Mentors: Gregory Zipfel, MD

Comparative Effectiveness of Cerebral Cavernous Malformations Managed by Surgical Resection Versus Observation: A Propensity Score Analysis

Osbun JM, Moore CM, Han R, Johnson G, Coxon A, Zipfel G

Introduction: Cerebral cavernous malformations (CCMs) are rare lesions that account for 15% of all intracranial vascular malformations and have a risk of causing intracranial hemorrhage (36%), focal neurological deficit (22%) and recurrent seizures (37%). 40% of known cases are asymptomatic lesions found by MRI. Little is known about whether patient outcomes are more favorable with conservative management, or surgery, and no consensus exists on management strategy. Our goal is to elucidate which patients have the highest risk for poor outcome and which patients will most benefit from surgical resection of a CCM.

Methods: Retrospective review of 953 patients with CCM treated at Barnes Jewish Hospital from 2005 to 2016 identified 652 observed cases and 301 surgically resected cases. Patient factors including age, gender, size of lesion, lesion location, history of seizure, history of intracranial hemorrhage, and medical co-morbidities will be used to create a cox-proportional hazard model for the risk of recurrent hemorrhage and seizure. Propensity scores will be estimated for the probability that a patient would undergo surgery and inverse probability of treatment weighting will be applied in each treatment group based on propensity score. Adjusted primary outcomes of both a composite of recurrent hemorrhage, focal neurological deficit and death as well as a secondary outcome of recurrent seizure, will be compared amongst treatment groups.

Results: We hypothesize that several patient characteristics such as history of previous seizure, prior intracranial hemorrhage, lesion size, and lesion location will predict the risk of future hemorrhage and or seizure. We also hypothesize that there will be a difference in the rate of composite outcomes amongst surgically treated and observed patients.

Conclusions: To date, few studies have attempted to explore the wide range of factors that predict the risk of poor patient outcomes, and no study has directly compared patient outcomes in surgically treated versus observed patients. This research is innovative in that it uses a comparatively large dataset to explore predictive factors of natural history and patient outcomes based on treatment decisions.

CRTC Postdoctoral Mentored Training Program in Clinical Investigation (MTPCI)

No Addante, Amy, MD

Poster Funding Program: CRTC Postdoctoral Mentored Training Program in Clinical Investigation (MTPCI)

Institution: Washington University School of Medicine

Research Department: Obstetrics and Gynecology

Mentors: David Eisenberg, MD, MPH; Mark Hoofnagle, MD, PhD

The Association Between Decreased Abortion Access and Maternal Mortality in the United States

Addante AN, Eisenberg DL, Leonard J, Hoofnagle M

Introduction: Maternal mortality has been increasing in the United States for several decades. Family planning services, specifically abortion, have been increasingly regulated, resulting in decreased access in some states. It is unknown how restricted access to abortion impacts maternal mortality. The objective of this study was to explore the relationship between access to abortion and maternal mortality in the United States.

Methods: This was a retrospective cohort study examining maternal mortality in the United States from 1995 to 2017. We used the Global Health Data Exchange (GHDx) and the Center for Disease Control and Prevention (CDC) WONDER databases to extract maternal mortality data for all 50 states for each year from 1995 to 2017. We categorized states as restrictive, neutral or protective of abortion access according to policy information published by the Guttmacher Institute.

Results: The mean maternal mortality ratios, weighted by births in each state, were not significantly different between each group of states in 1995 (Restrictive 12.5, 95% CI 11.4-13.7; Neutral 10.6, 95% CI 8.2-13.0; Protective 10.0, 95% CI 7.5-12.5). Maternal mortality ratios increased for each group of states over time. In 2017, the mean maternal mortality ratio was significantly higher in restrictive states when compared to protective states (Restrictive 27.1, 95% CI 24.2-30.0; Neutral 21.5, 95% CI 17.3-25.8; Protective 18.5, 95% CI 14.1-22.9). A similar trend is seen in both data sets. The maternal mortality ratio increased for black women in restrictive and neutral states and decreased in in protective states.

Conclusions: This study demonstrates differences in maternal mortality based on access to abortion across two data sets. Further investigation is needed to understand how decreased abortion access may contribute to increased maternal mortality.

2 Alexander, Vinita M, MD

Funding Program: CRTC Postdoctoral Mentored Training Program in Clinical Investigation (MTPCI)

Institution: Washington University School of Medicine

Research Department: Obstetrics and Gynecology

Mentors: Emily S Jungheim, MD, MSCI

Association of Pregnancy Outcomes with Area Deprivation Index

Alexander VM, Powe Dillon JM, Jungheim ES

Introduction: We explored the relationship between socioeconomic deprivation and clinical pregnancy (CP) rate, live birth (LB) outcomes, and preterm birth rates in a retrospective cohort study of 516 women undergoing their first cycle of IVF at a single academic fertility center in St. Louis, MO from January 2015 to December 2018.

Methods: The Area Deprivation Index (ADI) is based on a measure created by Health Resources & Services Administration (HRSA). Using published maps, neighborhood-level ADI was obtained per individual patient. To construct a model, independent samples t-tests and chi-square analyses were carried out. Logistic regression analysis was used to determine the relationship between CP, LB, and preterm birth and covariates.

Results: Overall, there was no significant difference between CP rate in the highest national quintile deprivation index group (most deprived) and in the lowest (least deprived) group. Compared to the least deprived quintile, the OR for CP in second least deprived quintile was: 1.344 (95% CI: 0.735-2.456, p= 0.337, and in the most deprived group was 0.605 (95% CI: 0.212-1.723, p = 0.347). Factors significantly associated with CP were: AMH (anti-mullerian hormone), ICSI (intracytoplasmic injection), and age at start of treatment. Overall, there was also no significant relationship between ADI and LB rate. Interestingly, the hazard ratio of preterm birth at < 37 weeks was elevated in the second and third quintiles of deprivation compared to the areas with the lowest deprivation index. Also, interestingly, there was a nonsignificant trend in increasing odds ratio of multiple births in the most deprived quintiles compared to the least deprived quintile.

Conclusions: We found no significant association between neighborhood deprivation index and probability of CP or LB after IVF. Given that the center is in St. Louis, MO and attracts many patients coming from Illinois, a state that mandates fertility coverage, it may be interesting to further investigate whether the most deprived ADI groups (and fertility insurance benefits) are more likely to have multiples.

No Caldwell, Katharine, MD

Poster Funding Program: CRTC Postdoctoral Mentored Training Program in Clinical Investigation (MTPCI)

Institution: Washington University School of Medicine

Research Department: Anesthesiology

Mentors: William Hawkins, MD

Malic Enzyme 1 Negative Tumors Demonstrate Increased Reliance on Cystine Import and Increased Sensitivity to Pharmacologic XCT Transport Inhibition

Caldwell KE, Spitzer D, Van Tine BA, Hawkins WG

Introduction: Malic Enzyme 1 (ME1) has been identified as an important prognostic indicator for multiple subtypes of cancer. Here, we investigate the underlying biology of ME1 negative tumors, and its role as a possible prognostic indicator for a novel chemotherapeutic developed by our lab; conjugated Sigma 2 Erastin (S2E).

Methods: The responsivity of ME1(+) and ME1(-) human tumor cell lines to cell death induced by pharmacologic inhibition of the XCT transporter was compared. ME1 knockdown and overexpressing cell lines were created to demonstrate the role of ME1 in this observed difference. Differences in reactive oxygen species generation (ROS) and cystine uptake were determined.

Differences in survival were noted between ME1(+) and ME1(-) tumor subtypes in vivo after administration of conjugated S2E.

Results: We identified differences in responsivity of ME1(+) and ME1(-) tumor cell lines to treatment with targeted S2E. These findings were again proven after knockdown in ME1+ cell lines and overexpression in ME1- cell line creation when compared to wild type cells. ME1- cells were demonstrated to have increased reliance on XCT activity as measured by cystine import and ROS generation in response to treatment with our ROS-inducing chemotherapeutic (S2E). To support this finding, ME1 negative cell subtypes were demonstrated to have decreased glutathione levels and increased reactive oxygen species levels after treatment with S2E. In vivo studies demonstrated that S2E created significantly improved survival in ME1 negative cancer subtypes with shorter gains in survival in ME1 positive subtypes, and only at higher doses.

Conclusions: Malic Enzyme 1 negative tumors have increased reliance on the activity of the XCT transporter and thus increased sensitivity to cell death by pharmacologic XCT inhibition by our novel chemotherapeutic of targeted S2E. These findings demonstrate preclinical data for a possible targeted strategy for patient selection or dose selection in a phase I trial based on ME1 cancer subtype.

51 Kang, Peter, MD

Funding Program: CRTC Postdoctoral Mentored Training Program in Clinical Investigation (MTPCI)

Institution: Washington University School of Medicine

Research Department: Neurology

Mentors: Jin-Moo Lee, MD, PhD; Hongyu An, DSc; Andria Ford, MD, MSCI

Oxygen Metabolic Stress in the Watershed is Associated with Cerebral Small Vessel Disease

Kang P, Ying C, Chen Y, Ford AL, An H, Lee JM

Introduction: Chronic hypoxia-ischemia is a putative cause for cerebral small vessel disease (CSVD), but direct evidence in humans is lacking. In a cohort of older adults with CSVD, we hypothesized that oxygen extraction fraction (OEF) would be elevated within the region of lowest cerebral blood flow (CBF) at greatest risk for ischemia.

Methods: Three cohorts: young healthy adults (n=22), older healthy adults (n=14), and adults with CSVD (n=29), underwent MRI using pseudocontinuous arterial spin labeling, asymmetric spin echo, and diffusion tensor imaging (DTI) to measure CBF, OEF, and white matter integrity, respectively. The average CBF map from young, healthy controls was thresholded at less than 10th percentile of white matter flow to capture a "physiologic watershed" region of interest. We compared group differences in regional CBF and OEF within the watershed and white matter regions. Further, we conducted linear regression to evaluate the relationship between regional cerebral blood flow and oxygen extraction fraction with structural and microstructural white matter injury defined using FLAIR white matter hyperintensities (WMH) and DTI, respectively.

Results: While CBF did not differ between groups, white matter and watershed OEF was highest in the cerebral small vessel disease cohort. Watershed OEF was associated with increased WMH volume as well as greater disruption of white matter microstructural integrity. The watershed region of young controls demonstrated remarkable overlap with regions of high lesion density in the CSVD cohort. Moreover, OEF progressively increased while CBF progressively decreased, in concentric contours surrounding WMH.

Conclusions: White matter hyperintensity density is greatest within the physiological watershed, characterized by low CBF and high OEF. Watershed OEF is selectively elevated in cerebral small vessel disease patients, suggesting regional vulnerability to disease.

No Lenger, Stacy, MD

Poster Funding Program: CRTC Postdoctoral Mentored Training Program in Clinical Investigation (MTPCI)

Institution: Washington University School of Medicine

Research Department: Obstetrics and Gynecology

Mentors: Jerry L Lowder, MD; Siobhan Sutcliffe, PhD

Towards Reducing Adult Female Urinary Incontinence (UI) Burden: Opportunities to Improve UI Guidelines

Lenger SM, Chu CC, Ghetti C, Hardi AC, Lai HH, Thakur A, Lowder JL, Sutcliffe S

Introduction: There is concern for possible low utilization and adherence to UI evaluation and diagnosis guidelines. Before adherence to guidelines can be evaluated, there needs to be a better understanding of the full range of guidelines available to all general and specialty providers who evaluate and diagnose UI in women. The objective of this study is to systematically review UI evaluation guidelines.

Methods: We performed a systematic literature search using strategies for the concept of UI guidelines in eight medical search engines, including Ovid-Medline and Embase. Major organizational websites were searched. After abstract and full-text screening, UI evaluation guidelines written for medical providers in English after 1/1/2008 were included. Exclusion criteria were guidelines for children, men, institutionalized or peripartum women and neurologic-related incontinence.

Results: Twenty-five guidelines met criteria. All guidelines recommended history taking, but they varied in level of detail. Two guidelines did not mention specific components and instead summarized history taking as a “good history” or “proper medical history.” The remaining guidelines explicitly specified at least one component. Excluding other disease processes was recommended (4%), mentioned (12%), listed with examples (32%), or inferred (28%); 44% recommended referral to a specialist if indicated. Similar variability was observed for physical examination (PE) with all guidelines recommending a PE or at least one exam component. Some (12%) provided no further guidance, whereas others recommended (R), recommended in certain situations (CS), or listed (L) PE components (Table 1). Evidence or recommendation levels for history or PE components were largely based on clinical principle, expert opinion, or panel consensus. Additional evaluation components were urine study (office dipstick, urine microscopy, or lab urinalysis; 80% R, 4% CS, 4% L), urine culture (8% R, 44% CS, 4% L, and 16% had unclear recommendation), post void residual (48% R, 48% CS, 4% not mentioned), and bladder diary (36% R, 8% CS, 32% L). Multichannel urodynamics, cystoscopy, and imaging were typically reserved for use in certain situations (80%, 56%, and 28% respectively).

Conclusions: While several exemplary UI evaluation guidelines exist, many others lack detail, are not evidence-based, and are variable. This variability may lead medical providers to perform inconsistent evaluations in the work up and diagnosis of UI. Opportunities to advance UI guidelines include improving clarity, consistency, and individualization.

Oral Lyons, Patrick, MD

Talk Funding Program: CRTC Postdoctoral Mentored Training Program in Clinical Investigation (MTPCI)

Institution: Washington University School of Medicine

Research Department: Medicine

Mentors: Marin Kollef, MD; Brian Gage, MD, MSc

Development and Validation of an Electronic Early Warning System for Oncology Inpatients

Lyons PG, Klaus J, McEvoy CA, Westervelt P, Gage BF, Kollef MH

Introduction: Electronic Early Warning Systems (EWS) designed to identify and prevent clinical deterioration among general ward patients, although promising, are limited by false positive alerts. We recently showed that oncology ward patients clinically deteriorate more frequently than general inpatients, suggesting that an oncology-specific EWS specific might offer improved positive predictive value. Thus, we aimed to derive and validate an EWS for oncology ward patients using electronic health record data.

Methods: This was a retrospective cohort study at Barnes-Jewish Hospital, a 1,300-bed academic hospital with a 138-bed cancer pavilion. We included 21,219 consecutive oncology ward hospitalizations from January 1, 2014, to June 30, 2017. The primary outcome was clinical deterioration (composite of ward death and transfer to the intensive care unit [ICU]). In a random 70% sample of admissions, we used discrete-time logistic regression within 6-hour time windows to fit an elastic net (EN) penalized model to predict clinical deterioration. Potential predictor variables included patient characteristics, vital signs, lab values, and medications. We repeated 10-fold cross-validation 5 times in the derivation sample to fit EN penalties and ensure model stability before evaluating model performance in the remaining 30%. We compared the model to the Modified Early Warning Score (MEWS) – a common ward-based EWS – using the area under the receiver-operating-characteristic curve (AUROC).

Results: We evaluated 21,219 admissions from 9,058 patients, producing 587,652 time windows. The composite outcome occurred in 1,965 windows: 1,425 ICU transfers and 540 ward deaths. The new model contained 69 variables and more accurately detected clinical deterioration (AUROC 0.81, [95% confidence interval (CI) 0.79-0.83]) than the MEWS (AUROC 0.60, 95% CI 0.58-0.62, $p < 0.001$).

Conclusions: We developed and validated an EWS for oncology inpatients which was more accurate than a commonly used existing tool. The model requires prospective evaluation and testing of associated interventions (e.g., rapid response activation) to determine if real-time use can improve oncology patient outcomes.

No Raghuraman, Nandini, MD, MS

Poster Funding Program: CRTC Postdoctoral Mentored Training Program in Clinical Investigation (MTPCI)

Institution: Washington University School of Medicine

Research Department: Obstetrics and Gynecology

Mentors: Alison Cahill, MD, MSCI; Molly Stout, MD, MSCI

A Randomized Controlled Noninferiority Trial Investigating the Utility of Maternal Oxygen Administration in Labor to Improve Fetal Acid-Base Status

Raghuraman NR, Wan L, Temming LA, Woolfolk C, Macones GA, Tuuli MG, Cahill AG

Introduction: Approximately 2/3 of laboring women receive supplemental oxygen (O₂) in an attempt to reverse perceived fetal hypoxemia and prevent acidosis. O₂ supplementation is routinely used in patients with Category II fetal heart tracings (FHT). However, this liberal use of intrapartum O₂ may not be beneficial, particularly since hyperoxygenation in neonates is harmful. We tested the hypothesis that room air (RA) for Category II FHT is not worse than O₂ in reducing umbilical artery (UA) lactate, a marker of metabolic acidosis and neonatal morbidity.

Methods: This was a randomized controlled noninferiority trial. Singleton pregnancies ≥ 37 weeks with Category II FHT necessitating intrauterine resuscitation in active labor were randomized to RA or 10L/min O₂ by face mask until delivery. The primary outcome was UA lactate measured by cord gases collected at delivery. Secondary outcomes were other UA gas components, cesarean delivery for nonreassuring fetal status (NRFS), and operative vaginal delivery. Assuming a mean UA lactate of 3.5 ± 1.6 mmol/L in patients with Category II FHT, 98 patients were needed for 90% power to detect non-inferiority with a margin of 30% and 1-sided alpha of 0.025. We increased the sample size to 114 patients to accommodate 15% loss to unattainable cord gases. Noninferiority was declared if the mean difference in lactate between RA and O₂ was <1.0 mmol/L. Analysis was by intention-to-treat.

Results: Of the 114 patients randomized, 99 with paired cord gases were included in the intention-to-treat analysis; 48 O₂ and 51 RA. There was no difference in mean UA lactate between patients randomized to O₂ and RA (mean [95%CI], 3.4 [3.0, 3.8] vs 3.5 [3.1, 4.0]), $P=0.69$). The mean difference in UA lactate was 0.1 mmol/L (95% CI -0.5, 0.7), which is within the non-inferiority margin. There was no difference in other UA gas components, operative vaginal delivery or cesarean delivery for NRFS between groups.

Conclusions: Among patients with Category II FHT in active labor, intrauterine resuscitation with RA is not inferior to O₂ in improving UA lactate. This calls for a closer look at liberal oxygen administration in labor. (ClinicalTrials.gov number NCT02741284)

No Sisk, Bryan, MD

Poster Funding Program: CRTC Postdoctoral Mentored Training Program in Clinical Investigation (MTPCI)

Institution: Washington University School of Medicine

Research Department: Pediatrics

Mentors: James DuBois, PhD, DSc; Roger Yusen, MD, MPH

Advancing Understanding and Measurement of Communication in Pediatric Oncology

Sisk BA, Mack JW, Baker JN, DuBois J

Introduction: Effective communication is critical to improving healthcare delivery and outcomes. In adult oncology, researchers have identified 6 central purposes of communication. In pediatric oncology, however, communication purposes have not been studied, nor are there robust instruments to measure these communication purposes. Given the unique emotional, social, and ethical contexts, communication in pediatric oncology likely has unique purposes not fully represented in adult oncology. In this study, we aimed (1) to identify and characterize the purposes of communication in pediatric oncology, and (2) to develop items for a survey measure that evaluates the fulfillment of these communication purposes.

Methods: Qualitative interviews: Interview up to 90 parents of children with cancer from 3 institutions at 3 time points: active treatment, survivorship, bereavement. Identify communication purposes: Analyze interview transcripts using inductive and deductive coding strategies. Communication purposes from adult oncology will serve as a priori coding framework. Focus groups: Perform 6 focus groups of healthcare providers to explore further communication purposes in pediatric oncology.

Results: To date, we have completed 46 interviews across 3 institutions. We are currently analyzing this dataset to identify communication purposes and develop a codebook. Preliminarily, we anticipate a novel communication purpose not previously identified in adult oncology: engendering solidarity and validation. After finalizing this analysis, we will perform focus groups with 3 goals: ask clinicians to 1) identify communication purposes, 2) reflect on communication purposes identified by parents, 3) identify potential facilitators and barriers to fulfilling these purposes. We will finally develop items for an instrument to measure whether these communication purposes are fulfilled in clinical encounters.

Conclusions: The results of this study will provide pediatric oncologists and communication researchers with a clear understanding of communication purposes in pediatric oncology, and will identify targets for future communication interventions.

No **Tang, Simon, PhD**

Poster Funding Program: CRTC Postdoctoral Mentored Training Program in Clinical Investigation (MTPCI)

Institution: Washington University School of Medicine

Research Department: Orthopaedic Surgery

Mentors: Linda Van Dillen, PhD

Factors Associated with Low Back Pain Symptoms in a Paradigm of Prolonged Standing

Tang SY

Introduction: Prolonged standing can provoke low back pain symptoms in back-healthy individuals. We hypothesized that spinal alignment and segmental intervertebral disc morphology in standing differs in these pain developers (PD) compared to non-pain developers (NPD). Moreover, these standing-induced adaptations may predict pain symptom development over time. The primary objectives of this study are to: 1) investigate whether regional lumbar alignment and segmental intervertebral disc (IVD) morphology differs between PDs and NPDs; 2) determine whether measurements from a positional magnetic resonance imaging (pMRI) system predicts pain symptoms in PDs.

Methods: A total of 40 participants (19 males / 21 females) were recruited for prolonged standing in a pMRI for a cross-sectional study. Self-reported pain measured by VAS and pain body diagram along with standing MRIs were acquired every 15 mins, up to 105 mins. A board-certified radiologist classified the degenerative status of the lumbar IVDs using a modified Pfirrmann scale. The lumbar Cobb angle, the anterior-to-posterior height-ratio and width of each lumbar IVD were measured for all time-points.

Results: 20 individuals (8 males / 12 females) developed pain (PDs) during prolonged standing. The IVD degenerative status were indistinguishable between PDs and NPDs at all levels ($p = 0.80$). The male and female PDs exhibit opposing segmental adaptations than their respective NPDs ($p < 0.01$). In PDs, BMI and Cobb angle are directly associated with pain symptoms ($p < 0.05$).

Conclusions: Examining the spine in a standing position showed that PDs differ in their segmental adaptations than NPDs. The regional lumbar alignment was the only anatomical variable that significantly predicts the magnitude of low back pain symptoms.

No **Todorovic, Marko, MD**

Poster Funding Program: CRTC Postdoctoral Mentored Training Program in Clinical Investigation (MTPCI)

Institution: Washington University School of Medicine

Research Department: Anesthesiology

Mentors: Simon Haroutounian, PhD, MScPharm; Michael S Avidan, MBBCh

Cognitive Flexibility and Persistent Postsurgical Pain: The FLEXCAPP Prospective Observational Study

Todorovic MS, Vila MR, Tang C, Fisher M, Steinberg A, Field B, Bottros MM, Avidan MS, Haroutounian S

Introduction: Impaired performance on tasks assessing executive function has been linked to chronic pain. We hypothesized that poor performance on tests assessing the ability to adjust thinking in response to changing environmental stimuli (cognitive flexibility) would be associated with persistent post-surgical pain.

Methods: This was a single-center, prospective, observational study in two perioperative cohorts: patients undergoing total knee arthroplasty or non-cardiac surgical procedures on the chest. The co-primary outcome measures compared preoperative performance on the Trails Making Test and the Color Word Matching Stroop Test between patients who developed persistent post-surgical pain, and those who did not. Secondary outcome measures included the associations between these test scores and pain severity at six months.

Results: Three hundred patients were enrolled. There were no significant differences in preoperative Trails Making Test B minus A times (33 vs 34 seconds, $P = 0.59$) or Stroop Interference T-Scores (47th vs 48th percentile, $P = 0.50$) between patients with and without persistent post-surgical pain (primary outcome). Of those who reported persistent post-surgical pain, poorer baseline performance on the Color Word Matching Stroop Test was associated with higher pain scores at six months in both knee arthroplasty ($R^2 = 0.10$, $P = 0.04$) and chest ($R^2 = 0.19$, $P = 0.02$) surgeries (secondary outcome).

Conclusions: Preoperative cognitive flexibility test performance was not predictive of overall persistent post-surgical pain incidence six months after surgery; however, poor performance on the Color Word Matching Stroop Test was independently associated with more severe persistent post-surgical pain in both cohorts.

124 Young, Erica, MD

Funding Program: CRTC Postdoctoral Mentored Training Program in Clinical Investigation (MTPCI)

Institution: Washington University School of Medicine

Research Department: Medicine

Mentors: Nathan Stitzel, MD, PhD

Identifying Genetic Risk Factors for Coronary Artery Disease in Multi-Ethnic Populations

Young EP, Stitzel NO

Introduction: Coronary Artery Disease (CAD) is the leading cause of death worldwide, and numerous studies have identified genetic variants that are associated with disease risk. However, the majority of studies have focused on individuals of European ancestry, and the genetic basis for CAD in non-Europeans is not well-understood.

Methods: We performed whole genome sequencing of 9,000 cases of CAD and 13,000 controls from multiple ancestry groups, and will test variants for association with CAD.

Results: We anticipate that this analysis will identify variants that are associated with CAD risk and highlight new mechanisms of disease pathogenesis.

Conclusions: The multi-ethnic design of this study will allow us to identify population-specific alleles that were not present in prior association studies of CAD in Europeans. This research will increase our knowledge of the biologic pathways that lead to CAD and improve our ability to predict disease risk in diverse populations.

CRTC TL1 Predoctoral Interdisciplinary Clinical Research Training Program

1 Alhallak, Kinan

Funding Program: CRTC TL1 Predoctoral Interdisciplinary Clinical Research Training Program

Doctoral Program of Study: Biomedical Engineering

Institution: Washington University School of Medicine

Research Department: Radiology

Mentors: Samuel Achilefu, PhD; Abdel Kareem Azab, PhD

Nanoparticle Multi-Specific T cell Engagers for the Treatment of Multiple Myeloma

Alhallak K, O'Neal J, Sun J, Muz B, King J, Kohnen D, Achilefu S, Vij R, DiPersio JF, Azab AK

Introduction: Despite the compelling clinical success of chimeric antigen receptor (CAR)-T cells and bispecific T cell engagers (BiTEs) for the treatment of multiple myeloma (MM), many patients relapse due to tumor escape. To circumvent these issues, we have developed a nanoparticle in which two antibodies are conjugated to the surface of a liposome; one to recognize an epitope on MM and the other to engage T cells, which we defined as the nanoparticle bispecific T cell engager (nanoBiTE). Moreover, we have made a nanoBiTE with more than three total targeting moieties; one to engage the T cells and the other two or more to target various epitopes on MM, defined as the nanoparticle multi-specific T cell engager (nanoMuTE).

Methods: Liposomes were prepared using the thin-film hydration method followed by extrusion. nanoBiTEs and nanoMuTEs were developed by conjugating monoclonal antibodies against BCMA, CS1, and/or CD38; together with anti-CD3 onto the liposomes.

Results: The nanoBiTEs and nanoMuTEs were able to activate T cells only in the presence of the target cell in vitro. The nanoMuTEs induced greater activation of T cells and T cell-redirectioned MM cell lysis compared to each individual nanoBiTE in the 3DTEBM. In vivo, the nanoBiTEs and nanoMuTEs were able to redirect T cells to the tumor site and reduce tumor burden in the MM-bearing mice compared to the T cell-inoculated group.

Conclusions: Further developments in this technology may pave paths for the investigational use of nanoMuTEs supplemented, for instance, with co-stimulatory molecules, T cell stimulants, and even cancer-specific signaling pathway inhibitors.

8 Bazai, Henna

Funding Program: CRTC TL1 Predoctoral Interdisciplinary Clinical Research Training Program

Doctoral Program of Study: Medicine

Institution: Saint Louis University

Research Department: Neurology

Mentors: Catherine Roe, PhD; Ganesh Babulal, PhD; Ganesh Rajasekar, MPH

Relationship Between Mind Wandering, Alzheimer's Biomarkers and Driving Among Older Adults

Bazai HY, Babulal GM, Roe CM

Introduction: Mind Wandering (MW) is increased in older adults with Alzheimer's (AD) and has a negative impact on driving. This impact has not been studied among cognitively older adults with elevated preclinical AD biomarkers. Understanding how AD biomarker levels affect decline in complex activities requiring cognitive and motor processes has not been widely studied. Using confidence intervals and correlation values, we examined relationships between MW and driving performance in older adults as well as the relationship between preclinical AD biomarkers and mind wandering.

Methods: Participants were cognitively normal and participating in longitudinal studies at the Knight Alzheimer's Disease Research Center. Mind wandering was assessed by the self-reported mind wandering Questionnaire (MWQ) and the mindfulness attention awareness scale (MAAS). Other assessments include driving ability with the driving habits questionnaire (DHQ) and Amyloid and Tau levels with CSF and imaging.

Results: There was a significant increase in MW ($p=.03$) as reported on the MWQ by participants with lower AD biomarker levels. Linear regression models, adjusted for age, gender, and education will be used in future analyses and confidence intervals will be calculated to aid the p values already obtained. Also noted, was a statistically significant correlation ($r=.27, p<.05$) between increased self-reported MW and decreased self-reported driving difficulty. We plan to further investigate the relationship of MW and driving by separating participants into a preclinical AD positive and negative group. There was significant correlation between increased distances driven from home and MW as well ($r=.18, p<.05$).

Conclusions: The lack of high MW reported in preclinical AD participants and the increased self-reported MW seen with a decreased self-reported driving can be explained by previous literature. Due to these seemingly counterintuitive results, more research is needed to explore the direct impact MW may have on driving in participants with preclinical AD in order to better assess risk reduction methods.

Oral Bedrick, Bronwyn

Talk Funding Program: CRTC TL1 Predoctoral Interdisciplinary Clinical Research Training Program

Doctoral Program of Study: Medicine

Institution: Washington University School of Medicine

Research Department: Obstetrics and Gynecology

Mentors: Emily S. Jungheim, MD, MSCI; Molly J. Stout, MD, MSCI

Access to Buprenorphine Care in Pregnancy: Minimizing Barriers for Patients

Bedrick BS, O'Donnell C, Hernandez J, Carter E, Kelly J, Stout MJ

Introduction: Opiate Use Disorder (OUD) in the United States has reached epidemic incidence with disproportionate rates of mortality in pregnant women. Although treatment for OUD is available and demonstrated as safe and effective for decreasing maternal and obstetric morbidity, there are many barriers to accessing these services. We aimed to contact all of the buprenorphine and methadone providers listed on the Substance Abuse and Mental Health Administration (SAMHSA) website to map and describe the treatment availability for pregnant patients in Missouri (MO) and Illinois (IL).

Methods: This is a cross-sectional phone survey study of all providers listed on the SAMHSA website for MO and IL. Individual providers listed on the website were contacted at the phone number listed on the SAMHSA website and a standardized series of questions regarding availability of new patient appointments, treatment for pregnant women, and availability of methadone or buprenorphine were asked. We used descriptive statistics to describe availability of treatment in our region and geocoding to map the locations of providers available to pregnant women.

Results: A total of 1366 buprenorphine providers were listed on the SAMHSA website, 457 (33.5%) in MO and 909 (66.5%) in IL. 59% of listed numbers were unable to be reached either due to wrong number, not in service, or three attempts made without success. After removing duplicate numbers and multiple providers within the same practice there were a total of 562 unique practices. 54.8% were accepting new patients and 39.7% accept pregnant patients. An appointment was available within 1 week 60% of the time. There were 98 methadone outpatient treatment programs (MOTP) listed in MO (n=16) and IL (n=82). The majority of MOTP were able to be reached (85.7%) and the majority of those were accepting new patients (92.9%) and pregnant patients (79.8%). When examining the geographic locations of both buprenorphine and MOTP providers, there are clusters near cities, sporadic availability in rural areas, and large rural areas with no access to treatment.

Conclusions: Barriers to receiving opiate use disorder treatment in pregnancy may include difficulty contacting and locating providers who treat OUD. Addressing administrative barriers to care including clearer and more direct lists and contacts for active providers and clinics may facilitate treatment for patients with opiate use disorder. Additionally, "care deserts" occur predominantly in rural areas and may be barriers for patients in these regions.

18 Cope, Skyler

Funding Program: CRTC TL1 Predoctoral Interdisciplinary Clinical Research Training Program

Doctoral Program of Study: Medicine

Institution: University of Missouri-Kansas City

Research Department: Surgery

Mentors: Robert S Figenshau, MD

Off-Clamp Robotic-Assisted Partial Nephrectomy in Patients With Pre-Existing Renal Insufficiency or Solitary Kidneys

Cope SJ, Bhatt R, Du K, Vetter JM, Kim E, Venkatesh R, Bhayani SB, Figenshau RS

Introduction: Performing robotic-assisted partial nephrectomy (RAPN) "off-clamp" may avert renal functional loss associated with warm ischemia. In a previous randomized trial, we did not observe any difference in change in renal function in the general population. We retrospectively compared perioperative and renal functional outcomes in patients with baseline renal insufficiency and/or solitary kidneys who underwent RAPN either off-clamp or on-clamp.

Methods: We retrospectively reviewed a prospectively maintained database of patients who underwent RAPN at our institution from 2007 to 2019 with available renal function measurements at least 3 months postoperatively. In patients who had chronic renal insufficiency (CRI) with preoperative estimated glomerular filtration rate (eGFR) <60 mL/min/1.73 m² or solitary kidney, those who underwent off-clamp RAPN were compared to on-clamp RAPN across patient characteristics, operative data, and renal functional outcomes. Renal function measurements closest to one year after surgery were used to minimize variability.

Results: In the 108 patients with CRI, there was a longer mean operative time for the off-clamp group compared to on-clamp (199.8 vs 174.5 minutes, p = 0.038). Multivariable analysis showed no significant difference in eGFR loss for the on-clamp vs. off-clamp group having 8% difference (95% CI -0.8% to -16.8%, p = 0.075). Of the 18 patients with solitary kidneys, off-clamp procedures resulted in less estimated blood loss (132.7 mL vs 928.6 mL, p = 0.013). Univariate analysis showed reduced postoperative renal function loss for off-clamp RAPNs in this small cohort (-28.7% vs -9.6%, p = 0.035).

Conclusions: Off-clamp RAPN achieves similar perioperative outcomes when compared with the on-clamp approach. Off-clamp RAPN appears to ameliorate renal function loss compared to on-clamp RAPN in patients with pre-existing solitary kidneys, but not in patients with pre-existing CRI.

30 Garrad, Evan

Funding Program: CRTCL1 Predoctoral Interdisciplinary Clinical Research Training Program

Doctoral Program of Study: Medicine

Institution: University of Missouri-Columbia

Research Department: Neurology

Mentors: Timothy Miller, MD, PhD

Feasibility and Sensitivity of a Symptom Monitoring Application in Real Time (SMART) in Symptomatic ALS Patients and Healthy Spousal/Partner Controls

Garrad EC, Clapp M, Jockel-Balsarotti J, Miller TM

Introduction: Disease progression in patients with Amyotrophic Lateral Sclerosis (ALS) has been ill-defined and highly variable since it was first recognized in the mid 1800's. Since this initial identification, reports have also shown ALS to be associated with both histopathological and clinical signs of frontotemporal dementia (FTD). Thus, the goal of this pilot, observational study was to utilize two applications, one smartphone and one tablet-based, to track symptom progression and detect cognitive dysfunction in ALS patients.

Methods: A prospective cohort study began by measuring executive cognitive function scores of male and female patients, between the ages of 51-72 (n=10), with a clinical diagnosis of ALS from the Washington University Neuromuscular Clinic. These scores were compared to overall ALS severity and normative executive function scores taken from the NIH-EXAMINER.

Results: Preliminary results showed age and education had minimal effect across the executive function tasks ($R^2 < 0.17$) and ($R^2 < 0.13$), respectively. Additionally, the scores for the Animal Fluency task (n=10, $R^2 = 0.29$) and Revised Self-Monitoring Scale (RSMS) (n=7, $R^2 = 0.39$), both showed a direct correlation to worsening ALS severity. On the Flanker and Set-shift tasks, 80% of patients were below the normative means, while 44% of patients fell below the mean on the Animal Fluency and Dot Counting tasks.

Conclusions: Our study found ALS severity to be correlated with decreased performance on 2 of the 5 tasks associated with executive function. Furthermore, a large portion of our cohort also scored below normal across several executive function tasks, which supports the association of cognitive decline observed in some ALS patients. There are inherent limitations at this stage due to a small sample size and potential confounding effects of motor function on task performance. Future studies will seek to validate effectiveness of TabCAT at detecting changes in executive function in patients diagnosed with FTD. Overall, these findings, combined with efficient screening methods, provides strong support for the feasibility of these applications as diagnostic tools for ALS-FTD patients.

No Heary, Kartemus

Poster Funding Program: CRTCL1 Predoctoral Interdisciplinary Clinical Research Training Program

Doctoral Program of Study: Medicine

Institution: Meharry Medical College

Research Department: Surgery; Washington University School of Medicine

Mentors: Susan Mackinnon, MD; Alex Wong, PhD

Quality of Life and Psychosocial Factors Predict Post-Operative Pain Relief

Heary KO, Wong AW, Lau SC, Dengler J, Thompson MR, Crock LW, Novak CB, Philip B, Mackinnon SE

Introduction: Injuries of peripheral nerves are crippling disorders that affect sensory, motor, and emotional function for the length of the injury. Commonly these injuries are accompanied by neuropathic pain and adversely affected psychosocial variables including Quality of Life. We have explored the relationship between pain and psychosocial variables (QoL, sadness, depression, anger, and hopefulness). We explored the predictive relationship of pain and our psychosocial variables, uncovering several unidirectional and bidirectional relationships. We hypothesize that psychosocial factors can be an alternative measure to pain for clinically monitoring the status of peripheral nerve injury patients having surgery for pain relief.

Methods: A retrospective review of prospectively collected data was used to identify 331 patients for the study. Self-reported values of pain, QoL, sadness, depression, anger, and hopefulness were collected from questionnaires containing visual analog scales (VAS). These variables were collected at each visit; participants required at least one follow up visit to be eligible for the study. Multilevel modeling was used to analyze concurrent and lagged relationships between psychosocial factors.

Results: Analysis revealed increased pain was associated with an increased impact of quality of life sadness, depression, and anger (B=0.484, SE=0.027, $p < 0.001$; B=0.255, SE=0.035, $p < 0.001$; B=0.310, SE=0.037, $p < 0.001$; and B=0.185, SE=0.027, $p < 0.001$ respectively). Decreased hopefulness ($p = 0.001$) is also concurrently associated with increased pain. Lagged pain scores were predictive of subsequent scores for quality of life, sadness, depression, anger, and hopefulness (B=0.331, SE=0.041, $p < 0.001$; B=0.077, SE=0.034, $p = 0.026$; B=0.535, SE=0.300, $p = 0.008$; B=0.086, SE=0.035, $p = 0.014$; and B=-0.100, SE=-2.130, $p = 0.034$, respectively). Participants reporting "no comment" when queried about childhood trauma were more likely to have increased pain at the same visit and subsequent visits than individuals who responded with "yes" or "no."

Conclusions: In conclusion, our study uncovered the predictive relationship where psychosocial factors could be used to foretell pain levels at subsequent visits. The findings of this study shed light on the importance of capturing alternative measures such as psychosocial factors when treating patients with peripheral nerve disorders. Therefore nerve surgeons should utilize psychosocial factors to evaluate outcomes following nerve surgery.

36 Hickman, Leonard

Funding Program: CRTC TL1 Predoctoral Interdisciplinary Clinical Research Training Program

Doctoral Program of Study: Medicine

Institution: Washington University School of Medicine

Research Department: Anesthesiology

Mentors: Ben Palanca, MD, PhD, MSc; Michael Avidan, MBBCh; R Edward Hogan, MD

Anesthetic Regimen Impacts Duration of Post-Ictal Generalized Electroencephalographic Suppression Following Electroconvulsive Therapy-Induced Seizures

Hickman LB, Hogan RE, Chan C, Huels ER, Ching S, Farber NB, Avidan MS, Palanca BJA

Introduction: Postictal Generalized Electroencephalographic Suppression (PGES) is defined as the initial occurrence of low amplitude EEG activity less than 10 microvolts following termination of a generalized seizure. PGES duration has been implicated as a marker for increased risk of sudden unexplained death in epilepsy. Suppression is also observed following generalized seizures induced during electroconvulsive therapy (ECT), where qualitative ratings of PGES are correlated with treatment efficacy. Using a novel, automated algorithm for PGES detection, we quantified the duration of suppressed EEG following ECT-induced seizures and investigated the impact of anesthetic regimen on detected suppression.

Methods: Fifteen patients with major depressive or bipolar affective disorder underwent right unilateral ECT with either high-dose ketamine (2-2.5 mg/kg) or low-dose etomidate (0.2 mg/kg) anesthesia in a randomized cross-over trial. Recordings were obtained using modified 65-sensor EEG caps. The 5-minute period following seizure termination was assessed for PGES by an expert epileptologist and a novel voltage threshold-based classification algorithm. PGES was defined as EEG amplitude less than 10 microvolts in the majority of channels.

Results: Across 50 post-ictal recordings, 35 contained PGES as detected by the automated classification algorithm. PGES most commonly began in the first 10 seconds following seizure termination with intermittent epochs detected up to 5 minutes after seizure termination. The median total duration of PGES was 5.5 seconds (IQR: 0 to 27). The total duration of PGES was greater following high-dose ketamine (median: 21.5 seconds, IQR: 6.5 to 64) than low-dose etomidate (median: 1.5 seconds, IQR: 0 to 9) general anesthesia. Pairwise comparison demonstrated significant difference between anesthetic regimens.

Conclusions: PGES following ECT-induced seizures can be detected using a simple voltage-based algorithm. It can occur intermittently for minutes following seizure termination, particularly during recovery from ketamine anesthesia. The impact of anesthetic type and dose should be considered when interpreting PGES duration after ECT-induced seizures.

37 Hoang, Sandy

Funding Program: CRTC TL1 Predoctoral Interdisciplinary Clinical Research Training Program; WUSM Dean's Fellowship

Research Program: Summer Research Program

Doctoral Program of Study: Medicine

Institution: Washington University School of Medicine

Research Department: Medicine

Mentors: M Laurin Council, MD; Esther Chung, MD

Incidence of Tumor Upstaging at the Time of Mohs Micrographic Surgery for Cutaneous Squamous Cell Carcinoma

Hoang S, Chung E, Rosman I, Hurst E, Council L

Introduction: Cutaneous Squamous Cell Carcinoma (cSCC) is the second-most common cutaneous malignancy. Although the majority of patients are cured with surgery alone, a proportion of patients will go on to recurrent and/or metastatic disease. Treatment protocols for cSCC are initially based on the original biopsy of the tumor. However, this initial biopsy may under-stage tumors due to sampling error, which may impact patient counseling, optimal treatment modalities, and ultimately, outcomes. By excising the entire tumor and examining the complete deep and peripheral margin, Mohs Micrographic Surgery (MMS) can offer visualization of a greater portion of the tumor and occasionally, a method for more precise cSCC staging. Objective: We seek to determine the incidence and risk factors of histopathologic upgrading of invasive cSCC during MMS.

Methods: Patient and tumor characteristics, as well as surgical data from 765 cSCC MMS cases over 1 year at a single academic surgical center, were retrospectively reviewed.

Results: Preliminary: 24 out of 465 (5.2%) cSCCs were upgraded to a higher stage on frozen section analysis during MMS compared to the initial biopsy, and aggressive features were identified in 7 (1.5%) tumors. Immunosuppression ($p=0.008$) and symptoms of pain ($p=0.018$) were associated with upgrading, while asymptomatic tumors ($p=0.014$) were associated with no upstaging. Tumors that were upgraded were associated with higher change in postoperative area (mean difference = 2.75 ± 0.62 cm², $p<0.001$) and subclinical spread, defined as >2 MMS stages ($p=0.046$).

Conclusions: A clinically significant proportion of cSCCs are histopathologically upgraded to more aggressive types during MMS. Painful cSCCs and cSCCs on immunosuppressed patients are more likely to be upgraded. Upgraded cSCCs may increase surgical complexity, as they exhibit subclinical spread and require larger surgical margins.

Oral Hooker, Quenten, MS

Talk Funding Program: CRTC TL1 Predoctoral Interdisciplinary Clinical Research Training Program

Doctoral Program of Study: Physical Therapy

Institution: Washington University School of Medicine

Research Department: Physical Therapy

Mentors: Linda Van Dillen, PhD; Susan Stark, PhD; Michael Harris, PhD

Consistent Differences in Lumbar Spine Alignment Between Chronic Low Back Pain Subgroups During Functional and Clinical Sitting Tests

Hooker QL, Roles K, Lanier VM, Van Dillen LR

Introduction: Altered lumbar spine alignment may contribute to the persistence of chronic low back pain (CLBP). Prior data support classifying individuals with CLBP based on subgroup-specific differences in lumbar alignment, as outcomes are further improved using classification-based treatment. To date, these subgroup differences in lumbar alignment have only been reported on during select clinical tests. Therefore, additional work examining the consistency of these findings across multiple functional and clinical tests is warranted. The purpose of this study was to examine lumbar alignment for a functional test of preferred sitting and clinical tests of flexed and extended sitting in 2 CLBP subgroups.

Methods: 154 participants with CLBP were examined by a physical therapist, who used a standardized exam to classify the individuals into rotation (Rot) and rotation with extension (RotExt) subgroups based on the Movement Systems Impairments (MSI) Classification System. Participants performed a functional test of preferred sitting followed by clinical tests of maximum flexed and extended sitting performed in random order. For all 3 conditions, the participant was seated on a stool with no armrests or backrest. 3D marker co-ordinate data were collected using a motion capture system. Sagittal plane lumbar curvature angle (LCA), defined as the angular distance between T12, L3, and S1 markers was calculated. Effect sizes (e.g. Cohen's d) and independent samples t-tests were calculated for LCAs between MSI classifications for each test.

Results: There was a small effect between CLBP classifications for preferred [Rot = -3.3 deg (-5.2 – -1.4); RotExt = -6.1 deg (-8.3 – -4.0), $d = 0.30$, $p = 0.05$], flexed [Rot = 8.1 deg (6.5 – 9.7); RotExt = 4.5 deg (2.6 – 6.4), $d = 0.48$, $p < 0.01$] and extended [Rot = -22.3 deg (-24.5 – -20.0); RotExt = -24.9 deg (-27.5 – -22.3), $d = 0.25$, $p = 0.11$] sitting.

Conclusions: There was a consistent trend for the Rot subgroup to demonstrate more lumbar flexion than ExtRot across preferred, flexed, and extended sitting. Results highlight the need to use subgroup-specific alterations in alignment patterns to guide the treatment of functional tasks limited to the CLBP condition.

42 Jakhar, Ishaan

Funding Program: CRTC TL1 Predoctoral Interdisciplinary Clinical Research Training Program

Doctoral Program of Study: Medicine

Institution: University of Missouri-Kansas City

Research Department: Pathology and Immunology

Mentors: Sonika Dahiya, MD

To Investigate the Role of Sexual Dimorphism in Melanoma Patients with Brain Metastasis

Jakhar I, Dahiya S

Introduction: Brain metastases are the most common intracranial neoplasms in adults, largely due to extended duration of cancer survival and presence of blood brain barrier that makes the brain a safe haven for metastatic disease. Therefore, in the context of more frequently stable and controlled systemic disease, brain metastasis remains an area of active interest in the field of organ-specific metastasis research. Furthermore, genomics is cardinal to precision medicine with availability of targeted drugs and advances in laboratory science. This is particularly true in melanoma with an evolving role of BRAF-targeted agents and immunotherapy. More recently, the focus has also grown to better understand sex-differences in cancer and how these impact survival and response to therapy. Notably, BRAF mutations are seen in ~50-60% of melanoma, a finding which is being actively leveraged for further management in unresectable or relapsed disease due to availability of BRAF-targeted therapy. Nonetheless, there is paucity of literature as to how this specific molecular alteration influences the incidence of metastasis and/or prognosis and more specifically, if it has any association with patient's gender. We precisely aimed to pursue these particular aspects.

Methods: Retrospective study of patients corresponding to either gender with ≥ 18 years of age.

Results: We identified 140 patients with metastatic melanoma to the brain, with 53.1% (26) being BRAF mutant (average age - 58.9 years); of these, 30.6% (15) were males with an average age of 61.4 years, and 22.5% (11) were females with an average age of 50.9 years. 46.9% (23) patients had wild type melanoma with an average age of 65 years; 32.7% (16) of these were males with an average age of 69.5 years, and 14.3% (7) were females with an average age of 54 years. Although the proportion of females was slightly higher in the BRAF mutant group than males (61.11% vs 48.39%), this finding was not statistically significant ($p=0.39$). Further survival data analysis is ongoing.

Conclusions: Pending additional statistical analysis. If successful, this work may potentially help yield possible prognosticators and/or additional research avenues.

43 Jin, Abbey

Funding Program: CRTC TL1 Predoctoral Interdisciplinary Clinical Research Training Program

Doctoral Program of Study: Pharmacy

Institution: St. Louis College of Pharmacy

Research Department: Center for Health Outcomes Research and Education

Mentors: Scott Micek, PharmD

Antibiotic De-Escalation Prevents Subsequent Development of Antibiotic Resistance in Sepsis and Septic Shock Patients

Jin A, Jose A, Cherian S, Micek S

Introduction: Antibiotic De-Escalation (DE) is a cornerstone of antimicrobial stewardship treatment strategies. Per 2018 Surviving Sepsis Campaign Bundle, sepsis or septic shock patients should be initiated on empiric broad-spectrum therapy with one or more intravenous antimicrobials for coverage from all possible organisms. However, patients on long term administration of broad spectrum therapy may develop antibiotic resistance, so switching to narrower spectrum antibiotic therapy is recommended. The goal of this study was to evaluate the effects of DE on resistance in patients with sepsis and septic shock.

Methods: A fixed sample size of n=7711 patients from 2010-2015, using patient data from Barnes Jewish Hospital in St. Louis, MO, were included in our population. Chi-squared analysis was performed to determine statistical significance. Statpages.info was the web-based software used to perform all statistical analyses. The alpha level was set at 0.05.

Results: The DE group had significantly reduced development of antibiotic resistance compared with all other groups. When the DE group was compared with the E group, the subsequent rates of resistance were: 3.74% vs. 6.67%, cefepime; 11.4% vs. 15.7%, ceftriaxone; 4.26% vs. 5.96%, meropenem; 6.55% vs. 11.72%, P/T. DE group compared with the mixed groups also showed similar findings: 3.74% vs. 9.27%, cefepime; 11.4% vs. 21.1%, ceftriaxone; 4.26% vs. 6.72%, meropenem; 6.55% vs. 10.3%, P/T. Furthermore, patients treated with the following antibiotics that experienced NC in therapy showed the lowest percent of subsequent development of resistance to antibiotics versus the de-escalated group (3.21% vs. 3.74%, cefepime; 9.42% vs. 11.4%, ceftriaxone; 2.94% vs. 4.26%, meropenem; 5.80% vs. 6.55%, P/T).

Conclusions: Patients de-escalated on antibiotics had reduced development of antibiotic resistance compared to escalated or mixed treatments. Further studies on whether the trends shown in this study are in accordance with not only other “backbone” antibiotics, but all other antibiotics administered to sepsis patients at Barnes-Jewish Hospital and other years of administration.

44 Jin, Julie

Funding Program: CRTC TL1 Predoctoral Interdisciplinary Clinical Research Training Program

Doctoral Program of Study: Medicine

Institution: Saint Louis University

Research Department: Orthopaedic Surgery

Mentors: Cara A Cipriano, MD, MSc

Toronto Extremity Salvage Score Versus Patient-Reported Outcomes Measure Information System in Adults with Lower Extremity Musculoskeletal Tumors

Jin J, Lee R, Cipriano CA

Introduction: The Toronto Extremity Salvage Score (TESS) is a patient questionnaire designed and validated to measure physical disability in patients undergoing surgery for extremity tumors. The NIH’s Patient-Reported Outcomes Measure Information System (PROMIS) offers universal measures of various patient-reported outcomes, but has not been validated in adult musculoskeletal oncology patients. The purpose of this study is to compare the PROMIS Physical Function and PROMIS Pain Interference measures to TESS in adult patients with lower extremity tumors.

Methods: 130 adult patients who underwent surgical treatment for a lower extremity musculoskeletal tumor between December 2015 and October 2018 were pre-operatively administered the Lower Extremity TESS questionnaire via paper and the PROMIS Physical Function Computer Adaptive Test (CAT) and PROMIS Pain Interference CAT via iPad. Data from the different surveys were fitted to multiple regression models.

Results: Data analysis is currently in progress. The data will probably show a strong correlation between Lower Extremity TESS and PROMIS Physical Function ($r > 0.80$) and a strong correlation between Lower Extremity TESS and PROMIS Pain Interference ($r > 0.80$).

Conclusions: The PROMIS Physical Function CAT and Lower Extremity TESS measure similar information in this patient population. The relationship between the PROMIS Pain Interference CAT and Lower Extremity TESS suggests that pain interference correlates strongly with functional disability. Ultimately the study will have regression equations allowing for conversion between the PROMIS measures and Lower Extremity LESS so that clinicians and researchers may compare data from the different surveys.

No Kereri, Leah

Poster Research Program: CRTC TL1 Predoctoral Interdisciplinary Clinical Research Training Program

Doctoral Program of Study: Pharmacy

Institution: St. Louis College of Pharmacy

Research Department: Pulmonary and Critical Care Medicine

Mentors: Mario Castro, MD MPH

Proliferation and Airway Remodeling in Severe Asthma

Kereri LS, Castro M; Boomer J; Goss C; Lieu J

Introduction: Airway remodeling in patients with severe asthma leads to decreased lung function. Therefore, we hypothesized that increased Ki67 expression, a marker for cellular proliferation, in the respiratory epithelium correlates to asthma severity compared to healthy subjects.

Methods: 35 well characterized subjects (12 severe asthma, 10 mild-moderate asthma, and 13 normal controls) underwent endobronchial biopsies. Biopsies were labeled with anti-Ki-67 protein followed by analysis of Ki-67 and epithelial area using ImagePro 3D software.

Results: The cohort of subjects were predominantly women (63%). Patients with severe asthma had significantly reduced lung function ($p < 0.001$ ANOVA). The number of Ki-67 positive cells was significantly reduced in healthy subjects ($p = 0.003$ T-test).

Conclusions: Increased Ki-67 expression is associated with increased airway remodeling and asthma severity as measured by FEV1 and ACT score.

54 Khalifeh, Jawad

Funding Program: CRTC TL1 Predoctoral Interdisciplinary Clinical Research Training Program

Doctoral Program of Study: Medicine

Institution: Washington University School of Medicine

Research Department: Neurosurgery

Mentors: Wilson Z Ray, MD; Jay F Piccirillo, MD

Patient-Reported Outcomes Measurement Information System Physical Function and Pain Interference in Spine Surgery

Khalifeh JM, Dibble CF, Hawasli AH, Ray WZ

Introduction: The Patient-Reported Outcomes Measurement Information System (PROMIS) is an adaptive, self-reported outcomes assessment tool that utilizes item response theory and computer adaptive testing to efficiently and precisely evaluate symptoms and perceived health status. Efforts to implement and report PROMIS outcomes in spine clinical practice remain limited. The objective of this retrospective cohort study is to evaluate the performance and psychometric properties of PROMIS physical function (PF) and pain interference (PI) among patients undergoing spine surgery.

Methods: The authors identified all patients who underwent spine surgery at their institution between 2016 and 2018, and for whom there was retrievable PROMIS data. Descriptive statistics were calculated to summarize demographics, operative characteristics, and patient reported outcomes. Assessments were evaluated preoperatively, and postoperatively within 2 months (early), 6 months (intermediate), and up to 2 years (late). Pairwise change scores were calculated to evaluate within-subjects differences and construct responsiveness over time. Pearson's correlation coefficients were used to evaluate the association between PROMIS PF and PI domains. Subgroup analysis was performed based on the primary diagnoses of cervical radiculopathy, cervical myelopathy, or lumbar degenerative disease.

Results: A total of 2,770 patients (1,395 males, 50.4%) were included in the analysis. The mean age at the time of surgery was 57.3 ± 14.4 years. Mean postoperative follow-up duration was 7.6 ± 6.2 months. Preoperatively, patients scored an average 15.1 ± 7.4 points below the normative population (mean 50 ± 10 points) in PF, and 15.8 ± 6.8 points above the mean in PI. PROMIS PF required a mean of 4.1 ± 0.6 questions and median 40 seconds (interquartile range [IQR] 29–58 seconds) to be completed, which was similar to PI (median 4.3 ± 1.1 questions and 38 seconds [IQR 27–59 seconds]). Patients experienced clinically meaningful improvements in PF and PI, which were sustained throughout the postoperative course. PROMIS instruments were able to capture anticipated changes in PF and PI, although to a lesser degree in PF early postoperatively. There was a strong negative correlation between PROMIS PF and PI scores at baseline (Pearson's $r = -0.72$) and during follow-up appointments (early, intermediate, and late $|r| > 0.6$, each). Subgroup analysis demonstrated similar results within diagnostic groups compared to the overall cohort. However, the burden of PF limitations and PI was greater within the lumbar spine disease subgroup, compared to patients with cervical radiculopathy and myelopathy.

Conclusions: Patients receiving care at a tertiary spine surgery outpatient clinic experience significant overall disability and PI, as measured by PROMIS PF and PI computer adaptive tests. PROMIS PF and PI health domains are strongly correlated, responsive to changes over time, and facilitate time-efficient evaluations of perceived health status outcomes in patients undergoing spine surgery.

63 Liebendorfer, Adam, MA

Funding Program: CRTC TL1 Predoctoral Interdisciplinary Clinical Research Training Program; WUSM Dean's Fellowship

Research Program: Summer Research Program

Doctoral Program of Study: Medicine

Institution: Washington University School of Medicine

Research Department: Otolaryngology

Mentors: Pawina Jiramongkolchai, MD, MSCI; Jay F Piccirillo, MD, FACS; Dorina Kallogjeri, MD, MPH

Effectiveness of Mometasone Nasal Irrigation for Chronic Rhinosinusitis

Liebendorfer A, Peterson A, Lander D, Kukuljan S, Kallogjeri D, Jiramongkolchai P

Introduction: While the efficacy and safety of intranasal corticosteroids (INCS) are well-established for the long-term management of chronic rhinosinusitis, penetration of INCS into the paranasal sinuses is limited. The specific aim of this study is to compare the effectiveness of mometasone furoate (MF) nasal irrigation to that of MF nasal spray in the management of CRS symptoms in surgery-naïve patients.

Methods: This is a double-blinded randomized clinical trial currently recruiting up to 50 adult patients with complaints of purulent nasal drainage accompanied by nasal obstruction, facial pain-pressure-fullness, or both, and reduction or loss of smell for 12 weeks or greater. One arm of participants receives an 8-ounce sinus rinse bottle and a two-month supply of packets of a dissolvable saline mixture in addition to mometasone nasal spray. The other arm receives the rinse bottle with packets of dissolvable mometasone and saline nasal spray.

Results: This research project is ongoing. We hope to have recruited enough participants to finish the study by the end of 2019.

Conclusions: As it is a double-blinded study, we currently do not have any conclusions to report yet.

72 McEvoy, Aubriana

Funding Program: CRTC TL1 Predoctoral Interdisciplinary Clinical Research Training Program

Doctoral Program of Study: Medicine

Institution: University of Washington

Research Department: Surgery

Mentors: Steven Poplack, MD; William Gillanders, MD

A Systematic Review of Axillary Ultrasound for Regional Staging of Invasive Breast Cancer: Assessing Exam Performance by Nodal Burden, Imaging Criteria, and Tumor Characteristics

McEvoy AM, Chang SH, Simon LE, Gillanders W, Poplack S

Introduction: The role of Axillary Ultrasound (AUS) in guiding surgical management of patients with invasive breast cancer is unclear partly because its accuracy has not been established. Via systematic review, we estimated the accuracy of AUS and identified factors that influence imaging performance.

Methods: A systematic search was performed in MEDLINE, EMBASE, and Cochrane Library databases from 2007 through 2018 to identify studies of AUS. Inclusion criteria were: invasive breast cancer, explicit imaging criteria for a positive test result, surgical pathology reference standard and sufficient data to construct a 2 × 2 table. Bivariate random-effects modeling was used to estimate sensitivity and specificity, and stratified analyses were conducted by pathologically-confirmed nodal burden. Linear regression assessed the impact of imaging criteria on performance.

Results: 14 studies with 14,383 patients were analyzed. Sensitivity and specificity of AUS alone for any lymph node metastasis were 55% (95% CI [46, 64]) and 87% [82, 90]. Sensitivity in patients with ≤ 2 nodes (N1) vs. ≥ 3 nodes (N2+) was 41% [32, 51] vs. 75% [65, 83]. The pooled negative predictive value of AUS for detecting ≥ 3 nodes (N2+) was 94%. Imaging criteria which included explicit evaluation of focal cortical thickening for a positive result was associated with higher AUS sensitivity (adjusted R-squared 0.3028). Clinico-pathologic factors associated with false negative AUS included tumor size >2cm and invasive lobular carcinoma histology.

Conclusions: Axillary ultrasound has high sensitivity for the detection of high nodal burden (≥ 3 nodes) but is relatively insensitive for the detection of low nodal burden (≤ 2 nodes). Given that axillary node dissection is only recommended in patients with ≥ 3 nodes, a negative exam may provide rationale for axillary observation in cT1N0 patients. This management strategy is currently being evaluated in randomized controlled trials. Standardized imaging criteria and recognition of false negative risk factors may improve the clinical utility of AUS in regional breast cancer staging.

76 Monterubio, Grace, MA

Funding Program: CRTCL1 Predoctoral Interdisciplinary Clinical Research Training Program

Doctoral Program of Study: Psychological & Brain Sciences

Institution: Washington University School of Medicine

Research Department: Psychiatry

Mentors: Denise Wilfley, PhD; Susan Stark, PhD; Ellen Fitzsimmons-Craft, PhD

Combined Eating Disorder and Weight-Loss Online Guided Self-Help Intervention: A Pilot Study

Monterubio GE, Fitzsimmons-Craft EE, Wilfley DE

Introduction: The intersection of Eating Disorders (EDs) and overweight/obesity reveals a large, and mostly untreated, population. Despite the misconception that most EDs result in restriction and low weight, such as in anorexia nervosa, many individuals diagnosed with a binge-type ED have comorbid overweight/obesity. Despite this intertwined problem, few interventions exist that address ED pathology combined with a healthy weight loss (WL) intervention. Combined intervention for EDs and WL for young adults, specifically college students, is needed programming which could potentially have substantial long-term health benefits. Among college students with binge-type eating disorders who are overweight (BMI >25), does use of an online, guided self-help program for EDs combined with healthy WL methods lead to reductions in ED symptoms and WL compared to controls referred to student health? This study aims to develop and implement an online, guided self-help program for the intervention of ED psychopathology and WL, and follow-up on remission of ED psychopathology and symptoms and WL maintenance after the intervention.

Methods: 60 college students with binge-type ED symptoms and are overweight were randomized into the intervention group (n=30) to receive 8 weeks of online intervention, or control group (n=30) to receive a referral to Student Health Services. All participants will receive a follow-up survey 9 weeks after completing the initial baseline, and a final follow-up survey 6-months after completing baseline.

Results: Analysis of intervention and control groups will compare change in average ED symptoms and weight at the end of the intervention and at 6-month follow-up. It is expected that those with access to the online intervention will have a greater outcomes change than those in the control group.

Conclusions: Online, guided self-help interventions have been used for WL, as well as for treatment of EDs, separately, but no program exists to manage these conditions together. Thus, the use of an online intervention for ED psychopathology and WL in individuals with clinical and sub-clinical EDs is the next step to offering care to this undertreated population.

81 Noda, Christopher

Funding Program: CRTCL1 Predoctoral Interdisciplinary Clinical Research Training Program; WUSM Dean's Fellowship

Research Program: Summer Research Program

Doctoral Program of Study: Medicine

Institution: Washington University School of Medicine

Research Department: Surgery

Mentors: Ryan C Fields, MD; Chet Hammill, MD; Greg Williams, MA

The Safety of Hepatic Resection after Radioembolization in Patients With Primary and Secondary Liver Cancers

Noda CH, Williams GA, Sanford DE, Hammill CW, Fields RC

Introduction: The liver is a particularly vulnerable organ to cancer with roughly 40,000 primary hepatocellular carcinoma cases reported in the USA in 2018 and nearly 25% of colorectal cancer patients presenting with liver metastases at the time of diagnosis. The treatment goal of patients with advanced liver cancer may include transarterial radioembolization (TARE) as an initial treatment, often to increase the likelihood of curative resection. To date, there are limited reports on hepatectomy following TARE. The purpose of this study is to review our outcomes of patients who have received TARE followed by hepatectomy at our institution.

Methods: A retrospective study was performed on patients diagnosed with non-resectable primary or secondary liver cancer from 2013-2019 who underwent TARE followed by hepatectomy. Postoperative complications were prospectively collected using the Modified Accordion Grading System (MAGS). Descriptive statistics and Kaplan-Meier test were used to assess survival outcomes utilizing SPSS (v23).

Results: Twelve patients (66% female) were treated with a TARE followed by a hepatectomy (nine with ≥ 4 segments resected) during the study period. Six patients were diagnosed with HCC, four with cholangiocarcinoma, one with a metastatic neuroendocrine tumor, and one with metastatic CRC. The mean Charlson Comorbidity Index score was 4.9. There were no 90 day post-hepatectomy mortalities and the overall morbidity was 66% with 16% of those being severe (\geq MAGS 3). Hepatectomy specific complications in our cohort included 2 (16%) bile leaks and 0 post-hepatectomy liver failure. The median recurrence free survival following hepatectomy was 26 months. Overall survival after hepatectomy at one-year was 78% and at three years was 47%.

Conclusions: Our results suggest that hepatectomy can be safely performed in select patients after TARE. Additional comparison to patients who receive hepatectomy as a first-line treatment for less aggressively staged cancer should be investigated to further understand the outcomes of hepatectomy in prior TARE-treated patients.

87 Oyama, Momoko

Funding Program: CRTC TL1 Predoctoral Interdisciplinary Clinical Research Training Program; WUSM Dean's Fellowship
Research Program: Summer Research Program
Doctoral Program of Study: Medicine
Institution: Washington University School of Medicine
Research Department: Pediatrics
Mentors: Hayley Friedman, MD

A Preliminary Evaluation of a Comprehensive CARE Model for Mother-Infant Dyads with Opioid-Use Disorder in Pregnancy

Oyama M, Woolfolk CL, Friedman HA

Introduction: In the setting of the current opioid epidemic, obstetric and pediatric providers have come together to develop integrated, multidisciplinary programs for the mother-infant dyad to provide prenatal care and treatment for opioid-use disorder (OUD) in pregnancy and support best outcomes for infants with neonatal abstinence syndrome (NAS). The BJC/WashU CARE Clinic (Clinic for Acceptance, Recovery, and Empowerment) is a new multidisciplinary program dedicated to providing comprehensive prenatal and postnatal care for women with OUD in pregnancy. The purpose of this retrospective review was to describe and highlight the integrated services of the CARE Clinic, characterize the population of women accessing services, and to evaluate the NAS infant outcomes.

Methods: This retrospective cohort review analyzed the electronic medical records of 51 mothers and 38 infants with in-utero opioid exposure during pregnancy that received care from the BJC/WashU CARE Clinic (January 2018 to May 2019). Comprehensive demographic and clinical data were collected for both mothers and infants. Frequency distribution was analyzed for each variable.

Results: The majority of women in the CARE Clinic program had comorbidities including maternal tobacco use (86.3%), anxiety and/or depression (74.5%; 64.7%), and a history of opioid use, marijuana use, and amphetamine use (98.0%; 58.8%; 52.9%). Infants with NAS had polysubstance exposure in-utero, required pharmacological treatment (61.3%), and had a mean length of hospital stay of 33 ± 41.9 days.

Conclusions: These preliminary results provide insight into the complexity of the CARE Clinic patient population and their health outcomes. These findings suggest the need for a comprehensive care model to promote best outcomes for both mother and infant.

No Paravastu, Sriram

Poster Research Program: CRTC TL1 Predoctoral Interdisciplinary Clinical Research Training Program
Doctoral Program of Study: Medicine
Institution: University of Missouri-Kansas City
Research Department: Surgery

Mentors: Rebecca Aft, MD, PhD; Katherine Weilbaecher, MD; Andrew Jallouk, MD, PhD

Effect of Disseminated Tumor Cells and Zoledronic Acid on Survival in Patients With Locally Advanced Breast Cancer

Paravastu SS, Jallouk AP, Weilbaecher KN, Aft RL

Introduction: Breast cancer is the most common type of cancer in women, with over 250,000 new cases diagnosed annually in the United States. Patients who present with disease localized to the breast typically undergo a combination of surgery, chemotherapy, and radiation therapy as well as additional treatments based on tumor subtype. These treatments are designed to minimize the risk of recurrence. Recurrence frequently occurs in bone where it may cause fracture, spinal cord compression, and severe bone pain. Disseminated tumor cells (DTCs) are individual or microscopic groups of tumor cells found in the organs of patients without clinical metastases. Bone marrow DTCs are identified in up to 40% of patients with early-stage breast cancer and are associated with increased risk of subsequent disease recurrence. Bisphosphonates are a class of medications which accumulate in bone and decrease bone resorption by inhibiting osteoclast activity. In a clinical trial at our institution, addition of zoledronic acid to standard chemotherapy decreased bone marrow DTCs and improved disease-free survival in some subgroups of patients with locally advanced breast cancer. We aimed to determine whether the presence of bone marrow DTCs correlates with reduced disease-free and overall survival in locally advanced breast cancer. Secondly, we aimed to determine whether addition of zoledronic acid to the treatment regimen affects the relationship between bone marrow DTCs and survival in these patients.

Methods: This is a retrospective cohort study using data obtained from a randomized controlled trial. This trial enrolled patients with stage II-III breast adenocarcinoma and randomized them to receive zoledronic acid or no zoledronic acid in addition to standard breast cancer therapy. We conducted chart review for each patient enrolled in that trial to determine disease and survival status. We performed Kaplan-Meier analysis of disease-free and overall survival stratifying patients by presence/absence of DTCs and by treatment group. We calculated hazard ratios for this analysis using a Cox proportional hazards model.

Results: There were 118 patients in all who had each of the data points used in this analysis. There is no detectable association of DFS with study arm in these patients (p values for study arm is .081). There were 55 patients who were ER+ and HER2- and whose records had all the data points needed for this model. ER+/HER2- patients who received zoledronic acid had a greater hazard of death or recurrence than those in the control arm (hazard ratio = 4.0, p = .017). There were 39 patients who were ER- and HER2- and whose records had all the data points needed for this model. There is no detectable association of DFS with study arm (p values for study arm is .54).

Conclusions: Administration of zoledronic acid alongside standard therapy for breast cancer does not seem to add any additional benefit. In ER+/HER2- patients, there maybe increased risk of recurrence and death in the zoledronic acid arm compared to the control arm.

102 Shimony, Alex, MS

Funding Program: CRTCL1 Predoctoral Interdisciplinary Clinical Research Training Program; WUSM Dean's Fellowship

Research Program: Summer Research Program

Doctoral Program of Study: Medicine

Institution: Washington University School of Medicine

Research Department: Pediatrics

Mentors: Ana Maria Arbelaez, MD, MSCI; Amy McQueen, PhD

White Matter Integrity Differences During Acute Hyperglycemia

Shimony AM, Rutlin J, Stone P, Wharton K, Hershey T, Shimony JS, Arbelaez AM

Introduction: There is growing evidence that patients with diabetes mellitus (DM) have increased risk for changes in cognition and brain structure over time. These effects are associated with duration of disease, exposure to chronic hyperglycemia, and severe hyperglycemic episodes. Little is known about the effects of isolated acute hyperglycemia, in the brain. This project will determine if exposure to a single acute hyperglycemic episode changes the diffusion characteristics of white matter in the brain of healthy individuals using Diffusion Tensor magnetic resonance imaging (DTI).

Methods: Fourteen healthy, young adults participated in a randomized crossover experiment with a two-week washout period. Subjects underwent a euglycemic and hyperglycemic hyperinsulinemic clamp in random order to hold their plasma glucose concentration at the desired level (90 mg/dL for euglycemia and 300 mg/dL for hyperglycemia) for four hours. DTI scans and blood samples for osmolality were acquired at three different time points during the clamp. DTI data was processed and analyzed voxelwise using FSL's TBSS tool. Correlations were examined between changes in DTI parameters and changes in osmolality.

Results: Subjects had a mean age of 34 years (SD = 10.9), mean BMI of 24.9 (SD = 3.5), eight were female, and eleven were white. Clusters of voxels in the body and splenium of the corpus callosum and posterior white matter tracts showed a significant positive correlation ($p < 0.05$) between changes in osmolality and changes in fractional anisotropy (FA) during acute hyperglycemia. While not statistically significant, clusters of voxels in the splenium and posterior corona radiata showed a negative correlation ($p = 0.07$) between changes in osmolality and changes in radial diffusivity (RD) during acute hyperglycemia.

Conclusions: These results show increased FA during acute hyperglycemia. While these results are opposite of diffusion changes seen after chronic hyperglycemia, they are consistent with normal physiology, with increased osmolality increasing diffusion of water along the intact white matter tracts. These results are encouraging for future diffusion imaging research, as they indicate strict glycemic restrictions for neuroimaging of diabetics may not be necessary.

106 Silverglate, Bret

Funding Program: CRTCL1 Predoctoral Interdisciplinary Clinical Research Training Program

Doctoral Program of Study: Medicine

Institution: Saint Louis University

Research Department: Psychiatry

Mentors: Paul Glaser, MD

Self-Medication and Adolescent Drug Use

Silverglate BD

Introduction: My summer research explored various risk factors for drug addiction and use amongst minors referred to a Washington University psychiatrist for substance use disorders. Self-medication has been known as a motivation for drug use for a long time. Because most substance use begins in adolescence, it would be enlightening to explore whether the motivations remain the same in adolescence. We were particularly curious to see if cannabis was used by teenagers with ADHD, especially hyperactive ADHD, as a form of self-medication. Our choice of substance and mental illness was partly practical, and partly theoretical. ADHD and cannabis use are common amongst adolescence, and it was assumed that the drug chosen for self-medication would subjectively 'balance out,' via its psychoactive effects, the symptoms of the mental illness. Other self-medicative hypotheses were explored.

Methods: The data was collected from the electronic health records of 553 patients seen by a Washington University Child Psychiatrist who specializes in addiction. All the patients were referred to him for substance use disorders, or suspicion thereof. Data analysis was performed in SPSS.

Results: The data did not support our concept. However, cannabis use, cannabis use frequency, and benzodiazepine use were significantly associated with an ADHD diagnosis, but not any subtype specifically.

Conclusions: The data call into question whether these drugs are being used as self-medication at all, since the psychoactive effects of the drug may not really be balancing out the symptoms of Inattentive ADHD. The whole concept of self-medication relies on the patient trying to use psychoactive substances to return to a baseline, thus, this drug use may not be appropriately termed 'self-medication.' On the other hand, cannabis may self-medicate for Inattentive ADHD in other ways that may be explored further.

126 Zdonczyk, Alexandra

Funding Program: CRTC TL1 Predoctoral Interdisciplinary Clinical Research Training Program; WUSM Dean's Fellowship

Research Program: Summer Research Program

Doctoral Program of Study: Medicine

Institution: Washington University School of Medicine

Research Department: Ophthalmology and Visual Sciences

Mentors: Susan Culican, MD, PhD; Andrew Lee, MD

Income Disparities in Outcomes of Horizontal Strabismus Surgery in a Pediatric Population

Zdonczyk AN, Lee AR, Culican SM

Introduction: Health disparities by socioeconomic status have been documented in many areas including surgical specialties, but such data is lacking in pediatric ophthalmology. This retrospective cohort study aims to identify whether such a disparity exists in pediatric strabismus surgical outcomes.

Methods: The study screened 1,445 patients who underwent strabismus surgery at St. Louis Children's Hospital between October 2015 and March 2017. Patients were grouped by insurance status as a proxy for socioeconomic status and their ocular deviations were recorded from their pre-operative visit and post-operative visits at 3, 12, and 24 months after operation. A chi-square, odds ratio, and logistic regression will be used to compare surgical failure rates between groups.

Results: This study is ongoing, but a preliminary sample yields a failure rate of 53% for the Medicaid group (n=53) and 43% for the privately-insured group (n=93). Over 80% of the patients screened had to be excluded, primarily due to having less than 11 months of follow-up, prior strabismus surgeries, and exclusionary medical conditions. Therefore, we are also comparing the number of post-operative follow-up visits between groups. In the patients excluded due to loss to follow-up, we found that 42% of the Medicaid group vs. 10% of the privately-insured group had no visits following the operation.

Conclusions: Between 1.5 and 5% of children in the US have strabismus, making it one of the most common eye conditions in children. Successful correction of strabismus is particularly important because it can greatly affect quality of life by causing double vision, eyestrain, headaches, and vision loss if uncorrected. Given the prevalence of strabismus and its significant impact on quality of life, it is important that we identify barriers to achieving good surgical outcomes. Ensuring sufficient follow-up after operation is an important component of long-term success, as 20-40% of patients need additional treatment after strabismus surgery. Therefore, identifying socioeconomic health disparities in outcomes and follow-up rates allows us to determine where needs assessments and interventions are best targeted.

CRTC TL1 Translational Sciences Postdoctoral Program (TSPP)

57 Kung, Che-Pei, PhD

Funding Program: CRTC TL1 Translational Sciences Postdoctoral Program (TSPP)

Institution: Washington University School of Medicine

Research Department: Medicine

Mentors: Jason Weber, PhD; Jay Piccirillo, MD, FACS; Ralph Quatrano, PhD

Tumor Suppressors p53 and ARF Control ADAR1-driven Tumorigenicity in Triple Negative Breast Cancer

Kung CP, Kuzmicki CE, Bross EA, Ryu S, Cottrell K, Freeman E, Sabloak T, Bramel ER, Maggi LB, Weber JD

Introduction: Triple-Negative Breast Cancer (TNBC) accounts for one-fifth of the breast cancer patient population. The heterogeneous nature of TNBC and lack of options for targeted therapy make its treatment a constant challenge. The co-deficiency of tumor suppressors p53 and ARF is a significant genetic signature enriched in TNBC, but it is not yet clear how TNBC is regulated by this genetic alteration. Understanding the connections between the p53/ARF inactivation and TNBC pathogenesis can lead to translational opportunities to develop novel treatments.

Methods: To answer this question, we established p53/ARF-defective Murine Embryonic Fibroblast (MEF) to study the molecular and phenotypic consequences in vitro. Moreover, transgenic mice were generated to investigate the effect of p53/ARF deficiency on mammary tumor development in vivo. Human TNBC cell lines were also used to corroborate our findings in the mouse model.

Results: Increased transformation capability was observed in p53/ARF-defective cells, and formation of aggressive mammary tumors was also seen in p53^{-/-}ARF^{-/-} mice. RNA-editing enzyme ADAR1 was identified as a potential mediator for the elevated oncogenic potential. Interestingly, we found that the overexpression of ADAR1 is also prevalent in human TNBC cell lines and patient specimen. Using short hairpin RNA (shRNA) to reduce ADAR1 expression abrogated the oncogenic potential of human TNBC cell lines, while non-TNBC cells are less susceptible. Different levels of RNA editing of known ADAR1 targets were detected in shRNA-treated human TNBC cell lines, suggesting that ADAR1-mediated RNA editing contributes to TNBC pathogenesis.

Conclusions: These results indicate critical roles played by the tumor suppressors p53 and ARF in the pathogenesis of TNBC, partially through affecting ADAR1-mediated RNA editing. Further understanding of this pathway could shed light on potential vulnerabilities of TNBC based on this genetic signature possessed by a significant population of TNBC patients.

Dames Fellowship

69 Ma, Christine

Funding Program: Dames Fellowship; WUSM Dean's Fellowship

Research Program: Summer Research Program

Doctoral Program of Study: Medicine

Institution: Washington University School of Medicine

Research Department: Medicine

Mentors: Deborah Rubin, MD, AGAF; Jianyun Lu, PhD; Elzbieta Swietlicki, PhD

Paligenosis and Embryonic-like Progenitor Cells in a Mouse Model for Colitis-Associated Cancer

Ma C, McFadden B, Lu J, Swietlicki E, Gazit V, Rubin D

Introduction: IFRD1 is a novel transcription factor regulating paligenosis, the mechanism by which mature cells re-enter the cell cycle to proliferate in response to injury. This process is hijacked during tumorigenesis as mutations accumulate in cycling cells. The exact timing and pathways of paligenosis-related gene expression in the development of cancer associated with inflammatory bowel disease (colitis-associated cancer; CAC) is still unknown. We therefore investigated whether knocking out IFRD1 affects markers of paligenosis and induction of Embryonic Progenitor Cells (EPC), in the context of early colon injury. The Azoxymethane(AOM)/Dextran Sodium Sulfate (DSS) mouse model was used to mimic human CAC.

Methods: Mice (divided into IFRD1 knockouts vs. Wild type controls) were administered 1 AOM injection and 1 cycle of DSS in drinking water, then sacrificed. RNA and Protein was isolated from the distal colon, and examined for expression of a panel of paligenosis/EPC markers via qRT-PCR and Western Blot.

Results: Several genes showed statistical trends towards a difference in RNA expression between the distal colons of the WT vs. the IFRD1 knockout mice, and statistically significant differences were present in certain genes when genders were analyzed separately. KO mice showed decreased CD44 ($p=0.0682$), a marker of quiescent stem cells. In addition, KO males had increased levels of Lgr5, Lrig1, and Sox9 compared to WT males ($p=0.078$, 0.00975 , and 0.0093 respectively)—three genes that mark crypt-base columnar (CBC) stem cells.

Conclusions: The results of this experiment serve as a preliminary assessment of the presence of paligenosis and EPC induction in CACs, in the context of the novel transcriptional regulator IFRD1. In particular, this project opens up the new possibility of slowly cycling QSCs vs. actively cycling CBCs playing different roles in early injury/dysplasia, with dependence on IFRD1 expression. Further study assessing changes in gene expression over the entire course of dysplasia progression is suggested. If future research does affirm this relationship, paligenosis and EPC would be potential screening markers and treatment targets in CAC.

DeNardo Education and Research Foundation Grant

4 Arhewoh, Reme

Funding Program: DeNardo Education and Research Foundation Grant; WUSM Dean's Fellowship

Research Program: Summer Research Program

Doctoral Program of Study: Medicine

Institution: Washington University School of Medicine

Research Department: Orthopaedic Surgery

Mentors: Luhmann Scott, MD

External Remote Control Readouts Overestimate Radiographic Lengthening of Magnetically-Controlled Growing Rods (MCGR) Over Multiple Lengthening Sessions

Arhewoh RE, Mo M, Brouillet K, Luhmann S

Introduction: Radiographic (XR) measurement of single MCGR lengthenings are difficult and can have significant error. This study evaluates the correlation of the External Remote Control (ERC) readouts with XR measurements over multiple lengthening sessions.

Methods: Single-surgeon Early Onset Scoliosis (EOS) database at a single site identified patients with MCGR constructs; 14 males and 16 females with a minimum of 2 lengthenings were included. ERC readout at each lengthening were recorded along with demographic, XR, and clinical data.

Results: Mean age at surgery was 7.8 y and follow up was 29 m. 66 rods implanted across index and revision procedures with 280 lengthenings and a mean of 5.7. Individual ERCs and XRs were correlated ($r=0.69$, $p<0.001$). Difference between sum of individual ERC and XRs was 14.5% ($sd=19\%$). Mean difference was significant in each individual session and the sum of all sessions per patient ($p<0.001$, $p=0.009$). Difference per session did not change over time ($r=0.15$). Difference between the sum of XRs and ERCs was positively correlated with subsequent lengthenings ($r=0.94$, $p=0.015$). Accuracy did not improve with increased grouped sessions ($r=-0.54$, $p=0.388$) with no difference between the group with 2 and the group with 5 or 6 lengthenings ($p=0.670$). In patients with dual rods, difference was correlated between rods ($r=0.66$, $p<0.001$) and distraction of each rod was not significantly different from the other ($p=0.124$). Patient weight correlated with difference ($r=0.27$, $p=0.032$) and in patients with multiple grouped lengthenings, increased weight was positively correlated with increase in measurement difference (mean $r=0.972$).

Conclusions: Here, we confirm previous studies showing that the average difference between ERC and XR measurement of distraction over time is 15%. In individual sessions, ERC and XR were significantly different, and the difference between them varied over time with no trend, and widened the overall difference with each subsequent lengthening. Patients with bilateral constructs had strong correlation in the distraction difference between rods, suggesting influence of patient specific factors; patient weight was identified as a contributing factor.

39 Hong, Zachery

Funding Program: DeNardo Education and Research Foundation Grant; WUSM Dean's Fellowship

Research Program: Summer Research Program

Doctoral Program of Study: Medicine

Institution: Washington University School of Medicine

Research Department: Orthopaedic Surgery

Mentors: Cara Cipriano, MD, MSCI

Risk factors for extrapulmonary metastasis in primary soft-tissue sarcoma patients

Hong ZL, Cipriano CA

Introduction: Soft Tissue Sarcomas (STS) represent a group of rare neoplasms of mesenchymal origin. Mortality rates are high, with five-year survival as low as 40% due to disease relapse after primary tumor resection. Computerized Tomography (CT) is often used for STS surveillance because of its high sensitivity for metastatic disease; however, disadvantages include cost and exposure to ionizing radiation. Eighty percent of STS metastases occur in the lungs, so chest imaging is universally practiced. Metastatic disease can present elsewhere, but there is minimal evidence on whether broader surveillance is indicated. The goal of this study is to characterize the pattern of STS metastases, as well as to determine risk factors for extrapulmonary metastases that could identify patients who would benefit from routine abdominal and pelvic CT.

Methods: We retrospectively reviewed the electronic medical records of 400 Barnes Jewish Hospital (BJH) patients who underwent excision of a STS by an orthopedic oncologist. The proportion of patients that developed pulmonary versus extrapulmonary metastases was calculated. Patient demographics at initial operation and primary tumor characteristics were analyzed to assess their value as prognostic factors for identifying patients at higher risk of extrapulmonary metastases. Statistical analysis was conducted with SPSS statistical software and an alpha less than 0.05 was considered significant.

Results: In the period examined, 129 patients developed metastases. The first detected metastasis was pulmonary for 86 and extrapulmonary for 43. The most common histological types to develop extrapulmonary metastases were malignant fibrous histiocytoma (14 patients, 33%) and liposarcoma (6 patients, 9%). All three patients with angiosarcomas developed extrapulmonary metastases. There was a significant difference in the proportion of patients with deep tumors who developed pulmonary (82 patients, 95%) compared to extrapulmonary (33 patients, 77%) metastases.

Conclusions: Although not an independent prognostic factor for extrapulmonary metastasis, patients with certain histological types of STS could benefit from additional CT of the abdomen and pelvis.

60 Law, Jody

Funding Program: DeNardo Education and Research Foundation Grant; WUSM Dean's Fellowship
Research Program: Summer Research Program
Doctoral Program of Study: Medicine
Institution: Washington University School of Medicine
Research Department: Surgery
Mentors: Terence Myckatyn, MD

Preoperative posterior intercostal nerve block and serratus plane block improve postoperative pain control and reduce hospital length of stay in patients undergoing autologous latissimus flap breast reconstruction after mastectomy for breast cancer

Law JM, Ghosh TD, Parikh RP, Myckatyn TM

Introduction: Postoperative pain is a major challenge for patients undergoing breast reconstruction after surgical treatment of breast cancer, resulting in prolonged hospitalizations and additional resource utilization. Evidence on the efficacy of techniques to minimize postoperative pain in autologous latissimus flap breast reconstruction is lacking. The purpose of this study is to determine if utilizing a preoperative posterior intercostal nerve block and serratus plane block (PINB+SPB) impacts postoperative pain control and length of stay in patients undergoing autologous latissimus flap breast reconstruction.

Methods: Consecutive patients undergoing postmastectomy autologous latissimus flap breast reconstruction were identified from a prospectively collected database to compare those who received PINB+SPB to those who did not. Primary outcomes included self-reported pain scores at multiple time points (3, 6, 12, 24, 48 hours in PACU), time to oral-only narcotic usage (TTON), and hospital length of stay (LOS). Sample differences will be compared using Wilcoxon rank-sum and Chi-squared for continuous and categorical variables. Kaplan-Meier analysis will be used to evaluate TTON and LOS, with Mantel-Cox test used to compare groups.

Results: We have collected data from 280 patients and are currently in the process of performing a statistical analysis. We predict the analysis will show that patients in the PINB+SPB group report significantly lower postoperative pain at various time points and shorter median TTON. It is also anticipated that median LOS will be reduced for patients receiving PINB+SPB in both hours and hospital nights.

Conclusions: Preoperative PINB+SPB administration is associated with improved postoperative pain control, shorter TTON, and reduced hospital LOS for patients with breast cancer undergoing postmastectomy autologous latissimus flap reconstruction. This study will be significant in evaluating if adopting this regional anesthetic technique will have an impact on opioid use, patient satisfaction, and potential cost savings across the healthcare system.

99 Rohatgi, Karthik

Funding Program: DeNardo Education and Research Foundation Grant; WUSM Dean's Fellowship
Research Program: Summer Research Program
Doctoral Program of Study: Medicine
Institution: Washington University School of Medicine
Research Department: Surgery
Mentors: Aimee James, PhD, MPH; Graham Colditz, DrPH, MD, MPH

Geographic access to low-dose computed tomography lung cancer screening in Missouri and Illinois: urban-rural disparities and their effects

Rohatgi KW, Marx CM, Lewis-Thames MW, Liu J, Colditz GA, James AS

Introduction: Low-Dose Computed Tomography (LDCT) lung cancer screening is recommended for individuals aged 55-80 who have at least a 30 pack-year smoking history, who currently smoke or have quit in the last 15 years, and who present with no lung cancer symptoms. Compared to chest x-ray, LDCT reduces the risk of lung cancer death by up to 20%, yet uptake remains low (less than 5% of eligible adults as of 2015). Our first objective was to identify locations in Missouri and Illinois that bear a high burden of lung cancer and/or cigarette smoking but have low access to LDCT screening. We also sought to quantify the association between (1) rurality, demographic characteristics and access to screening, and (2) access to screening and lung cancer mortality.

Methods: This study used publicly available data aggregated at the census block group or county level. We defined access to screening at the block group level as the presence of a screening center within 30 miles. We used a mixed-effects logistic regression model to examine the association between rurality, socio-demographic variables and access to screening. A county-level multiple regression model was used to study the relationship between screening access and lung cancer mortality.

Results: Southeastern Missouri emerged as an area with low access to screening, high smoking prevalence and high lung cancer mortality. Over 97% of residents living in metropolitan area cores or nearby commuting areas had access to screening, whereas just over 40% of micropolitan, small town and rural dwellers did. After controlling for socio-demographics, metropolitan areas were associated with 5.65 times greater odds of having access to screening than rural areas (95% CI, 3.82-8.35). No association was observed between access to screening and lung cancer mortality, although counties with high smoking prevalence and low education levels had greater mortality.

Conclusions: Rural areas have significantly lower geographic access to LDCT screening; however, low uptake of LDCT screening may contribute to the lack of any association between screening access and mortality. Rural screening programs must be coupled with smoking cessation interventions to effectively reduce mortality.

113 Tuite, Genevieve

Funding Program: DeNardo Education and Research Foundation Grant; WUSM Dean's Fellowship

Research Program: Summer Research Program

Doctoral Program of Study: Medicine

Institution: Washington University School of Medicine

Research Department: Medicine

Mentors: M Laurin Council, MD; Parteek Singla, MD

Clinical Characteristics of Basal Cell Carcinomas of the Female Vulva: An Institutional Retrospective Review

Tuite GC, Singla P, Hurst E, Council ML

Introduction: Basal Cell Carcinoma (BCC) is a common skin cancer that usually occurs in sun exposed areas on the head and neck. Vulvar BCCs are rare, representing <1% of all BCCs. Our study aims to further elucidate the clinical characteristics of vulvar BCCs using a retrospective single institution review.

Methods: A query was submitted for all Washington University pathology records for "BCC" and "labia(l), mons pubis, introitus, vulva, perineum, clitoris/clitoral, and suprapubic." Retrospective chart review was then performed looking at age, race, histologic subtype, immune status, tumor size pre-and post-operatively, treatment, specialty performing treatment, current status, and recurrence.

Results: Of the 35 cases, 28 involved the cutaneous vulva (80%), 6 in the suprapubic area, and 1 involving the clitoris. While subtypes were not always specified (63%), pigmented (20%), nodular (8%), basosquamous (3%), fibroepithelioma of Pinkus (3%), and superficial multifocal (3%) were seen in the cohort. Most vulvar BCCs were treated by wide local excision (44%) and vulvectomies (37%), with 3 cases treated with Mohs (11%) and 2 with electrodesiccation and curettage. Most of the cases were identified and treated by gynecology (75%). The mean margins for Mohs was 3mm vs wide local excision at 4.4mm and vulvectomy at 6mm. The average size of tumors pre-operatively were 1.1 x 0.9cm. Comparison of pre-operative tumor sizes showed those treated with vulvectomy were slightly larger at 1.4 x 1.1cm compared to excision 1.1 x 0.85cm and Mohs 1.03 x 0.83cm.

Conclusions: The majority of patients are being seen and treated by gynecology resulting in internal referral to gynecology-oncology with 37% of cases being treated with vulvectomies despite majority being non-aggressive histologic subtypes and comparable pre-operative tumor sizes. More radical treatment with vulvectomy resulted in larger margins being taken compared to Mohs (0.6mm vs 0.3mm). Consideration for an excision with standard 3-4mm margins or a tissue-sparing procedure such as Mohs could be valuable in treating a non-aggressive BCC of the vulva resulting in improved cosmetic and functional outcomes.

Eli Lilly & Company Grant

10 Brown, Corey, MEng

Funding Program: Eli Lilly & Company Grant

Research Program: Summer Research Program

Doctoral Program of Study: Medicine

Institution: Meharry Medical College

Research Department: Orthopaedic Surgery; Washington University School of Medicine

Mentors: Scott Luhmann, MD

The Frequency of Compartment Syndrome after Tibial Tubercle Fracture in Skeletally-Immature Patients

Brown CA, Brouillet K, Luhmann SJ

Introduction: The Ogden Classification System for tibial tubercle fractures in skeletally immature patients has been the standard for fracture classification. More recently, Pandya et al described a unique classification system which used CT scans to assess the three-dimensional configuration of the fracture. Pandya reported a significant number of compartment syndromes, which had not been previously reported in studies using the Ogden classification. The Pandya report has become widely referenced and, due to the significant frequency of compartment syndromes, is potentially unnecessarily increasing the concern that CT scans are needed preoperatively, and that fasciotomies are necessary during fracture fixation. The purpose of this study is to determine the frequency of compartment syndrome of the leg after tibial tubercle fracture, which do not involve the posterior proximal tibial physis.

Methods: Retrospective review of tibial tubercle fractures, which do not involve the posterior proximal tibial physis, at our institution from 2007 to 2019. Patient BMI, age, mechanism of injury, Ogden classification, and preoperative and postoperative complications including compartment syndrome were collected.

Results: There were 49 tibial tubercle fractures in 48 patients (46 males, 2 females) with a mean age of 14.9±1.5 years, and a mean BMI of 25.4±5.3 kg/m². All were treated with Open Reduction Internal Fixation. All patients achieved radiographic union. Zero patients presented with either compartment syndrome or vascular compromise.

Conclusions: Devastating complications of compartment syndrome following tibial tubercle fracture reported by Pandya et al., were not detected. This result does not support the concern that CT is needed to classify and treat tibial tubercle fractures. The result does not support the need for a low threshold for anterior compartment fasciotomy in patients with tibial tubercle fractures.

40 Hunter, Kamilya, MHS

Funding Program: Eli Lilly & Company Grant

Research Program: Summer Research Program

Doctoral Program of Study: Medicine

Institution: Meharry Medical College

Research Department: Occupational Therapy; Washington University School of Medicine

Mentors: Allison King, MD, PhD, MPH; Taniya Varughese, MSOT, OTR/L

Cognition: Effects on Overall Health Outcomes in the Adolescent Sickle Cell Community

Hunter KM, King A, Varughese T

Introduction: The prevalence and severity of cognitive impairment has been well established in children with Sickle Cell Disease (SCD). However, not much is known about the cognitive impact of the disease on adolescents and adults. Disease-modifying therapies like regular blood transfusions and hydroxyurea may be protective against cognitive deficits. The objective of this study was to determine if adolescents with SCD have greater cognitive impairment as measured by below average performance on neuropsychological assessments when compared to a normative sample.

Methods: This is a cross-sectional study of a larger observational prospective cohort trial. Participants completed a battery of assessments to measure cognition at baseline. Assessments included the Rapid Estimate of Adolescent Literacy in Medicine Short Form (REALM SF), the Newest Vital Sign, the NIH Toolbox Cognition Battery (NIHTB-CB), and the Weschler Abbreviated Scale of Intelligence-Two Subtest form (WASI-II). Participants' mean scores on neuropsychological assessments were compared with normative means using a one-sample T-test.

Results: No significant differences were found between participant mean scores on the WASI and the normative sample. On the NIHTB-CB, adolescents with SCD scored significantly lower than the normative mean on domains of attention (mean difference: -12.6; p<.001), executive function (-5.50; p=.035), processing speed (mean difference:-13.2; p<.001), and overall fluid composite cognition (mean difference: 46.00; p<.001).

Conclusions: Adolescents with SCD have deficits in multiple cognitive domains. These deficits may contribute to decreased performance in everyday tasks and poor outcomes in the academic and work environment. We believe routine cognitive screening and referrals to cognitive rehabilitation should be made standard of care to help alleviate the cognitive deficits observed in adolescents with SCD.

70 Mamo, Ruthy, MS

Funding Program: Eli Lilly & Company Grant

Research Program: Summer Research Program

Doctoral Program of Study: Medicine

Institution: Meharry Medical College

Research Department: Genetics; Washington University School of Medicine

Mentors: Ting Wang, PhD; Jennifer Flynn

The epigenetic role of Polycomb Repressive Complex 2 (PRC2) binding in NSCLC progression and metastasis

Mamo RT, Flynn J, Wang T

Introduction: The establishment and maintenance of epigenetic gene silencing is fundamental to cell determination and function. Some of the essential epigenetic systems involved in regulating gene activity involve Polycomb Repressive Complex proteins and the DNA methylation systems. The purpose of this study is to show how the corresponding silencing pathways are mechanistically linked. Through experimentation, we hope to identify the specific interaction of PRC2, including its subunit EZH2 (Enhancer of Zeste homolog 2), with DNA in hypomethylated regions (DMVs) in normal cell lines and its lack of interaction in specific cancer cell lines of NSCLCs.

Methods: A western blot experiment was conducted to verify whether a specific antibody binds to EZH2 the catalytic subunit of PRC2, in H1299, a NSCLC metastasis-derived cell line. We also conducted Chromatin immunoprecipitation (ChIP-seq) to identify where PRC2 binds in the DNA sequence of this cancerous cell line, and specifically whether or not PRC2 binding is altered in DMVs. Lastly, we compared the global profile of DMV regions in H1299 to what is observed in a normal lung context using various computational tools.

Results: Western blot results show that anti-EZH2 antibody binds in H1299 cancer cell lines. Preliminary ChIP-seq data shows DNA bound to anti-EZH2 antibody complexes in cancer cell lines and computational analysis shows a decrease in trimethylation in cancer vs normal.

Conclusions: Limitations of the study include other potential pathways contributing to the lack of PRC2 binding in normal pathology. However, understanding modifications of this epigenetic mechanism can offer a better understanding of cancer progression and may lead to better treatment options for NSCLC and cancer patients alike.

74 McFadden, Brandon

Funding Program: Eli Lilly & Company Grant

Research Program: Summer Research Program

Doctoral Program of Study: Medicine

Institution: Meharry Medical College

Research Department: Medicine; Washington University School of Medicine

Mentors: Deborah Rubin, MD, AGAF; Marc Levin, MD; Lu Jianyun, PhD

Effects of Genetic Manipulation of Transcriptional co-regulator IFRD1 in a Mouse Model on Palignosis and Tumorigenesis in Colitis Associated Cancer

McFadden BL, Liang M, Ma C, Gazit VA, Jianyun L, Swietlicki EA, Levin MS, Rubin DC

Introduction: Colon cancer is the third most common cancer in the world, and the global burden is expected to increase due to the growth and aging of the population. Research has shown that colon cancer is a biologically heterogeneous disease that develops by distinct pathways consisting of genetic and epigenetic changes. The genomic profiles of chronic inflammatory based colon cancers show even more heterogeneity in that certain mutations like in TP53 seem to occur earlier in colitis associated cancer compared to sporadic colon cancer. The histological findings of multifocal flat lesions and signet ring cells seen in colitis associated cancer are more difficult to detect and lead to advance staging and worse clinical outcomes of colitis associated cancer. IFRD1 is a transcriptional co-regulator that is increased in colon cancers and is associated with reduced survival. It also plays a role in regulating intestinal lipid metabolism and epithelial proliferation and is increased in states of early cell injury and inflammation. Studying precancerous lesions in the colon is possible by the identification of Aberrant Crypt Foci (ACF) in mice colons. Deletion of IFRD1 in knockout mice will show reduced tumorigenesis in a colitis associated cancer model compared to mice that express IFRD1 (wildtype).

Methods: WT (n=10) and KO (n=10) mice were injected with AOM followed by 2 treatments of DSS on days 5 and 8 and were analyzed for changes in body weight. Mice were given 24 hours to recover and then had their colons resected on day 11. Colons were stained with 0.2% methylene blue and analyzed with a dissecting microscope to quantify ACF. Colons were also processed for hematoxylin and eosin and for epithelial proliferation by BrdU staining analysis.

Results: KO mice as a combined group (male and female) showed reduced crypt cell proliferation near areas of colonic injury compared to WT mice as a combined group (male and female) ($p < .05$, fig 1).

Conclusions: IFRD1 KO mice show reduced crypt cell proliferation compared to WT mice. IFRD1 regulates crypt cell proliferation in the early stages of inflammation-induced tumorigenesis.

88 Patel, Siddharth

Funding Program: Eli Lilly & Company Grant

Research Program: Summer Research Program

Doctoral Program of Study: Medicine

Institution: Meharry Medical College

Research Department: Surgery; Washington University School of Medicine

Mentors: Dominic Sanford, MD; Ryan Fields, MD

Perioperative Outcomes after Minimally Invasive Whipple in Pancreatic Cancer Patients Following Neoadjuvant Therapy: Is It Safe?

Patel S, Williams G, Sanford D

Introduction: Whipple is a complicated surgical procedure that is currently standard of care for resectable pancreatic cancers including pancreatic ductal adenocarcinoma (PDAC). Whipple is performed with minimally invasive or open approaches. Before resection, neoadjuvant therapy is often used to downstage the patients. There is currently no literature showing the perioperative outcomes in PDAC patients who received neoadjuvant therapy undergoing minimally invasive (MIPD) vs. Open Whipple (OPD). Should surgeons utilize minimally invasive approach for resection of pancreatic cancers for patients treated with neoadjuvant therapy? In this study, we sought to identify if there is a significant difference in outcomes of PDAC patients receiving neoadjuvant therapy undergoing MIPD compared OPD.

Methods: The approach for this project included the utilization of the National Surgical Quality Improvement Program (NSQIP) database. The limitation with this database is that it only tracks 30-day complications. However, NSQIP is a nationally validated, risk-adjusted, outcomes-based program. We used propensity score matching for ten baseline characteristics to remove confounding variables from covariates.

Results: The study samples included 197 MIPD patients and 2116 OPD from NSQIP. Our initial analysis with our propensity match showed significant reduction in perioperative blood transfusion (15.2% vs. 26.3%; $p < 0.001$) and postoperative length of stay (7.9 vs. 9.7 days; $p < 0.0001$). However; there was a slight increase in readmission rate for MIPD patients (20.8% vs. 14.7%; $p = 0.022$). To account for confounding variables, we utilized propensity matching with a 3:1 ratio for OPD and MIPD patients. Our sample size was $n=197$ for MIPD and $n=591$ for OPD patients. Post-match analysis of the data maintained initial significant findings.

Conclusions: Our results suggest that there is a significant increase in the readmission rate for MIPD patients. However, there is also a decrease in postoperative LOS and blood transfusion rate in MIPD patients. This data helps us conclude that MIPD is a plausible option in a qualified candidate. Possible future research may be conducted to see if this conclusion holds up with other pancreatic malignancies.

104 Simmons, Melynda, MS

Funding Program: Eli Lilly & Company Grant

Research Program: Summer Research Program

Doctoral Program of Study: Medicine

Institution: Meharry Medical College

Research Department: Psychiatry; Washington University School of Medicine

Mentors: Cynthia Rogers, MD; Rachel Lean, PhD

The relationship between cannabis use, maternal depression, and child behavior outcomes at 5-year follow up

Simmons MN, Lean R, Rogers C

Introduction: Cannabis use is prevalent in the maternal population. In 2016, 8% of pregnant women in the US tested positive for THC. Prenatal use of substances is associated with preterm birth and depression. Postnatal use of nicotine and alcohol is linked to depression, but there are mixed results regarding the association between postnatal cannabis use and depression.

Researchers have faced difficulty isolating cannabis use as an independent risk factor for depression since its use often co-occurs with polydrug use and other risk factors for depression. Maternal depression is also linked to child conduct problems. Treating depression has been found to improve child outcomes markedly. This study will examine the relationship between postnatal cannabis use, maternal depression, and child behavioral outcomes at 5 year follow up and seeks to accomplish the following specific aims: (1) Examine the prevalence of maternal lifetime cannabis use and assess group differences across background characteristics and term vs pre-term birth. (2) Examine the relationship between depression and maternal lifetime cannabis use and assess group differences between term and pre-term birth. (3) Examine the association between maternal depression, cannabis use, and child behavior problems.

Methods: 76 preterm and 68 term born children were recruited from the St. Louis Children's Hospital NICU and Barnes Jewish Hospital, respectively. At 5 year follow up, children returned for developmental assessments and their mothers completed questionnaires regarding substance use, depression and their child's behavior. SPSS Statistics was used to complete statistical analyses.

Results: After controlling for covariates, cannabis use was linked to higher depression symptoms ($p=0.048$) and maternal depression was linked to more severe child behavior problems ($p=0.000$). However, there was no difference in child behavior outcomes between mothers that report cannabis use and those that did not.

Conclusions: Developing a better understanding of postnatal cannabis use as a risk factor for maternal depression may be helpful for targeting moms at high risk for depression sooner and improving child outcomes.

Epharmix Fellowship

122 Xu, Ran

Funding Program: Epharmix Fellowship

Research Program: Clinical Research & Innovation Student Program

Doctoral Program of Study: Medicine

Institution: Washington University School of Medicine

Research Department: Medicine

Mentors: Carlos Bernal-Mizrachi, MD; Will Ross, MD, MPH

Improving HbA1c with glucose self-monitoring in diabetic patients with EpxDiabetes, a phone call and text message-based telemedicine platform: a randomized controlled trial

Xu R, Xing M, Javaherian K, Peters R, Ross W, Bernal-Mizrachi C

Introduction: Diabetes is estimated to affect 30.3 million people (9.4% of the population) in the United States, yet an estimated 63.9% of adults with Type 2 diabetes mellitus (T2DM) do not meet American Diabetes Association (ADA) recommended self-monitoring frequencies. Generating new methods to promote self-blood glucose measurements and facilitate patient-provider assessment has the potential to positively impact blood glucose control in large populations. We conducted a randomized controlled trial of EpxDiabetes, a novel digital health intervention as an adjunct therapy to reduce HbA1c and fasting blood glucose (FBG) among patients with Type 2 diabetes. Additionally, we examined the effect of social determinants of health on our system.

Methods: Sixty-five patients were randomized at a primary care clinic. Self-reported FBG data was collected by EpxDiabetes automated phone calls or text messages. Only intervention group responses were shared with providers, facilitating follow-up and bi-directional communication. Δ HbA1c and Δ FBG were analyzed after 6 months.

Results: There was an absolute HbA1c reduction of 0.69% in the intervention group (95% CI, -1.41 to 0.02) and an absolute reduction of 0.03% in the control group (95% CI, -0.88 to 0.82). For those with baseline HbA1c > 8%, HbA1c decreased significantly by 1.17% in the intervention group (95% CI, -1.90 to -0.44), and decreased by 0.02% in the control group (95% CI, -0.99 to 0.94). FBG decreased in the intervention group by 21.6 mg/dL (95% CI, -37.56 to -5.639), and increased 13.0 mg/dL in the control group (95% CI, -47.67 to 73.69). Engagement (proportion responding to \geq 25% of texts or calls over 4 weeks) was 58% for the intervention group (95% CI, 0.373 to 0.627) and 48% for the control group (95% CI, 0.296 to 0.621). Smoking, number of comorbidities, and response rate were significant predictors of Δ HbA1c.

Conclusions: EpxDiabetes helps to reduce HbA1c in patients with uncontrolled T2DM and fosters patient-provider communication; it has definite merit as an adjunct therapy in diabetes management. Future work will focus on improving the acceptability of the system and implementation on a larger scale trial.

Kuchnir Scholar Summer Research Fellowship

29 Freeman, William

Funding Program: Kuchnir Summer Research Fellowship; WUSM Dean's Fellowship

Research Program: Summer Research Program

Doctoral Program of Study: Medicine

Institution: Washington University School of Medicine

Research Department: Medicine

Mentors: Michael Mullins, MD, FACEP, FAACT

Pilot study of non-invasive, point-of-care ultrasound to assess swelling in copperhead snakebites

Freeman WE, Mullins ME

Introduction: Copperhead envenomation is relatively common in Missouri, and is believed to occasionally cause symptoms of compartment syndrome, requiring a fasciotomy to relieve pressure within the muscle compartment. Since fasciotomy is an invasive and possibly disfiguring surgery, it is desirable to have a non-invasive test to rule out compartment syndrome and eliminate unnecessary fasciotomy. This study aims to use point-of-care ultrasound to elucidate differences in compartment swelling and blood flow in the affected and unaffected extremity.

Methods: 2-D and pulse Doppler ultrasound images of the bitten and unbitten extremity were taken, and swelling was assessed by measuring the distance from skin to bone, skin to muscle, and muscle to bone in the affected and unaffected limbs at the bite site and on the adjacent limb segment. The pulse Doppler amplitude was used to estimate arterial blood flow to a nearby muscle compartment.

Results: Of the five patients enrolled, one patient had a full examination, two patients had ultrasound examinations of only the bite site, and two patients had data sets lost during storage on the ultrasound server. Skin to bone depth at the bite site was 182% that of the unaffected skin to bone depth on average (SD 37%, n=3). The affected leg in patient B demonstrated skin to bone, skin to muscle, and muscle to bone depths were 109%, 217%, and 93% of the respective depths in the unaffected leg. Pulse Doppler amplitude in the radial artery of the affected limb was 195% of the amplitude of the unaffected radial artery.

Conclusions: Ultrasound may be a useful tool at the bedside to investigate symptoms of and possibly rule out compartment syndrome in copperhead snakebites, but more studies are needed to confirm this.

Meharry Medical College, Office of the President

110 Thompson, Zindzi

Funding Program: Meharry Medical College, Office of the President; CRTCL1 Predoctoral Interdisciplinary Clinical Research Training Program

Research Program: Summer Research Program

Doctoral Program of Study: Medicine

Institution: Meharry Medical College

Research Department: Otolaryngology; Washington University School of Medicine

Mentors: Jay Piccirillo, MD, FACS; Jake Lee, MD; John Schneider, MD

Predictors of Subjective Olfactory Function After Endoscopic Transsphenoidal Hypophysectomy

Thompson ZS, Lee JJ, Klatt-Cromwell CN, Orlowski HL, Piccirillo JF, Schneider JS

Introduction: Endoscopic Transsphenoidal Hypophysectomy (ETSH) is the current gold standard treatment for tumors of and near the pituitary gland. Loss of olfactory function is a noted complication of the surgery; however, there is a lack of literature on post-ETSH olfactory function. We proposed a retrospective cohort study to identify (a) demographic, (b) intraoperative, (c) histologic, and (d) cephalometric predictors of post-operative olfactory dysfunction.

Methods: This study included adults with diagnosed sellar masses at Barnes-Jewish Hospital in St. Louis that underwent surgical resection via ETSH from January 2015 to January 2019. After applying eligibility criteria to the 301 patients who underwent ETSH from Washington University's electronic medical record, we received responses to our Global Rating of Smell Change survey from 147 participants. Responses were input into a database with information on 61 variables for each patient. For data analysis, we performed descriptive statistics of baseline variables, univariate logistic binomial regression to calculate relative risk, and multivariable logistic binomial regression.

Results: On multivariable analysis, abdominal fat grafting (adjusted relative risk [aRR] 2.95, 95% confidence interval [CI] 0.95 to 2.51) was strongly associated with PEOD while smoking history (aRR 1.54, 95% CI 0.95 to 2.51) likely has a clinically meaningful but imprecise effect. A more obtuse angle between the planum sphenoidale and face of the sella turcica measured on sagittal imaging was protective (aORR 0.98, 95% CI 0.96 to 0.99).

Conclusions: Abdominal fat grafting, acute skull base angle, and smoking history were clinically significant risk factors for patient-reported PEOD. Surgeons can now give patients a better idea of which factors put them at risk of smell loss after surgery.

Movement Science Program (MSP)

41 Jeong, Hyo-Jung, PT, MS

Funding Program: Movement Science Program (MSP)

Mentors: Mary Hastings, PT, DPT, MSCI; Michael Mueller, PT, PhD

Limited foot and ankle joint mobility does not play a role on heel rise performance in people with diabetes and peripheral neuropathy

Jeong HJ, Mueller MJ, Stumpf JL, Hastings MK

Introduction: Foot and ankle dysfunction in people with diabetes and peripheral neuropathy (DPN) is a risk factor for developing an ulcer and amputation. Heel rise (HR) task is a measure of foot and ankle movement dysfunction. People with DPN have limited foot and ankle joint mobility that may contribute to poor performance on the HR task. The purposes of this study were to determine if people with DPN 1) have limited foot and ankle plantarflexion (PF) joint mobility and 2) have impaired double-limb HR performance (DLHR) because of limited joint mobility compared to controls.

Methods: Fifty eight participants with DPN and 16 healthy controls participated. We used 3-D motion analysis to assess foot and ankle mobility during repetitions of a DLHR and non-weight bearing (NWB) PF tasks. We compared the group differences during NWB PF task and task differences within groups.

Results: The DPN group had reduced foot [DPN vs controls, mean (SD): -10(7) vs -16(8)] and ankle [-10(6) vs -15(4)] PF in the DLHR compared to controls ($p < 0.01$). This indicates presence of foot and ankle dysfunction in people with DPN. The DPN group had reduced foot [-22(7) vs -25(5)] and ankle [-19(5) vs -22(7)] PF in the NWB task compared to controls ($p < 0.05$). This result supports the existence of limited foot and ankle joint mobility in DPN. The foot and ankle PF were reduced in DLHR compared to NWB PF task in DPN [DLHR vs NWB PF, foot -10(7) vs -22(7); ankle -10(6) vs -19(5)] and controls [foot -16(8) vs -25(5); ankle -15(4) vs -22(7); $p < 0.01$]. The significant reduction in DLHR to NWB PF task indicates no impact of limited joint mobility on HR performance.

Conclusions: People with DPN had foot and ankle dysfunction and limited foot and ankle joint mobility compared to controls. However, the foot-ankle movement dysfunction during HR task is not due to limited joint mobility. Understanding the factors that limit HR task performance will help inform and direct treatment strategies to modify selected factors (i.e., muscle strength or joint mobility) that could result in better foot-ankle mechanics in people with DPN.

NASA Fellowship

125 Yuan, Sean

Funding Program: NASA Fellowship

Research Program: Summer Research Program

Doctoral Program of Study: Medicine

Institution: Washington University School of Medicine

Research Department: Medicine; NASA Johnson Space Center, Texas

Mentors: Steven Laurie, PhD; Brandon Macias, PhD; Michael Stenger, PhD

Optical Coherence Tomography of the Macula in Long-Duration Spaceflight

Yuan SM, Laurie SS, Macias BR, Stenger MB

Introduction: Optic disc edema is the primary finding leading to the diagnosis of Spaceflight Associated Neuro-ocular Syndrome. Optical Coherence Tomography (OCT) of astronauts has quantified optic disc edema and peripapillary retinal thickening that are hypothesized to arise from chronic headward fluid shifts in microgravity. The effects of weightlessness on the macula, however, are poorly understood and must be characterized so that ocular damage can be prevented on future missions to Mars. The purpose of this study is to assess changes in macular retinal thickness of astronauts undergoing long-duration spaceflight.

Methods: OCT images of 11 astronauts undergoing ~6 month missions to the ISS were acquired before, during, and after flight. Cross-sectional OCT images were segmented for retinal boundaries and retinal thickness was quantified in MATLAB.

Results: Total retinal thickness over a 3-mm diameter circle centered at the fovea decreased by 3.6 μm and 5.6 μm at Flight Day 45 and 150, respectively, compared to preflight baseline measurements. The difference was not statistically or clinically significant. Analysis of ten sub-layers of the retina found no significant differences except in the photoreceptor layers. The photoreceptor inner segment thickness decreased by 2.3 μm and 2.6 μm and the outer segment thickness increased by 2.5 μm and 3.2 μm at Flight Day 45 and 150 respectively, before normalizing to baseline postflight.

Conclusions: The results of this study suggest that exposure to ~6 months of weightlessness does not cause clinically significant edema in the macula and that central vision is not at risk. However, there may be a slight posterior shift of the ellipsoid zone that separates the photoreceptor inner and outer segments. Future research is needed to examine the impact of such a shift and whether missions longer than 6 months have effects on the macula or underlying layers.

Otolaryngology NIH T32 Physician Scientist Program (PSP)

No **Jeanpierre, Latoya, MSCI**

Poster Funding Program: Otolaryngology NIH T32 Physician Scientist Program (PSP)

Doctoral Program of Study: Medicine

Institution: Wayne State University

Research Department: Otolaryngology

Mentors: Jonathan Peelle, PhD; Jay Piccirillo, MD, FACS; Dennis Barbour, MD, PhD

Quantifying Lateralization of Speech Processing Using Automated Meta-Analysis

Jeanpierre L, Reid T, Bajracharya A, Peelle JE

Introduction: Historically, information regarding the speech production and comprehension has arisen from lesion data. With the advent of neuroimaging techniques such as functional magnetic resonance imaging, there has been a large number of studies exploring speech processing, leading to differing ideas concerning how speech is processed within the brain. The purpose of this study was to perform an automated meta-analysis and calculate lateralization indices to try to clarify this question. We hypothesize that as speech becomes more complex, more of its processing is done by the left hemisphere of the brain.

Methods: An automated meta-analysis was performed using the online tool NeuroSynth. The resulting meta-analytic brain map for each level of speech generated by NeuroSynth was then used to calculate lateralization indices via the bootstrap method using the LI-Toolbox in SPM 12 of Matlab.

Results: Four levels of speech were identified. These levels were: sound, phonemes, words and sentences. Sound was processed bilaterally with a lateralization index of 0.049. All levels of speech above sound were left lateralized. Phonemes had a li of 0.75. Words had a li of 0.36 while sentences had a li of 0.47.

Conclusions: The results of this study suggest that speech processing is completely left lateralized. According to our hypothesis, sound should have been processed bilaterally, while sentences should have been the most left lateralized. However, the results showed that phonemes were the most left lateralized of all levels of speech. This was an unexpected finding. Understanding the hemispheric lateralization of speech has potential clinical implications as a tool. For example, it can help to inform language mapping for resection. Additionally, it can inform the effectiveness of tasks used in diagnoses of speech related pathologies.

59 **Lander, Daniel**

Funding Program: Otolaryngology NIH T32 Physician Scientist Program (PSP)

Doctoral Program of Study: Medicine

Institution: Washington University School of Medicine

Research Department: Otolaryngology

Mentors: Craig A Buchman, MD; Jay F Piccirillo, MD, FACS; Margaret A Olsen, PhD, MPH

Incidence of Infectious Complications Following Cochlear Implantation in 7449 Recipients Over 10 Years

Lander DP, Durakovic N, Kallogjeri D, Jiramongkolchai P, Olsen MA, Piccirillo JF, Buchman CA

Introduction: Cochlear Implantation (CI) is the treatment of choice for patients with severe to profound sensorineural hearing loss. Infection following CI can result in hearing loss secondary to implant removal and rarely meningitis, when left untreated. Published rates of infection after CI vary widely (1.7%-8.2%), and there is a paucity of generalizable, large-scale data regarding the risks of infection after CI. This study aimed to determine the incidence and timing of infectious complications after CI using the administrative databases provided by the Healthcare Cost and Utilization Project (HCUP).

Methods: A retrospective cohort study using the HCUP State Inpatient Databases (SID), State Emergency Department Databases (SEDD), and State Ambulatory Surgery Databases (SASD) from FL, MD, NY, VT, and WI. Patients aged one year and older with an ICD-9/10-CM or CPT-4 code for CI in the SID or SASD from 1/1/2006 to 9/30/2016.

Results: In total, 1,975 children and 5,474 adults received CIs. Infectious complications occurred in 64 children (3.2%) at a rate of 8.2 comp. / 1,000 person-years (95% CI 6.6-10.2). Children aged one and two years had the highest rates of infectious complications, 15.4 and 14.8 comp. / 1,000 person-years, respectively. Infectious complications occurred in 110 adults (2.0%) at a rate of 5.2 comp. / 1,000 person-years (95% CI 4.3-6.1). Pediatric infectious complications typically occurred earlier than adult infectious complications with 55% (N=47) of pediatric comp. occurring within 180 days of CI compared to 43% (N=56) of adult comp. Less than 11 cases (<0.15%) of meningitis, petrositis, and postauricular fistulas were observed.

Conclusions: The low rates of infectious complications in CI recipients in this study confirm the safety of CIs and are useful as reliable point estimates for future investigations. Children aged one and two years experienced infectious complications at roughly three times the rate of older pediatric CI recipients. The overall increase in infectious complications in children is predominantly driven by early complications, occurring within 180 days. Increased vigilance early after implantation is warranted by healthcare providers for young children receiving CIs.

Psychiatry K12 Career Development Awards Program in Drug Abuse and Addiction

Oral **Muthulingam, Dharushana, MD, MS**

Talk Funding Program: Psychiatry K12 Career Development Awards Program in Drug Abuse and Addiction

Institution: Washington University School of Medicine

Research Department: Medicine

Mentors: Frederick L Altice, MD, MA; Laura Bierut, MD

Criminal Justice History for Individuals With Opioid Use Disorder (OUD) Presenting to a Community Substance Use Treatment Center and Intention for Medication for Addiction Treatment (MAT)

Muthulingam D, Madden LM, Barry DT, Altice FL

Introduction: The OUD epidemic is especially concentrated in the criminal justice system (CJS). Overdose is the leading cause of mortality among incarcerated individuals transitioning to the community and many initiate treatment involuntarily from CJS requirements. MAT can significantly reduce the risk of death and relapse in this transition period, but the characteristics of this transitioning population are not well known. Identifying characteristics is the first step towards increasing uptake of MAT, which is a key clinical translation goal. Aim: in this preliminary analysis of a survey study of MAT preferences, we compare patients with OUD and differing CJS experiences presenting to initiate care at a large community substance use treatment center.

Methods: Participants were eligible if age ≥ 18 , met criteria for OUD, and were presenting for care initiation. Survey included summary of treatment options and queried demographics, experience, and preferences. Chi-squared test compared categorical variables.

Results: Of 195 individuals with OUD presenting to start care, 64.1% had history of incarceration, of whom 54% had been incarcerated 30 days prior to presentation. Of all, 24% had been legally compelled to treatment. Those with any incarceration history were more likely to be men, Hispanic, and MAT-experienced (24.6% vs 15%, $p=0.025$). Those recently incarcerated were more likely to be black and less likely to have injected (27.4% vs 40.3%, $p=0.0298$). Those who had been legally required to present for treatment were more likely to be men and had less intention to start MAT (78.7% vs 85.1%, $p=0.0492$).

Conclusions: Most of those presenting for OUD care in our study have an incarceration history, half of whom, recently. A quarter of new OUD patients had been legally ordered to present to care. Remote incarceration had higher likelihood of injection behavior, while those with civil commitment were less likely to intend MAT initiation, indicating unique risk factors and suggesting tailored counseling strategies are warranted. Next steps should evaluate motivations, preferences, and barriers to care to better target counseling and outreach for this high-risk population.

No **Ramsey, Alex, PhD**

Poster Funding Program: Psychiatry K12 Career Development Awards Program in Drug Abuse and Addiction

Institution: Washington University School of Medicine

Research Department: Psychiatry

Mentors: Laura Bierut, MD; Enola Proctor, PhD

Participatory Design of a Personalized Genetic Risk Tool to Promote Use of Smoking Cessation Interventions

Ramsey AT, Dorsey A, Zalik M, Chen LS, Bierut LJ

Introduction: Returning genetic susceptibility test results related to smoking has the potential to increase use of tailored treatments and reduce disease risk. However, too little research has focused on the communication of such results for maximal acceptability and utility. The goal of this study was to engage stakeholders in a participatory co-design process to inform the perceived utility and optimal communication of a personalized genetic risk tool for smoking.

Methods: The personalized "genetics report card" was designed to communicate one's relative genetic risk (e.g., much above average) related to smoking (lung cancer/COPD/relapse), along with treatment recommendations tailored to genotype. Brief in-person participatory design interviews ($n=110$) and quantitative surveys ($n=100$) were conducted with hospitalized patients who smoke, non-patients who smoke, and medical professionals. Design-oriented feedback on the content and format of the personalized "genetics report card" was thematically analyzed and used to inform development of new versions.

Results: Six iterative versions of the report card were successively evaluated in an evolving "horse race". Acceptability improved with newer versions, and 92% preferred the final version over its predecessor. Current smokers were more likely to interpret the message of the report card as urging cessation whereas medical professionals typically interpreted the message as informing a genetic role on disease risk. Of the 100 surveyed participants, 75 were interested in receiving smoking-related genetic results. After 34 participants viewed a sample smoking-related genetic risk report, 32 (94%) were interested in receiving a similar personalized report. A plurality (48%) rated the most useful aspect of the report to be "motivate behavioral change", followed by 27% indicating a primary purpose of "advise specific actions to take".

Conclusions: Iterative design and feedback with key stakeholders yielded a highly acceptable smoking-related genetic risk report that should be tested in clinical, direct-to-consumer, or other community-based settings to promote use of evidence-based smoking cessation interventions.

David F. Silbert Summer Fellowship (Silbert)

7 Basri, Noah

Funding Program: David F. Silbert Summer Fellowship (Silbert); WUSM Dean's Fellowship

Research Program: Summer Research Program

Doctoral Program of Study: Medicine

Institution: Washington University School of Medicine

Research Department: Genetics

Mentors: Ting Wang, PhD; Hyo Sik Jang; Nakul Shah

A Dual Epigenetic Editing System for Site-Specific Modulation of Gene Expression

Basri NL, Jang HS, Shah N, Wang T

Introduction: Histone deacetylase inhibitor and DNA methyltransferase inhibitor therapies, now widely used to treat cancer and other diseases, alter the entire epigenome of target cells. Until now, the synergy of DNA demethylation and histone acetylation has not been harnessed in a site-specific manner. Whereas current systems bring in one effector at a time to achieve one type of epigenetic effect (e.g. methylation, demethylation, etc), our approach consists of a dual epigenetic editing system that enables simultaneous DNA demethylation and histone acetylation at a desired locus.

Methods: The SunTag epitope array was fused to the catalytically inactive dCas9 to enable site-specific recruitment of DNA and chromatin modifying enzyme such as TET and p300. This was achieved through Gibson Assembly, a cloning method for scarless assembly of multiple DNA fragments.

Results: Plasmids containing the p300 histone acetyltransferase and KRAB repressor domains fused by a linker to the ms2 bacteriophage coat proteins were generated. The gRNA was designed against the mobile SINE element AluJb and was verified to contain the MS2 loops by Sanger sequencing.

Conclusions: A growing number of pathologies are characterized by an aberrant epigenetic landscape. The targeted dual epigenetic editing system will enable site-specific gene activation or repression by editing the local epigenetic milieu. We anticipate the locus-specific epigenetic editing platform presented here will inform future attempts to interrogate the role of epigenetics in cancer, neurological pathologies and other diseases. Subsequent work will be directed towards achieving lentiviral transduction of DMS-53 and K562 cell lines. Additionally, the efficacy of the targeted dual epigenetic editor system will be assessed by ChIP-qPCR, western blot and bisulfite sequencing in those cell lines.

Siteman Cancer Center Leah Menshouse Springer Summer Student Program

15 Chidambaram, Smrithi

Funding Program: Siteman Cancer Center Leah Menshouse Springer Summer Student Program

Doctoral Program of Study: Medicine

Institution: Saint Louis University

Research Department: Otolaryngology

Mentors: Jose Zevallos, MD, MPH, FACS; Angela Mazul, PhD, MPH

Prognostic significance of smoking status on HPV-positive oropharyngeal cancer staged under the 8th edition of the American Joint Committee on Cancer (AJCC-8) staging guidelines

Chidambaram S, Nakken ER, Thorstad WL, Kennedy WR, Zevallos JP, Mazul AL

Introduction: Human Papilloma Virus (HPV)-positive oropharyngeal squamous cell carcinoma (OPSCC) has a better prognosis and response to treatment than HPV-negative oropharynx cancer associated with more traditional risk factors such as tobacco and alcohol. In 2017, the American Joint Committee on Cancer separated staging for HPV-positive and HPV-negative oropharyngeal cancers in the 8th edition of the AJCC Cancer Staging Manual. However, AJCC-8 does not incorporate smoking status into the staging of HPV-positive tumors of the oropharynx. This study aims to determine the prognostic significance of smoking on HPV-positive OPSCC when controlling for AJCC-8 stage.

Methods: This is a retrospective cohort study of 344 HPV-positive OPSCC cases with known stage and smoking status seen by a radiation oncologist at a tertiary academic center from 1997-2017. Smoking status was reported as ever or never tobacco smoker. Univariate and multivariable analyses were conducted. Kaplan-Meier curves were generated to compare 5-year overall survival (OS) in the ever and never smoking groups and stratified by AJCC-8 stage. Hazard ratios (HR) were estimated with Cox proportional hazard regression for the independent effects of smoking status and stage.

Results: In this HPV-positive OPSCC cohort, univariate analysis indicated never smokers demonstrated better 5-year OS when compared with ever smokers. When 5-year OS was stratified by AJCC-8 stage, stage I never smokers had the best survival (98.15%; 95% CI: 94.62%-100%), with significantly better survival than stage I ever smokers (85.7%; 95% CI: 78.7-93.4). Statistically significant trends of smoking on prognosis were limited to stage I disease. In the multivariable analysis, after adjusting for sex and age, never smoking (HR: 0.46; 95% CI: 0.22-0.97) was associated with decreased risk of death compared to ever smoking while also adjusting by AJCC-8 stage.

Conclusions: Smoking is prognostic in HPV-positive OPSCC but may only be relevant in AJCC-8 stage I and stage II disease. It is important for physicians to understand the impact of smoking in HPV-positive OPSCC when considering treatment plans and de-escalated treatment strategies.

22 Dorsey, Amelia

Funding Program: Siteman Cancer Center Leah Menshouse Springer Summer Student Program

Doctoral Program of Study: Psychology

Institution: Webster University

Research Department: Psychiatry

Mentors: Laura Bierut, MD; Alex Ramsey, PhD

Participatory design of a personalized genetic risk tool to promote use of evidence-based behavioral health interventions

Dorsey AJ, Ramsey AT, Zalik MR, Chen LS, Bierut LJ

Introduction: Returning genetic results for various health conditions has the potential to create tools to communicate and reduce disease risk. However, researchers have rarely engaged in designing personalized genetic risk reports, particularly within behavioral health. The goal of this study was to engage community members in a process of participatory co-design to inform the communication of personalized genetic risk related to smoking. Specifically, we examined whether this approach to co-design could yield a more comprehensible tool for communicating genetic risks.

Methods: The personalized "genetics report card" was designed to communicate one's relative genetic risk (e.g., much above average) related to smoking (lung cancer/COPD/relapse) along with treatment recommendations tailored to genotype. Brief in-person participatory design interviews were conducted with participants (n=110) representing several groups, including hospitalized patients who smoke, non-patients who smoke, community health educators, biomedical and behavioral health researchers, and medical professionals in oncology and genetics. Design-oriented feedback on the content and format of the personalized "genetics report card" was thematically analyzed and used to inform development of new versions.

Results: Six versions of the report card were successively evaluated in turn. New versions were generally more acceptable than prior versions, and 92% preferred the final version over its predecessor. Current smokers were more likely to interpret the message of the report card as urging behavior change (e.g., "quit smoking") whereas healthcare professionals typically interpreted the message as informing a genetic role on disease risk (e.g., "a genetic component increases my risk for lung problems").

Conclusions: This study provides support for participatory co-design because our iterative process of design and rapid feedback efficiently generated a more acceptable version of a behavioral health genetic risk report. This rapid cycle co-design process can be implemented in clinical, direct-to-consumer, or other community-based settings to promote patient and consumer demand for a wide range of evidence-based treatments.

34 Grinwald, Mitchell

Funding Program: Siteman Cancer Center Leah Menshouse Springer Summer Student Program

Mentors: Milan Chheda, MD; Luciano Galdieri, PhD

Mapping the ZFH4-CHD4 interaction in glioblastoma stem cells

Grinwald M, Galdieri L, Chheda MG

Introduction: Glioblastoma (GBM) is the most common and aggressive brain tumor. Recurrence is inevitable, and most patients die within two years. GBM stem cells (GSCs), highly treatment-resistant cells, may be one reason for rapid GBM recurrence. Previously we demonstrated that ZFH4, a 450kD transcription factor, is required for the GSC state and it interacts with CHD4, a core member of the nucleosome remodeling and deacetylase (NuRD) complex. Both ZFH4 and CHD4 co-localize to the same genomic loci and regulate a highly overlapping set of genes. To understand ZFH4 function and potentially abrogate its interaction with CHD4, we are studying how the two proteins interact.

Methods: We generated deletion fragments of ZFH4 to identify the minimal region required for its interaction with CHD4. We then subcloned this region of interest (ROI) and mutated it to disrupt its two zinc fingers domains. We used co-immunoprecipitation, followed by immunoblotting, to test the ROI and mutant variants for their ability to interact with CHD4. We carried out all experiments in 293T cells.

Results: We found the ZFH4-CHD4 interaction requires zinc, but not DNA. Using ZFH4 deletion fragments and immunoprecipitation studies, we identified a ROI required for the CHD4 interaction. This region contains two zinc finger domains, which may mediate the ZFH4-CHD4 interaction. We found that the ROI can interact with CHD4 and that this interaction is disrupted by alanine substitutions at the zinc coordinating residues of the zinc finger 14 (ZF14) of ZFH4.

Conclusions: Our current results implicate ZF14 as critical to the ability of the ZFH4 to interact with CHD4. Identification of ZF14 as modulating the ZFH4 interaction with the NuRD complex may provide the basis for new differentiation therapies for GBM.

Summer Opportunities Abroad Program (SOAP) - WUSM Global Health & Medicine (GH&M)

33 Ghaznavi, Cyrus

Funding Program: Summer Opportunities Abroad Program (SOAP) - WUSM Global Health & Medicine (GH&M); JMSA Fellowship
Research Program: Summer Research Program

Doctoral Program of Study: Medicine

Institution: Washington University School of Medicine

Research Department: Medicine; Japan

Mentors: Peter Ueda, MD, PhD; Haruka Sakamoto, MD; Gerome Escota, MD; Kenji Shibuya, MD, DrPH

The Herbivore's Dilemma: Changes in and Factors Associated with Heterosexual Relationship Status and Interest in Romantic Relationships Among Young Adults in Japan - Analysis of National Surveys, 1987-2015

Ghaznavi CM, Sakamoto H, Nomura S, Kubota A, Yoneoka D, Shibuya S, Ueda P

Introduction: It has been suggested that an increasing proportion of young adults in Japan have lost interest in romantic relationships, a phenomenon termed "herbivization," but this has not been assessed in nationally representative data. Individuals in romantic relationships tend to experience better health outcomes and overall life satisfaction compared to their single counterparts. We sought to assess changes in, and socioeconomic factors associated with, heterosexual relationship status and reported interest in romantic relationships.

Methods: We performed cross-sectional analyses of seven rounds of the National Fertility Survey (1987-2015), a nationally representative survey of Japan, including adults aged 18-39 years (n = 11,683-17,675). Respondents were categorized based on current heterosexual relationship status (married; unmarried but in a relationship; single), with singles further classified into those reporting interest vs. no interest in heterosexual romantic relationships.

Results: Between 1992 and 2015, the age-standardized proportion of 18 to 39-year-old Japanese adults who were single had increased steadily, from 27.4 to 40.7% among women and from 40.4 to 50.8% among men. This increase was largely driven by decreases in the proportion of married among women aged 25-39 years and men aged 30-39 years, while those in a relationship had increased only slightly for women and remained stable for men. By 2015, the proportion of single among women was 30.2% (30-34 years) and 24.4% (35-39 years); the corresponding numbers for men were 39.3% and 32.4%. Around half of the singles (21.4% of all women and 25.1% of all men aged 18-39 years) reported that they had no interest in heterosexual romantic relationships. Single women and men who reported no interest in romantic relationships had lower income and education and were less likely to have regular employment compared to those who reported such an interest.

Conclusions: Singlehood among young adults in Japan has steadily increased over the last three decades. The large proportion of young adults that has lost interest, given up, or find it hard to form romantic relationships may have important implications for public health and fertility in Japan.

52 Kauffman, Samantha

Funding Program: Summer Opportunities Abroad Program (SOAP) - WUSM Global Health & Medicine (GH&M); WUSM Dean's Fellowship

Research Program: Summer Research Program

Doctoral Program of Study: Medicine

Institution: Washington University School of Medicine

Research Department: Pediatrics; Sierra Leone

Mentors: Mark Manary, MD; David Taylor Hendrixson, MD

Comparison of an alternative therapeutic food for the international food aid market to a standard ready-to-use therapeutic food (RUTF) for the treatment of severe acute malnutrition in children of the Western Rural Area and Pujehun District of Sierra Leone

Kauffman SL, Hendrixson DT, Manary MJ

Introduction: Severe acute malnutrition (SAM) is the cause of 10% of deaths worldwide. Ready-to-use therapeutic food (RUTF) is an effective treatment for severe acute malnutrition (SAM). Only about 20% of children with SAM have access to treatment and around 50% of RUTF is imported from Europe or the United States. An alternative RUTF formulation that is nutritionally equivalent to standard RUTF, but with a lower associated cost may increase access to treatment. This study aims to compare the reported symptoms and compliance associated with the standard RUTF and the alternative RUTF.

Methods: Children ages 6-59 months diagnosed with SAM were recruited from rural health clinics in the Western Rural Area and Pujehun District of Sierra Leone to participate in a randomized, double-blinded, controlled clinical equivalency trial comparing the two RUTFs. Caretakers received a two-week ration of the randomized RUTF with instructions on daily feeding methods. Subjects and caretakers returned for follow-up, food collection, measurements, and monitoring of any adverse events every two weeks until recovery or failure. Any adverse symptoms such as vomiting, diarrhea, fever, or cough were recorded for comparison between the two groups.

Results: The study is currently ongoing, but we anticipate that there will be no significant differences in the prevalence of adverse symptoms between the standard and the alternative RUTF based on preliminary data.

Conclusions: If the final findings bear out our initial results, then the alternative RUTF formulation - which is lower cost and nutritionally equivalent to the current standard RUTF - may help to increase access to treatment for children under five with SAM.

85 Ofori, Joel

Funding Program: Summer Opportunities Abroad Program (SOAP) - WUSM Global Health & Medicine (GH&M); WUSM Dean's Fellowship

Research Program: Summer Research Program

Doctoral Program of Study: Medicine

Institution: Washington University School of Medicine

Research Department: Medicine; Ghana

Mentors: Gary Weil, MD; Alex Debrah, PhD

Use of Doxycycline to Improve Filarial Lymphedema 200mg/d vs 100mg/d for 6weeks in Ghana

Ofori JK; Debrah AY

Introduction: Lymphatic Filariasis (LF) is a parasitic neglected tropical disease. An estimated 16.7 million of those infected suffer from Lymphedema (LE). The study's purpose is to 1) confirm the findings of a previous study reporting the efficacy of 200mg Doxycycline (DOX) per day for 6 weeks in reversing or stopping the progression of filarial LE stages 1-3 and 2) determine whether a dosage reduction to 100mg/day DOX for 6 weeks has similar efficacy as 200mg/day DOX. As part of the Summer Opportunities Abroad Program, my goals during this rotation were to experience clinical research fieldwork in a global setting and gain insight into the geographic and environmental factors leading to LF. I also was able to see clinical manifestations of LF up close.

Methods: This is a prospective, multinational, double-blinded, placebo-controlled, interventional phase II clinical trial.

Participants (n=420) were randomized among 3 treatment groups and separated into parallel groups. During the 12-months follow-up, I assisted with re-staging, clinical photographs, and examination of participants. I also assisted with limb measurements using the traditional lower limbs circumference tape measurements and a newly introduced scanning device known as the Lymphatech®. Blood, urine, and saliva were collected, along with pregnancy tests for eligible patients. Participants will be followed up again at 18 and 24 months after the start of treatment.

Results: The research is still underway. It is anticipated that after trial completion, sample analysis will show that 100mg/day DOX for 6 weeks is just as effective as the 200mg/day DOX for 6 weeks dose in causing a lack of progression and even reduction of filarial LE in study participants with LE stages 1 to 3. It is also expected that fewer adverse events occur in study participants with the lower dosage of 100mg/day DOX.

Conclusions: Granted results are as expected, it will be proposed to policy makers that DOX become part of the standard in LF morbidity management. Lower dosages of DOX will also be less costly to health care providers and not require supervision, allowing it to be more widely distributed and reach more of the affected individuals. Further research will be required to move the trial to phase III and phase IV to expand on the general use of DOX as a treatment alternative to current interventions.

93 Qiao, Luxi

Funding Program: Summer Opportunities Abroad Program (SOAP) - WUSM Global Health & Medicine (GH&M); WUSM Dean's Fellowship

Research Program: Summer Research Program

Doctoral Program of Study: Medicine

Institution: Washington University School of Medicine

Research Department: Epidemiology; London

Mentors: Elizabeth Brickley, PhD, Mphil; Celina Turchi, MD, PhD; Caline Mattar, MD

Assessment of surveillance and screening programs for congenital ZIKA defects in the Americas

Qiao L, Ramond A, Turchi Martelli CM, Brickley EB

Introduction: Zika virus (ZIKV) is a globally transmitted emerging infectious disease that is unique among the arboviruses due to its teratogenic effects, which can cause severe adverse birth outcomes. While surveillance programs for ZIKV-related birth defects have been set up in response to the epidemic in the Americas, no current guidelines regarding screening for ZIKV in pregnancy are available. Given the complexity of disease dynamics and the severity of clinical outcomes, an overview of the existing surveillance programs and a formal assessment of the potential feasibility and utility of a screening program are warranted.

Methods: We selected countries in the Americas that reported >50 cases of Congenital Zika Syndrome (CZS) from 2015 to present and described them in terms of operational characteristics and frequency of ZIKV-related birth outcomes. We then used the Wilson-Jungner Screening Criteria to evaluate whether a ZIKV screening program for pregnant women is currently feasible and to identify priorities for further research.

Results: During the 2015-2017 ZIKV epidemic in the Americas, ZIKV-related birth defects were detected by both initiating new surveillance systems and repurposing existing surveillance systems. Since the causal link between ZIKV and microcephaly was not initially confirmed, the first surveillance programs focused on identifying neonates with birth defects. As causality was confirmed, surveillance was expanded to include pregnant women at risk of ZIKV infection. Evaluation of a potential ZIKV-screening program for pregnant women highlights factors affirming its usefulness, such as the importance of CZS as a health problem and the existence of prenatal cytomegalovirus screening program as a precedent, and reveals several barriers to implementation, such as the need for more specific diagnostic tests and for effective antiviral treatments.

Conclusions: While they serve different purposes, both surveillance and screening programs are useful tools for epidemic preparedness. Given that the reemergence of ZIKV is likely, this research will inform public health officials in designing future public health strategies to reduce the burden of adverse ZIKV-related birth outcomes.

95 Rauschenbach, Michael, PhD

Funding Program: Summer Opportunities Abroad Program (SOAP) - WUSM Global Health & Medicine (GH&M); WUSM Dean's Fellowship

Research Program: Summer Research Program

Doctoral Program of Study: Medicine

Institution: Washington University School of Medicine

Research Department: Medicine; Ukraine

Mentors: Natasha Rybak, MD; Jennifer A Phillips, MD, PhD

Correlating Clinical and Pathological Data for Counting Kids: Enhancing Detection of Pediatric Tuberculosis in Ukraine

Rauschenbach M, Rybak N, Petrenko V, Dolynska M, Gychka S, Semenjuk K

Introduction: Tuberculosis caused an estimated 1.6 million deaths and 10 million global cases in 2017, 10% of which occurred in children under 15. However, pediatric tuberculosis is under-reported in part because our best diagnostic tools only capture 25% of cases. Still, Ukraine's Ministry of Health (MOH) reported 2017 rates of pediatric TB (2.5%) and pediatric TB deaths (9), well below global estimates implying that TB is under-diagnosed both clinically and on autopsy. Our research this summer identified clinical medical records associated with the autopsy reports for children who died in 2017. We sought to connect clinical and pathology data in order to identify undiagnosed cases of pediatric TB in Kyiv Oblast.

Methods: Of 632 pediatric autopsies from 2017, 597 were excluded by various criteria as very unlikely to be TB. After locating as many of the remaining 35 medical records, stored on paper at 10 hospitals in Kyiv Oblast, as we could, we collected available TB-relevant data, including presenting symptoms, exposure history, history of vaccination, documented differential diagnoses, diagnostic testing and results, and causes of death. This data will then be combined with pathology data to classify these 35 cases as probable TB, possible TB, TB unlikely, or Not TB.

Results: Our classificatory work is not complete. Early analysis suggests several cases of possible TB in our cohort. Given that Kyiv is only 1 of 24 administrative regions of Ukraine, these few cases would add significantly to the low number of reported pediatric TB deaths. Rural patients, and those whose parents refuse vaccinations, appear more likely to meet our inclusion criteria for possible TB.

Conclusions: Constructing useful retrospective datasets in Ukraine is more difficult than in the US, but our work this summer provides proof of feasibility for further projects. Developments of our project include a prospective study that enrolls children with suspicion of active TB and collects samples for analysis with newer diagnostic techniques. Ultimately, the Brown & National Bogomolets Medical University Collaboration hopes to identify lacunae in the diagnosis of pediatric TB in order to improve outcomes for Ukrainian children.

96 Roberts-Sano, Olivia

Funding Program: Summer Opportunities Abroad Program (SOAP) - WUSM Global Health & Medicine (GH&M); WUSM Dean's Fellowship

Research Program: Summer Research Program

Doctoral Program of Study: Medicine

Institution: Washington University School of Medicine

Research Department: Medicine; Guatemala

Mentors: Jane O'Halloran, MD; Carlos Mejia, MD; Andrej Spec, MD, MSCI; Joanna Melendez, MD

Implementation of a Guatemalan cohort study of comorbidities in people living with HIV

Roberts-Sano O

Introduction: Advances in ART and HIV care have led to a higher life expectancy in people living with HIV (PLWH), meaning that other comorbidities are now a greater concern in the aging population. While research on comorbidities in PLWH exist for some regions, there is no such data for Central America. Genetic, lifestyle, and clinical factors vary greatly between populations, making it necessary to study comorbidities in PLWH in Central America as well. The study aims to answer what is the epidemiology of comorbidities in PLWH in Guatemala. The specific aim of our project this summer was to implement the baseline data collection for this study.

Methods: The implementation of the baseline data collection involved multiple phases. First, there was a review of the proposed questions about demographics, lifestyle and medical history and changes based on local wording and more accurate capturing of the intended piece of data. Then changes were made to the collection tool for accuracy and completeness of answers. Detailed protocols on how to conduct interviews and take vital signs and anthropometric measurements were written to ensure longitudinal continuity. A smaller pilot group of interviews were conducted to assess the method and to make adjustments before full implementation. This implementation was the start of a 5-year prospective cohort study of patients over the age of 18 who attend a public HIV clinic.

Results: The expected results from the implementation of the baseline of this cohort include clinical and demographic characteristics and the prevalence of different comorbidities.

Conclusions: The results could help inform patient care of PLWH in Guatemala by providing the prevalence of different comorbidities in different subsets of the patient population.

T35 NIH NHLBI Training Grant

11 Broberg, Curtis

Funding Program: T35 NIH NHLBI Training Grant
Research Program: Summer Research Program
Doctoral Program of Study: Medicine
Institution: Washington University School of Medicine
Research Department: Surgery
Mentors: Alison Snyder-Warwick, MD; Ala Jablonka, PhD

Investigating a novel role for Tbx21: NMJ reinnervation after injury

Broberg CJ, Jablonka A, Snyder-Warwick A

Introduction: Terminal Schwann cells (tSCs) serve as critical regulators of neuromuscular junction (NMJ) function through roles in synaptogenesis, maintenance, and repair after injury. A potential marker exhibiting enhanced expression in these cells, Tbx21, is a transcription factor classically associated with T cells and with recruitment of immune elements. The purpose of this study was to characterize the effects of Tbx21 absence at the NMJ during the reinnervation process following injury.

Methods: Wild Type (WT) and Tbx21^{-/-} mice underwent sciatic nerve transection and repair. Morphometric analysis of NMJ reinnervation was conducted on 7 WT and 8 Tbx 21 null (Tbx21^{-/-}) mice, with examination of a total of 963 NMJs. Muscle force analysis was conducted on 9 WT and 7 Tbx21^{-/-} mice.

Results: Morphometric analysis revealed that at every time point, Tbx21^{-/-} mice showed significantly lower levels of full NMJ reinnervation than WT mice. Muscle force analysis was conducted at multiple timepoints following sciatic nerve injury and repair. At 4 weeks Tbx21^{-/-} mice generated only 56.39% of the force generated by WT mice. There were no statistically significant differences in muscle force at 3 and 6 weeks.

Conclusions: These results indicate that Tbx21 does play a role in proper and timely NMJ reinnervation.

12 Cai, Michelle

Funding Program: T35 NIH NHLBI Training Grant
Research Program: Summer Research Program
Doctoral Program of Study: Medicine
Institution: Washington University School of Medicine
Research Department: Medicine
Mentors: Timothy Ley, MD; Casey Katerndahl, PhD

Evaluation of putative PML-RAR α target genes for their ability to cause aberrant self-renewal in hematopoietic progenitor cells

Cai MA, Katerndahl CDS, Ley TJ

Introduction: Acute promyelocytic leukemia (APL) is initiated by a translocation resulting in the fusion of two transcription factors, PML and RAR α . While treatment has vastly improved survival, the mechanisms by which the PML-RAR α (PR) fusion enables self-renewal remain unknown. We have used PR-knock-in mice and APL patient samples to identify genes that are differentially expressed in PR⁺ cells. These genes were further screened for PR binding partners by ChIP-seq. Ultimately, three genes—GATA2, CPA3, and SLC45A3—were evaluated here for effects on PR-driven self-renewal.

Methods: Bone marrow cells from PR⁺, Cas9⁺ mice were transfected with gRNAs against GATA2, CPA3, SLC45A3, and Rosa26 as a transfection control. Cells were then grown in methylcellulose with cytokines to facilitate hematopoietic stem cell growth. Each week, colonies were counted, cells harvested, and aliquots taken for replating in methylcellulose, staining for flow cytometry analysis, and DNA isolation for gRNA target sequencing.

Results: In the absence of PR, all cells fail to self-renew regardless of Cas9-induced mutations. GATA2 and SLC45A3 mutations in PR⁺ cells exhibit accelerated self-renewal compared to cells with mutations in Rosa26 or CPA3. Sequencing suggests a selective pressure is exerted on these GATA2 mutations, as 100% of alleles bear a GATA2 mutation by week 4 of culturing, compared to ~50% in Rosa26-mutated cultures. Flow cytometry indicates persistence of promyelocyte phenotype for all PR⁺ groups except those with mutations at the first zinc finger of GATA2, which exhibit a lineage switch to monocytic precursors. PR⁻ cultures rapidly differentiate into mature, mast-like cells.

Conclusions: These results implicate GATA2 as a key gene in the response to PR-driven proliferative stress. The self-renewal and lineage shift observed indicates that this gene plays a regulatory role when cells are assuming the APL phenotype. Future work must be done to examine if this response is specific to PR or if it can be generalized to other oncogenic stresses. This novel pathway may have check-points that can be targeted by chemotherapy or provide insight into how cells can be stimulated to resist oncogenic proliferation when it occurs.

13 Chiang, Sarah

Funding Program: T35 NIH NHLBI Training Grant
Research Program: Summer Research Program
Doctoral Program of Study: Medicine
Institution: Washington University School of Medicine
Research Department: Neurosurgery
Mentors: Eric Leuthardt, MD; Joseph Humphries

Development of a non-invasive brain-computer interface intervention for painful carpal tunnel syndrome

Chiang SN, Leuthardt EC

Introduction: Carpal tunnel syndrome (CTS) affects 3 to 6% of American adults and often presents with severe chronic hand pain, costing the US over \$600 billion per year in lost productivity and medical costs. Surgery is considered the most effective treatment, but up to 12% of patients' symptoms do not improve post-operatively and up to 5% experience complex regional pain syndrome with hand pain as a complication of surgery. Studies have shown that brain-computer interfaces (BCIs), which measure electrical signals in the brain by electroencephalogram (EEG), can improve function in a paralyzed hand after stroke or even decrease phantom limb pain by strengthening specific neuronal connections. This study describes the creation of a BCI designed to improve CTS patients' painful symptoms by incorporating vibrating tactile feedback over the affected hand and training the user to maximize theta-frequency (4-8 Hz) electrical signals in the brain, which are associated with a relaxed, meditative state.

Methods: The system uses a non-invasive EEG headset to record activity from the user's scalp, and then outputs both visual and tactile feedback to the user based on the received signals—a cursor that moves upward and motors that increase their vibration strength as theta signals increase. The BCI also includes a passive mode, in which the user does not make any conscious effort to change their theta rhythms; rather, a machine learning algorithm adjusts the motors until theta power is maximized.

Results: The tactile feedback was constructed to contain 48 motors that cover both surfaces of the user's hand, controlled by custom circuit boards and software that controls their activity based on the EEG input. We anticipate that this new BCI will afford the user an understanding of how their theta rhythms are changing; therefore, with repeated training, they can learn how to control and maximize their theta rhythms for the best pain control possible.

Conclusions: Ultimately, our hope is that this BCI system will train CTS patients' pain control circuits into a more physiologic state, reducing the severity of their symptoms and allowing these patients who had lost hope of a pain-free life return to their daily activities.

14 Chibueze, Stanley

Funding Program: T35 NIH NHLBI Training Grant
Research Program: Summer Research Program
Doctoral Program of Study: Medicine
Institution: Washington University School of Medicine
Research Department: Otolaryngology
Mentors: Jay Piccirillo, MD, FACS; Nedim Durakovic, MD; Dorina Kallogjeri, MD, MPH

Pre-Habilitation with Computer-Based Cognitive Therapy in Individuals to Undergo Cochlear Implantation

Chibueze S, Khan AM, Kukuljan S, Bommarito T

Introduction: Cochlear implantation (CI) is an effective treatment for hearing loss that has improved significantly since its inception. However, post-operative outcomes remain variable. Clinically, that translates to poor predictive measures and a lack of effective interventions. In this study, we sought to evaluate the efficacy of preoperative BrainHQT^M intensive cognitive training, any correlation between responsiveness to BrainHQT^M exercises and future performance in CI, and to determine improvement, if any, in CI performance with preoperative use of a BrainHQT^M training program.

Methods: In this prospective, open-label clinical study comparing visual-intensive BrainHQT^M exercise regimen to a matched, retrospective cohort for those who will receive a cochlear implant for hearing loss, participants were required to complete 30 minutes of pre-selected visual intensive cognitive BrainHQT^M training per day, 5 days per week for at least 6 weeks.

Results: This study is still ongoing. Therefore, in lieu of experimental data, we opt to present our predictions. We expect to see a positive correlation between improvements in BrainHQT^M program performance and CI performance. Additionally, we expect for participants of this study (the exposed group) to have a better CI outcome as measured from the hearing and speech recognition tests including audiogram, CNC word recognition test, AzBio sentence test in quiet and noise compared to their unexposed match pairs, and that the change in performance from baseline for the exposed group through 1 year will be more extensive compared to the unexposed group.

Conclusions: If the data supports our predictions, we would be able to conclude that the pre-operative cognitive training program, BrainHQT^M for patients undergoing cochlear implantations is efficacious in predicting future CI performance. Additionally, preoperative use of cognitive BrainHQT^M program improves CI outcomes. BrainHQT^M may also allow for better stratification between groups of patients prior to CI surgery, as it may show that some CI candidates have greater neuroplastic potential and thus will have better CI performance.

20 Coxon, Andrew

Funding Program: T35 NIH NHLBI Training Grant

Research Program: Summer Research Program

Doctoral Program of Study: Medicine

Institution: Washington University School of Medicine

Research Department: Neurosurgery

Mentors: Gavin Dunn, MD, PhD; Tanner Johanns, MD, PhD

Mapping the draining lymph nodes of the central nervous system

Coxon AT, Johanns TM, Dunn GP

Introduction: Despite the dogma that the central nervous system (CNS) is an immune privileged site, recent evidence shows that the immune system actively surveils the CNS. Within the past 5 years, scientists have discovered lymphatic vessels in the meninges of mice and humans. These vessels lead to the deep cervical lymph nodes (DCLN) in mice and in humans, but the specific lymph nodes that drain the human CNS are unknown. Technetium tilmanocept (TcTM) is a radiopharmaceutical that binds to mannose receptors (CD206). Macrophages and dendritic cells express CD206 in lymph nodes, so TcTM will bind to these cells in the lymph nodes after draining from the injection site. TcTM can be detected by lymphoscintigraphy (LS) and single-photon emission computed tomography with x-ray computed tomography (SPECT-CT). Surgeons use TcTM to determine which lymph nodes to remove during cancer resection surgery, but TcTM has not been studied in the brain. We intend on using TcTM to map the draining lymph nodes of the CNS.

Methods: Patients having a tumor resected are eligible for the trial. All patients will have TcTM injected intracranially after tumor resection. Six patients will be enrolled in Cohort 1 to define the time course of drainage to the lymph nodes. Patients in Cohort 1 will be imaged with planar LS within 7 hours of injection and the following day. Either 12 or 24 patients will be enrolled into Cohort 2 to localize the draining lymph nodes with SPECT-CT. The optimal imaging timepoint from Cohort 1 will be used for Cohort 2. Patients in Cohort 2 will be stratified depending on if their tumor is in the frontal, parietal, occipital, or temporal lobe.

Results: We anticipate that TcTM will be detected in the deep cervical lymph nodes after injection into the brain. It is unclear exactly which lymph nodes the tracer will go to. We hypothesize that the results among patients will be similar, but interindividual variation is a possibility. Furthermore, patients with disease in different lobes of the brain may have different lymph drainage patterns.

Conclusions: We anticipate enrolling the first patients in late August or early September. The results of this research may inform future study of CNS immune surveillance.

23 Dowling, Anna

Funding Program: T35 NIH NHLBI Training Grant

Research Program: Summer Research Program

Doctoral Program of Study: Medicine

Institution: Washington University School of Medicine

Research Department: Psychiatry

Mentors: Cynthia Rogers, MD; Christopher Smyser, MD; Rachel Lean, PhD

The relationship between resting-state functional connectivity and executive function in very preterm children

Dowling AV, Lean RE, Rogers CE, Smyser CD

Introduction: Executive function (EF) refers to the cognitive framework underlying our ability to plan and organize, regulate emotions, and maintain focus on tasks. Children born very preterm (VPT) have impairments in EF. Aberrant functional connectivity within and between key brain networks may underlie these deficits. This study used resting-state fMRI (rsfMRI) to examine functional connectivity in the brains of VPT children at age 9-10 with the goal of determining which networks and regions are most strongly associated with EF.

Methods: EF was tested in 44 VPT children (<30 weeks) and 11 term control (TC) children (37-41 weeks) using the NIH Cognitive Toolbox at age 9-10 years. rsfMRI was used to measure functional connectivity between regions of interest (ROIs) in four brain networks— default mode network (DMN), frontoparietal network (FPN), cingulo-opercular network (CO), and dorsal attention network (DAN)— to reveal how functional connectivity patterns correlate with EF. Linear mixed models were used to determine whether social risk at birth predicts within-DMN connectivity and EF at age 9-10.

Results: Mean EF score in VPT children was significantly lower than that in TC (-0.21 versus 0.74, $p = 0.002$). The DMN showed the strongest positive relationship between within-network connectivity and EF. EF correlated negatively with connectivity between the DMN and each of the three task-positive networks. ROIxROI connectivities that correlated most strongly with EF included those between the posterior cingulate and the temporal gyrus and those between the anterior cingulate and the medial frontal or superior temporal gyrus. Social risk at birth was significant ($p = 0.04$) in predicting within-DMN connectivity but not EF at age 9-10.

Conclusions: The results of this study suggest that EF is impaired in VPT children and that resting-state functional connectivity between regions of the DMN correlate with performance on EF tasks. Deficits in EF in childhood have been shown to predict a wide range of negative health outcomes in adulthood. Understanding the neural mechanisms of EF in VPT children will allow us to develop therapies to strengthen the neural pathways underlying the development of EF.

26 England, Patrick

Funding Program: T35 NIH NHLBI Training Grant
Research Program: Summer Research Program
Doctoral Program of Study: Medicine
Institution: Washington University School of Medicine
Research Department: Orthopaedic Surgery
Mentors: Cara Cipriano, MD, MSCI

Detection of soft tissue sarcoma local recurrence: physical examination versus advanced imaging

England PH, Cipriano C

Introduction: Early detection of soft tissue sarcoma (STS) recurrences may decrease the morbidity of repeat operations and improve results of systemic treatments. The clinical benefit of surveillance imaging, specifically MRIs, compared to physical examination in detecting local recurrences (LR) remains controversial. Our study aims to determine 1) how many LR were detected by advanced imaging compared to physical examination, and 2) whether detection method was affected by potential confounding factors such as tumor, patient, or operative characteristics.

Methods: We retrospectively reviewed our institutional database of 611 sarcoma patients who underwent tumor excision at Barnes Jewish Hospital (BJH) between 1999 and 2018. The number of LR detected by physical examination versus advanced imaging were compared. Logistic regression and bivariate analysis was used to evaluate patient and tumor characteristics that could impact the ability to detect LR on physical examination. Statistical analysis was conducted using SPSS and an alpha of 0.05.

Results: There were 62 out of 400 patients (15.5%) that developed a LR. Of the recurrent tumors, 33 (53%) were detected by either self-detection or a physical exam and 19 (30%) were detected by surveillance MRI. In addition, physical exam detected early LR significantly sooner than surveillance MRI (1.5 months vs 17 months, $p=0.003$). Patients who had LR in the pelvis or sacrum had their LR more commonly detected by advanced imaging compared to physical examination (9 vs 0).

Conclusions: Self-detection and physical examination detect early STS LR more frequently than advanced imaging, specifically MRIs. The use of surveillance MRIs should be tailored to patients who have tumors in the pelvis and sacrum which are less likely to be detected by physical examination. In conclusion, our study provides evidence for a more tailored and cost-effective form of surveillance for those in the sarcoma population.

32 Geselowitz, Benjamin

Funding Program: T35 NIH NHLBI Training Grant
Research Program: Summer Research Program
Doctoral Program of Study: Medicine
Institution: Washington University School of Medicine
Research Department: Psychiatry
Mentors: Joan Luby, MD; Alecia Vogel, MD, PhD; Diana Whalen, PhD

Early childhood predictors of adolescent Borderline Personality Disorder (BPD), prospectively assessed

Geselowitz BW, Whalen DJ, Luby JL, Vogel AC

Introduction: Developmental models of BPD have highlighted the interaction of psychological variables such as impulsivity and emotional reactivity with social risk factors including invalidating parenting and childhood trauma. Prospective longitudinal studies have demonstrated the association of BPD with a number of social, familial and psychological antecedents. However, to date, few of these studies have studied the interaction of multiple risk domains and their interactions beginning in early childhood.

Methods: Participants were 170 children enrolled in a prospective longitudinal investigation of children and their families. Participants completed a baseline assessment between ages 3-7. Psychopathology and suicidality were assessed via parent and trained interview report before age 8 and also with self-report after age 8. Borderline symptoms were assessed between ages 13-19 by self-report. Adverse childhood experiences (ACEs) and peer relations, were assessed by parent-report. Parental support was assessed through a laboratory task between ages 3-6.

Results: Preschool ACEs accounted for 14.9% of adolescent borderline symptom variance in a bivariate analysis. Controlling for gender and preschool ACEs, preschool and school age externalizing symptoms, preschool internalizing symptoms and preschool parental support were significant predictors of borderline symptoms. In bivariate analyses, preschool and school age suicidality composite scores significantly predicted borderline symptoms.

Conclusions: These findings underscore the importance of early childhood factors in BPD etiology and suggests that preschoolers with internalizing and externalizing psychopathology, high ACEs burden and early suicidality are at high risk of developing borderline symptoms. However, further research is needed to specify intervenable factors for targeted early intervention.

45 Jocher, Brandon

Funding Program: T35 NIH NHLBI Training Grant
Research Program: Summer Research Program
Doctoral Program of Study: Medicine
Institution: Washington University School of Medicine
Research Department: Surgery
Mentors: Akinobu Itoh, MD, PhD

Incidence and risk factors for acute kidney injury post-heart transplant: an analysis of perioperative hemodynamics

Jocher BM, Itoh A

Introduction: Acute kidney injury (AKI) is a common complication following orthotopic heart transplant and is associated with increased morbidity and mortality. The goal of this study is to examine risk factors associated with AKI post-heart transplant during the perioperative period to develop a more comprehensive outlook and identify potentially treatable risk factors.

Methods: We conducted a retrospective cohort study evaluating all patients who underwent heart transplantation between August 31, 2009 and December 31, 2016 at Barnes-Jewish Hospital. Data were obtained from the Society of Thoracic Surgeons (STS) national database and retrospective chart review. The primary end-point was the incidence of acute kidney injury (AKI) as defined by the Kidney Disease Improving Global Outcome (KDIGO) criteria. Secondary end-points included impact of AKI on 30-day and 1-year mortality.

Results: A total of 229 heart transplant patients were included in the study for analysis. In total, 146 (64%) developed AKI, where 44 (30%) were classified as stage I, 28 (19%) as stage II, and 75 (51%) as stage III. Risk factors found to be associated with the presence of AKI include elevated central venous pressure (CVP), increased use of vasopressors and inotropes, number of blood products transfused, and complications such as primary graft dysfunction (PGD). The CVP was elevated in the AKI group at each of the time points (19 vs 16 mmHg pre-op, 15 vs 14 mmHg post-op, 15 vs 13 mmHg 24 hrs. post-op, and 16 vs 15 mmHg 48 hrs. post-op). Vasoactive-inotropic score was significantly higher in the AKI group at all timepoints measured. The development of PGD was closely tied to presence of AKI with an odds ratio of 3.17 (95% confidence interval, 1.33 to 7.54; P = 0.009). From the limited mortality data available, no significant association was shown between presence of AKI and 30-day and 1-year mortality.

Conclusions: Risk factors such as elevated CVP, high use of vasopressors and inotropes, and development of PGD were closely associated with development of AKI and should be further investigated to determine if appropriate treatments or modifications can reduce the incidence of AKI.

56 Koenig, Adam

Funding Program: T35 NIH NHLBI Training Grant
Research Program: Summer Research Program
Doctoral Program of Study: Medicine
Institution: Washington University School of Medicine
Research Department: Anesthesiology
Mentors: Enyo Ablordeppey, MD, MPH; Abigail Barker, PhD

Cost Assessment of Bedside Ultrasound Guided Central Venous Catheter Confirmation in Critically Ill Patients

Koenig AM, Barker AR, Theodoro DL, Griffey RT, Ablordeppey EA

Introduction: It is estimated that approximately 5 million chest radiographs (CXR) are performed annually post central venous catheter (CVC) insertion despite emerging evidence suggesting that CXR is unnecessary if ultrasound confirms catheter position and excludes pneumothorax. A comprehensively performed healthcare cost and resource utilization analysis comparing ultrasound guided CVC confirmation protocols versus standard CXR is overdue.

Methods: We performed a cost-minimization analysis at our institution comparing an ultrasound guided CVC confirmation protocol versus a traditional CXR protocol to evaluate internal efficiency. We synthesized available evidence to estimate the direct and indirect cost savings to the hospital for using an ultrasound based CVC confirmation protocol in lieu of traditional CXR. Variables were identified a priori. Values were obtained from internal data, then supplemented by and checked against data from existing literature.

Results: We anticipate the direct costs of an ultrasound based protocol will be less than that of a traditional CXR protocol. We also anticipate indirect cost savings to the hospital by means of workflow improvement and error reduction. Ultimately, we expect that adoption of an ultrasound based protocol will yield a cost savings to the hospital.

Conclusions: Our study is intended to encourage the adoption of an ultrasound-guided CVC confirmation protocol by identifying cost savings from the use of ultrasound over traditional chest radiography. Performing an economic analysis framed in terms of costs and outcomes may influence both clinicians and hospital policymakers, thus facilitating earlier implementation.

61 Leo, Ashwin

Funding Program: T35 NIH NHLBI Training Grant
Research Program: Summer Research Program
Doctoral Program of Study: Medicine
Institution: Washington University School of Medicine
Research Department: Orthopaedic Surgery
Mentors: Scott Luhmann, MD

Posterior spinal fusion to L4: Which pre-op parameters influence optimal post-op outcomes?

Leo A, Luhmann S

Introduction: For patients suffering from adolescent idiopathic scoliosis (AIS), performing posterior spinal fusion (PSF) with L4 as the lowest instrumented vertebra (LIV) is commonly perceived as being easiest to optimize deformity correction, minimize post-op disc wedging and tilt, and obtain maximal post-op spinal and pelvic balance/alignment, all at the expense of post-op lumbar spinal motion (in comparison to PSF to a higher LIV). However, certain pre-op parameters regarding motion, alignment, and morphology from L4-L5-S1-pelvis may compromise the beneficial outcomes of PSF to L4. Our aim is to learn which pre-op parameters influence optimal outcomes for PSF to L4 procedures.

Methods: This was a retrospective chart and radiographic study based on consecutive AIS patients who underwent PSF to L4 under a single surgeon at a tertiary care children's hospital. All included patients had radiographs available at 3 analysis points: pre-op (max 6 months pre-surgery), post-op 1 (approx. 6 weeks post-surgery), and post-op 2 (minimum 2 years post-surgery). Patients not between the ages of 10 and 17 or with aborted or revised PSF's were excluded. For every patient, radiographic measures were taken (based on measurement manuals from the Spinal Deformity Study Group and the Growing Spine Study Group) and then analyzed to find significant correlations and trends.

Results: We found that certain pre-op parameters may indeed influence beneficial post-op outcomes in PSF to L4. These pre-op parameters include L4 Superior Endplate Angle (SETA) supine, L5 SETA supine, L4 SETA push prone, L5 SETA standing AP, coronal balance standing AP, L5-S1 disc wedging standing AP, pelvic incidence standing lateral, and pelvic tilt standing lateral.

Conclusions: Our results suggest that surgeons should carefully evaluate pre-op parameters regarding motion, alignment, and morphology from L4-L5-S1-Pelvis to determine whether patients would get maximal benefit from PSF to L4. Using a higher sample size, we hope to conduct follow-up studies evaluating the same relationships to produce stronger conclusions and determine which exact values of the pre-op parameters lead to optimal post-op outcomes.

62 Liang, Miranda

Funding Program: T35 NIH NHLBI Training Grant
Research Program: Summer Research Program
Doctoral Program of Study: Medicine
Institution: Washington University School of Medicine
Research Department: Medicine
Mentors: Deborah Rubin, MD, AGAF; Vered Gazit, MD

Regional Differences in Intestinal Adaptation Post-Resection in Short Bowel Syndrome

Liang MU, Gazit V, Rubin DC

Introduction: Following resection of the small intestine, patients can develop short bowel syndrome (SBS), which is characterized by inadequate nutrient absorption in the GI tract. Following resection, the small intestine can adapt by villi/crypt lengthening and hyperplasia. Many SB patients will require parenteral nutrition (PN), but after adaptation, some are able to wean from PN. Our main goal is to identify the main stem cell signaling pathways that drive adaptation in the small bowel post-resection. These pathways could ultimately be targeted by pharmaceutical therapies to enhance adaptation in SB patients. Using human biopsy samples, we compared gene expression profiles from each intestinal region in normal and SB patients. In addition, we separated SB patients based on etiology—Crohn's disease (CD) or other—to observe the effect that CD may have on adaptation.

Methods: Intestinal biopsies were taken from non-SB and SB patients during routine procedures. Intestinal region of origin—duodenum, jejunum, or ileum—was recorded for each sample. The biopsies were then used to start myofibroblast cultures, isolate mRNA for qPCR, and mount on slides for immunohistochemistry. Statistical analysis was conducted using Student's T-test or one-way ANOVA when appropriate with Prism software (Graphpad).

Results: In regard to normal intestinal physiology, we observed a significantly higher rate of cell proliferation in the ileum compared to the jejunum. When comparing normal and SB patients, we observed increased levels of epimorphin and Pdgfr α expression in the SB jejunum compared to normal jejunum. Lastly, we observed a decreased level of BMP-2 expression—but not BMP-4 expression—in SB-CD samples compared to normal and SB non-CD samples.

Conclusions: As we hypothesized, we could discern differences in gene expression between intestinal regions and in normal and SB patients, demonstrating that intestinal adaptation varies between regions. We also demonstrated that Crohn's SB patients have a different gene expression profile than SB patients of other etiologies. More research is required to identify the underlying causes of these variations so that we can enhance adaptation with pharmaceutical therapies.

64 Lineback, Kristen

Funding Program: T35 NIH NHLBI Training Grant
Research Program: Summer Research Program
Doctoral Program of Study: Medicine
Institution: Washington University School of Medicine
Research Department: Psychiatry
Mentors: Natasha Marrus, MD, PhD; John Constantino, MD

Callous-Unemotional Traits in Preschoolers: Relationships to Autistic Traits, Social Motivation, and Externalizing Behaviors

Lineback KM, Marrus NM, Constantino JN

Introduction: Quantitative autistic traits (QAT) and callous-unemotional traits (CUT), both of which are associated with low social motivation, have also been linked to externalizing behaviors in children. Nevertheless, the relationship between QAT and CUT in early childhood is not well understood. Identifying factors important for the ontogeny of these traits is critical to differentiate manifestations of asocial versus antisocial behaviors in childhood psychopathology, which could inform early assessment and intervention.

Methods: 111 twin pairs ascertained from the general population using birth records, as well as a small clinical cohort with autism spectrum disorder (ASD, n=16), were evaluated at 36 or 48 months for parent-reported QAT, CUT, Social Motivation, and Externalizing.

Results: CUT scores were continuously distributed in the general population, correlated highly with QAT, and differed between children with and without ASD. Principal component analysis (PCA) of CUT scores identified three unique components - "social conscientiousness," "shamelessness," and "unemotionality." In separate PCAs, both QAT and Social Motivation showed the strongest component loadings with the "unemotionality." In contrast, Externalizing primarily loaded on "shamelessness." Inter-twin concordances supported heritability of QAT, "social conscientiousness," "unemotionality," Externalizing, and Social Motivation in the general population. In contrast, there was no evidence of heritability for "shamelessness."

Conclusions: In this general population preschool twin sample, variation in CUT is represented by three components. "Shamelessness" highlights distinctions between antisocial features of CUT and asocial behaviors, while "unemotionality" suggests associations between Social Motivation, QAT and CUT. In addition, "shamelessness," unlike other CUT components, does not appear heritable and is the primary CUT component associated with Externalizing. Future longitudinal twin studies quantifying "shamelessness" and other CU-related social behaviors are needed to identify genetic and environmental factors differentiating QAT and CUT, with the goal of advancing targets for intervention.

66 Lohner, Nathan

Funding Program: T35 NIH NHLBI Training Grant
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Doctoral Program of Study: Medicine
Institution: Washington University School of Medicine
Research Department: Surgery
Mentors: Spencer Melby, MD; Meghan Kelly, MD

Patients with chronic kidney disease undergoing aortic valve replacement for aortic stenosis have improved outcomes after TAVR compared to SAVR

Lohner NB, Kelly MO, Bakir NH, Melby SJ

Introduction: Transcatheter aortic valve replacement (TAVR) is considered a lower-risk alternative to surgical aortic valve replacement (SAVR), but outcomes in patients with chronic kidney disease (CKD) are not well defined. We sought to compare outcomes of CKD patients undergoing TAVR vs. SAVR.

Methods: Data was prospectively gathered and retrospectively reviewed for consecutive patients undergoing SAVR (n=428) or TAVR (n=672) for aortic stenosis at two institutions from 2010 to 2017. Preoperative glomerular filtration rate (GFR) was used to determine patients with baseline CKD (GFR<60). Propensity score analysis yielding 249 patients in each group was done with a logistic model with nearest neighbor 1:1 matching and a 0.1 caliper algorithm to compare outcomes in those who had TAVR vs. SAVR.

Results: There were no significant differences in preoperative variables for CKD patients who underwent TAVR vs. SAVR (Table). Propensity score analyses revealed no difference in 30-day mortality rates. However, postoperative atrial fibrillation (11% vs. 33%; p<0.01), pneumonia (<1% vs. 6%; p<0.01), and reoperation for bleeding (1% vs. 5%; p<0.01) were higher in SAVR patients. Acute renal failure (3% vs. 10%; p<0.01) was worse in SAVR patients, and more SAVR patients needed postoperative hemodialysis (0% vs. 3%, p<0.01). Five-year survival, however, was better in SAVR patients (15/249, 6% vs. 71/249, 28.5%, p<0.0001).

Conclusions: TAVR patients had fewer postoperative complications and better renal protection than SAVR, however, SAVR patients had better longer-term survival. TAVR should be considered in patients with underlying kidney disease to preserve renal function and thus protect against the need for dialysis, but long-term survival may be better with SAVR.

67 Lu, Lillian

Funding Program: T35 NIH NHLBI Training Grant
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Doctoral Program of Study: Medicine
Institution: Washington University School of Medicine
Research Department: Radiology
Mentors: Zheng Jie, PhD

Quantification of myocardial oxygen extraction fraction via non-contrast magnetic resonance imaging

Lu LT, Zheng J

Introduction: Coronary endothelial function is an important marker in predicting risk of coronary artery disease. Current techniques for measuring endothelial function are via cardiac oxygen extraction fraction (OEF) with PET scanning and contrast-enhanced MR. However, contrast is contraindicated in many patients. PET scanning is also expensive and exposes patients to ionizing radiation. Therefore, a safer and more accessible alternative is preferred. The purpose of this study is to assess the feasibility of a new non-contrast method of measuring cardiac OEF in healthy subjects.

Methods: Seven healthy subjects were recruited to have cardiac OEF mapping performed. Five of the subjects were scanned only at rest and underwent the same protocol twice on separate days for reproducibility. The remaining subjects were scanned both at rest and during cardiac stress induced by squeezing a hand dynamometer. During stress, heart rate and blood pressure were monitored and rate pressure product (RPP) was calculated to provide a measure of exercise intensity. Resulting image data was processed using existing software. Image analysis was performed to assess image quality and calculate OEF values.

Results: Bland-Altman analysis for intra-observer variability showed no significant differences between visits. Overall mean OEF was 0.61 ± 0.09 , which was slightly lower but comparable to PET values of 0.71 ± 0.18 in patients of the same age group. Coefficient of variation for OEF was calculated at 7.69%. Patients who underwent the stress protocol demonstrated a significant OEF increase of 11% with a RPP increase of 38.0%. These results were comparable to PET studies that demonstrated OEF increases of 18.3% with a RPP increase of 133.9%.

Conclusions: The results of this study indicate a feasible non-contrast MR method of measuring cardiac OEF. However, further development is needed to improve image quality and thus accuracy, as current OEF measurements are still slightly lower than expected due to image artifacts. Ongoing research will focus on gathering additional cardiac stress data to establish reliability of the new method and eventually deliver it to patients in a clinical setting.

68 Lucas, Hannah

Funding Program: T35 NIH NHLBI Training Grant
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Doctoral Program of Study: Medicine
Institution: Washington University School of Medicine
Research Department: Medicine
Mentors: Cynthia Herrick, MD

Provider communication and patient understanding of treatment recommendations for gestational diabetes

Lucas HR, Williams RC, Hollar L, Herrick CJ

Introduction: Gestational diabetes (GDM) increases risk for Type 2 diabetes (T2D); however, postpartum screening rates for diabetes are low, particularly among women on Medicaid during pregnancy. This study aims to elucidate themes among patients, providers and clinic staff related to understanding of GDM and future risk and prevention of T2D.

Methods: Semi-structured interviews or focus groups with patients, providers, and clinic staff were audiotaped and transcribed verbatim. Two individual raters developed a codebook and coded transcripts for themes. Discrepancies were resolved through discussion. Codes relating to patient understanding and provider/staff provision of education and perception of patient understanding were analyzed to ascertain similarities and differences.

Results: Our sample included 36 women who had GDM and lacked private health insurance at delivery (18 screened; 18 unscreened; 17 <1 year postpartum and 19 >1 year postpartum). Median age was 30.5 and the majority were African American and did not have a college degree. Providers (21) and clinic staff (9) were predominantly white and female. Providers came from OB, Family Practice, and Internal Medicine with equal distribution between physicians and mid-level practitioners. Clinic staff were 55% RN and 44% RD. The majority of patient participants had limited understanding of GDM and how to reduce their future T2D risk. For treatment recommendations during pregnancy, most patients accurately recalled main points of diet counseling and self-monitoring of blood glucose and medications, though recall of detail was variable. Similarly, providers and staff tended to focus their patient education more on immediate treatment and monitoring than future T2D risk and prevention. Most providers felt their patients were more motivated to make lifestyle changes during pregnancy than postpartum.

Conclusions: This study identifies gaps in low-income women's education and understanding of their GDM diagnosis and need for postpartum T2D prevention. Our results will inform the development of an intervention to increase adherence to postpartum screening and lifestyle modifications for low-income women with GDM.

73 McGraw, Alexis

Funding Program: T35 NIH NHLBI Training Grant
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Doctoral Program of Study: Medicine
Institution: Washington University School of Medicine
Research Department: Radiology
Mentors: Tammie Benzinger, MD, PhD; Matthew Brier, MD, PhD

Atrophy rates in stable and relapsing multiple sclerosis

McGraw A, Kanthamneni M, Brier M, Benzinger T

Introduction: New white matter (WM) lesions are responsible for the clinical attacks of MS. However, patients also accrue grey matter (GM) atrophy over time, seemingly independent of WM lesions. The relationship between these two pathologies has not been well described. We hypothesize that patients with no recent relapses (i.e., no new WM lesions) will have less GM atrophy than those with recent relapses.

Methods: We analyzed 380 scans gathered longitudinally through MS PATHS across 89 MS patients and used FreeSurfer for volumetric analysis. WM lesions were identified using an automated approach and filled with a Laplacian filling technique. Subjects were separated into 3 groups based on their most recent relapse and the rates of atrophy across a number of brain regions were compared. Regional volumetric measures were extracted from FreeSurfer and linear statistical models were used to compare the rates between the groups for statistical significance.

Results: Verification of the Laplacian technique showed that there was no significant difference in the output of standard processing method vs. the Laplacian. Therefore, this method can be used to avoid manual input. We then calculated the percent change in volume per unit time for each patient in a variety of brain regions and performed a two-way analysis of variation with MS type and relapse group as factors. We found statistically significant effect of relapse group in three regions: the medial orbital frontal lobe ($p=0.004$), the pars opercularis ($p=0.033$), and the superior frontal lobe ($p=0.05$).

Conclusions: We found that global effects in atrophy rate, if present, are small. The increased atrophy rates found in the pars opercularis and medial orbital frontal lobe are a logical consequence of disease progression. However, the decrease in atrophy rate in the superior frontal lobe cannot be explained by our current understanding of MS progression. Further studies should try to account for the location of WM lesions and incorporate that into the analysis.

75 Mittauer, Eric

Funding Program: T35 NIH NHLBI Training Grant
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Doctoral Program of Study: Medicine
Institution: Washington University School of Medicine
Research Department: Medicine
Mentors: Alan Braverman, MD, FACC

Aortic Dissection Related to Pregnancy: Results from the International Registry of Acute Aortic Dissection (IRAD)

Mittauer EM, Woznicki E, Braverman AC

Introduction: Aortic dissection (AoD) is a rare complication of pregnancy for which women with aortopathy disorders are at increased risk. Our aim was to detail the clinical features, imaging characteristics, and outcomes of women with acute AoD related to pregnancy and postpartum in the International Registry of Acute Aortic Dissection (IRAD) database.

Methods: 29 out of 9707 of AoDs in IRAD occurred during pregnancy or postpartum. The IRAD database was queried and additional clinical information was obtained from 17 IRAD investigators about the 29 patients who were the basis of this study.

Results: 29 women developed AoDs related to pregnancy at a mean age of 32 years. 13 women had type A AoDs and 16 had type B AoDs. The timing of dissection was available in 25 patients: 15 AoDs occurred during pregnancy, 3 in the 1st trimester and 12 in the 3rd trimester. There were 10 postpartum AoDs, occurring at an average 6.7 days postpartum. At time of dissection mean aortic diameters were: aortic root (sinus of Valsalva) 4.3 cm, ascending aorta 4.3 cm, and proximal descending aorta 3.1 cm. Eighteen of 29 women were recognized to have an underlying aortopathy condition, 14 with Marfan syndrome, 1 with Loeys-Dietz syndrome, 2 with bicuspid aortic valves, and one with familial thoracic aortic aneurysm syndrome. Type A dissections were associated with significantly increased ascending aortic diameters, while type B dissections were not. All 13 type A dissections were treated surgically. Of 16 type B dissections 9 were treated medically, 3 were treated with endovascular procedures, and 4 were treated surgically. Fetal outcome was known in 24 pregnancies, with 22 successful live births and 2 elective terminations. Nine patients delivered vaginally and 15 via caesarean, and all but one woman survived hospitalization for AoD.

Conclusions: AoD complicating pregnancy is rare, occurring in only 0.3% of cases of AoDs in IRAD. However, among women of childbearing age (<45 years), 29/280 or 10.4% of dissections occurred during pregnancy or early postpartum. The majority of the cases involved underlying aortopathy conditions including hereditary thoracic aortic aneurysm disease including Marfan syndrome, Loeys-Dietz syndrome, familial thoracic aortic aneurysm, and bicuspid aortic valve with aneurysm. However, many women had not been diagnosed with these conditions before the aortic dissection. Better recognition of such underlying factors may allow improved management of pregnancy to lower the risk of aortic dissection in women with aortopathies.

77 Nakken, Erik

Funding Program: T35 NIH NHLBI Training Grant

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Doctoral Program of Study: Medicine

Institution: Washington University School of Medicine

Research Department: Otolaryngology

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Sociodemographic disparities in HPV-negative head and neck cancer

Nakken ER, Chidambaram S, Kennedy WR, Thorstad W, Zevallos JP, Mazul AL

Introduction: Racial and sex-based disparities in overall survival are very prevalent among head and neck cancer (HNC) patients. However, recent studies have shown mixed results regarding what drives these disparities. In addition, some institutions have shown a disappearance of these disparities when multidisciplinary care is administered. Our objective was to determine if racial and sex-based disparities in HPV-negative HNC are present at one tertiary care center and to determine what drives these disparities.

Methods: We formed a retrospective cohort with data from 667 head and neck cancer cases, excluding HPV-positive oropharyngeal cancer, from 1997-2017. We calculated 5-year overall survival (OS) with Kaplan-Meier curves and adjusted hazard ratios (HR) to explore potential clinical drivers – stage, site, smoking, and age – in disparities by using Cox proportional hazard regression.

Results: Analysis showed no difference in 5-year OS between races (black: 54.8%, 95% CI: 46.9-64.0%; white: 57.2%, 95% CI: 52.6-62.2%) and adjusted HR (HR=1.03, 95% CI: 0.74-1.419). Although non-significant, females tended to have better 5-year OS (female: 62.5%, 95% CI: 55.2-70.8%; male: 54.4%, 95% CI: 49.7-59.6%) and adjusted HR (HR=1.22, 95% CI=0.85-1.74).

Furthermore, female larynx cases had significantly better survival with an unadjusted HR of 1.69 (95% CI=1.01-2.83) and still trended towards a disparity even after adjustment for stage, smoking and treatment (HR=1.57, 95% CI=0.84-2.91).

Conclusions: Similar to results in other single institutions, we did not see racial survival disparities in head and neck cancer cases. The disparity seen in larynx cancer could be the result of a biologic difference in sex or other mediating factors we did not control for, and further studies are needed. When provided the proper standard of care, both racial and sex disparities can be overcome. However, sociodemographic disparity trends persist. Therefore, institutional changes and future qualitative studies will assist in determining interventions.

79 Namude, Maliza

Funding Program: T35 NIH NHLBI Training Grant

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Doctoral Program of Study: Medicine

Institution: Washington University School of Medicine

Research Department: Surgery

Mentors: Aimee James, PhD, MPH

Variation in the colorectal cancer screening process in rural Southern Illinois: from recommendation to follow-up

Namude MW, Maki J, Moore-Connelly M, Hunleth J, Oestmann K, Izadi S, Rolf L, Colditz G, James A

Introduction: Rural residence is associated with lower colorectal cancer (CRC) screening rates and poorer outcomes. Rural practices rely more on FOBT/FITs (Fecal Occult Blood Test/Fecal Immunochemical Tests) for initial screening, in part due to limited access to the more sensitive and specific colonoscopy. Our qualitative study examines the variation in the CRC screening process when guidelines are put into practice in the context of rural Southern Illinois.

Methods: We conducted interviews with providers and staff at 11 primary care facilities and 2 colonoscopy facilities that are part of the Southern Illinois Healthcare system, a rural not-for-profit health system. An interview guide was used to elicit information about the facility's process for recommending, tracking and reminding patients about CRC screening, barriers and facilitators for screening at the patient, provider, and clinic level, and feasibility and acceptability of potential interventions for improving screening and follow-up rates. Raw interview transcripts were then used to document the steps in the screening process for each facility to compare and contrast.

Results: We found variation in every stage of the process: discussion and recommendation, FIT referral and receipt, FIT return and results, follow-up of missing results, colonoscopy referral and scheduling, and finally tracking along the way. However, we noted that clinics converged at the beginning of the process, using age as a trigger for screening discussion, and again at the end, using the next appointment a patient has as an opportunity to follow up and find out if they completed the process.

Conclusions: Researchers looking to implement evidence-based practices (EBPs) across primary care clinics will encounter variation in how their practices are translated to reality. This may be especially true in under-resourced clinics serving medically underserved communities such as rural communities. Variation will affect implementation strategies, need for adaptation, and ultimate success of the intervention. Researchers need to plan for and assess variation, design flexible interventions, and allow time and resources for adaptation.

80 Nigaglioni Rivera, Adriana

Funding Program: T35 NIH NHLBI Training Grant
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Institution: Washington University School of Medicine
Research Department: Obstetrics and Gynecology
Mentors: Tessa Madden, MD, MPH

The relationship between medical mistrust and birth control decision making

Nigaglioni Rivera A, Paul R, Madden T

Introduction: Contraceptive decisions are influenced by patient preference and access to the preferred method. Another factor which might influence decision making is medical mistrust. Higher levels of medical mistrust have been linked to reduced medication adherence, satisfaction with care, and utilization of medical services. Initiation and cessation of some contraception can be controlled by the patient, but other methods such as intrauterine devices (IUDs) and implants require a healthcare provider (HCP) visit. Medical mistrust may impact patients' willingness to use these methods.

Methods: We conducted a controlled time-trend study of 1,008 women receiving contraceptive care at 3 federal qualified health centers. Women chose contraception after standardized counseling. A post-visit survey included 8 modified items to assess the participant's medical mistrust. We categorized the groups into "high" and "low" mistrust based on quartile distribution. We calculated proportions and performed univariate and multivariate Poisson regressions to estimate the association between demographic and reproductive characteristics, medical mistrust, and the contraceptive method desired and received.

Results: Women who reported black race, lower education level, public insurance, or lower household income were more likely to have high medical mistrust. Women with high medical mistrust were less likely to have discussed contraception with their HCP at the visit (RR 0.91, 95%CI 0.86-0.96). Among women who chose a contraceptive method, those with high medical mistrust were more likely to report that they alone chose the method (RR 1.11 95%CI 1.03-1.19). Women with high mistrust were less likely to both desire and receive an IUD or implant (RR 0.95 95%CI 0.90-0.99 and RR 0.96 95%CI 0.92-1.00 respectively).

Conclusions: Certain demographic characteristics were associated with higher levels of medical mistrust. Women with high medical mistrust were less likely to discuss contraception with their HCP and more likely to make autonomous decisions about method use. Strategies to increase medical mistrust may improve contraceptive care.

82 Nunno, Andrew

Funding Program: T35 NIH NHLBI Training Grant
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Doctoral Program of Study: Medicine
Institution: Washington University School of Medicine
Research Department: Neurology
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Blood Amyloid-Beta Relationship with Alzheimer's Disease

Nunno A, Greene T, Hamilton M, Sullivan M, Sung L, Li M, Bollinger J, Hanks K, Mawuenyega K, Bateman R

Introduction: Alzheimer's Disease (AD) is the most common cause of dementia, and is extremely burdensome on the patient, family, and healthcare system. Current diagnostic techniques are inaccurate, expensive, and often too late for treatment to be effective. Thus, an early non-invasive diagnostic test may be imperative to better outcomes. Blood levels of amyloid-beta B(A β), a protein associated with AD pathophysiology, has been found in a case-control study to correlate with AD. The purpose of this study is to determine whether an A β blood test can be used as a screening tool by examining it in a larger population that is representative of St. Louis's demographics.

Methods: 1120 participants are required for this study. All participants will be over 60 years of age and must match the demographics of St. Louis and its surrounding areas. Recruitment has come from other studies, local clinics, flyers, and word of mouth. Steps for community outreach are being undertaken, and is a key focus going forward. At an initial visit, a 60 mL blood draw, and a cognitive assessment are conducted. Mass spectrometry analyzes the blood for its A β 42/40 ratio, and APOE ϵ 4 carrier status. 294 participants will be brought back for a 400mL blood draw, and a PET scan.

Results: As of last report, 194 participants have been enrolled. Participants have identified as 90.7% white, 8.8% black, 0.5% Asian, and 64.4% female. We expect the A β blood test to corroborate PET AD diagnosis, as well as predict future development of AD. Relationships between A β blood status and age, APOE ϵ 4 genotype, and cognitive status should be seen. Lastly, A β blood test results should be consistent between visits demonstrating the test's reliability.

Conclusions: A blood test for AD would facilitate AD research by dramatically reducing the cost of the screening process. Today's treatments do little for patients but having an AD blood test readily available would allow patients, and their families, to better plan their future. Lastly, the lack of diversity in the first group of participants demonstrates the importance of effortful community outreach.

92 Pullarkat, Priyanka

Funding Program: T35 NIH NHLBI Training Grant
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Institution: Washington University School of Medicine
Research Department: Medicine
Mentors: Neha Mehta-Shah, MD

The prognostic value of metabolic markers in relapsed/refractory Hodgkin lymphoma

Pullarkat P, Watkins M, Ippolito J, Mehta-Shah N

Introduction: Hodgkin Lymphoma (HL) is a rare form of lymphoma that often affects young people, with a median age of diagnosis of 39. In collaboration with Dr. Joe Ippolito, our group has recently shown that increased visceral fat area relative to subcutaneous fat (rVFA) is associated with poorer prognosis in women, but not men, with diffuse large B-cell lymphoma (DLBCL). In this study, we examined whether rVFA and other metabolic markers can also be prognostic in relapsed/refractory HL.

Methods: We conducted a retrospective study of 114 relapsed/refractory HL patients treated at Washington University School of Medicine in St. Louis who presented with first relapse between 2004 and 2018. We evaluated clinical characteristics including sex, BMI, diabetes status, and treatment outcomes. Visceral and subcutaneous fat areas, evaluated by CT scan, will be used to calculate rVFA.

Results: Ninety-five patients were eligible for analysis. There was no significant difference in overall survival (OS) ($p = 0.55$) or progression-free survival (PFS) ($p = 0.49$) between men and women in our study. Patients with higher BMI at diagnosis were associated with inferior OS and PFS. Those with BMI < 25 had a 5-year PFS and OS of 71% and 90% compared to the BMI > 25 group with PFS and OS of 58% and 84% respectively. The five patients with diabetes had a significantly lower 5-year OS rate of 40% compared to 90% for non-diabetic patients ($p = 0.00$). Diabetic patients also had a lower 5-year PFS rate of 40% compared to 63% for non-diabetic patients. We predict that higher rVFA will also be associated with poorer outcomes.

Conclusions: Our preliminary results suggest an association between diabetes and HL prognosis; our rVFA analysis will provide further insight into the relationship between host metabolism and outcomes in patients with relapsed/refractory HL. Determining the prognostic value of rVFA and other metabolic markers could help guide first-line therapy for high-risk patients and provide a clinical basis for further research into how patient metabolism affects cancer biology and whether this process can be modified.

100 Shashikumar, Sukruth

Funding Program: T35 NIH NHLBI Training Grant
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Doctoral Program of Study: Medicine
Institution: Washington University School of Medicine
Research Department: Medicine
Mentors: Karen Joynt-Maddox, MD, MPH; Kenton J. Johnston, PhD

The impact of frailty on heart failure outcomes

Shashikumar SA, Luke A, Johnston KJ, Joynt Maddox KE

Introduction: Medicare value-based payment programs financially reward and penalize hospitals based on outcomes for patients with heart failure (HF). While these programs risk adjust clinical outcomes for typical medical comorbidities, they do not adjust for frailty. Consequently, hospitals caring for a high proportion of patients with frailty may be unfairly penalized. Understanding outcomes of frail HF patients may allow improvement of risk adjustment and more equitable assessment of healthcare systems.

Methods: We examined adults aged ≥ 18 years with a primary diagnosis of HF from 2012 through September 2015 in the National Inpatient Sample. We adapted a validated claims-based frailty index to assign a frailty score to each patient and characterized the top quintile as "frail." We estimated multivariate regression models, controlling for typical medical comorbidities (e.g., diabetes, heart failure, and kidney disease) and hospital characteristics, to investigate the relationship between frailty and outcomes (in-hospital mortality; whether patients were discharged to their home; and average length and total charge for each hospitalization).

Results: Of 732,932 HF patients, 146,582 were characterized as frail. Frail patients were more likely than non-frail patients to die during hospitalization (mortality rate 4.13% vs. 2.69%, adjusted odds ratio [aOR] = 1.49, 95% CI 1.44-1.55, $p < 0.001$), less likely to be discharged to their home (58.4% vs. 76.5%; aOR = 0.55, 95% CI 0.54-0.55, $p < 0.001$), were hospitalized for more days (6.27 days vs. 5.01 days; adjusted difference = 0.19 days, 95% CI 0.18-0.19, $p < 0.001$), and incurred higher total charges (\$48,968 vs. \$42,679; adjusted difference = \$9,367, 95% CI \$8,677-\$10,057, $p < 0.001$).

Conclusions: Frail HF patients had higher odds of mortality, lower odds of discharge to home, longer hospitalizations, and higher costs, even after accounting for typical medical comorbidities. Clinicians should consider screening for frailty to identify a high-risk population that could benefit from targeted intervention. Policymakers should consider incorporating frailty into risk adjustment for more equitable quality measurement and allocation of bonuses and penalties.

103 Shivakumar, Nirmala

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Institution: Washington University School of Medicine

Research Department: Medicine

Mentors: Philip RO Payne, PhD, FACMI; Albert M Lai, PhD; Marin H Kollef, MD

Evaluation of Early Warning Scores for Sepsis Prediction on the General Ward

Shivakumar N, Yu SC, Michelson AP, Gupta A, Betthausen K, Kollef MH, Lai AM, Payne PRO

Introduction: Sepsis is life-threatening organ dysfunction due to a dysregulated host-response to infection. Early identification and appropriate management is vital to providing optimal care as each hour of delay in antimicrobial therapy can increase mortality by up to 7.6%. Early warning scores (EWS) for assessing clinical deterioration, commonly utilized in hospitals, have begun to be evaluated for sepsis prediction in the intensive care unit (ICU), but not the general ward setting. In this research, we calculated EWS for patients in the general ward setting and assessed their predictive performance.

Methods: All non-ICU inpatients admitted to Barnes-Jewish Hospital from 2012-2017 were included. Patients were excluded if they had insufficient data, were in an ICU during the prediction period, or admitted to the psychiatric or obstetrics/gynecology services. Each EWS was calculated 6-hours before sepsis onset using electronic health record data from the preceding 24 hours with missing data imputed using normal physiologic values. The EWS evaluated included the National Early Warning Score (NEWS), NEWS 2, Modified Early Warning Score (MEWS), Systemic Inflammatory Response Syndrome (SIRS), Quick Sequential Organ Failure Assessment (qSOFA), and Sequential Organ Failure Assessment (SOFA). The EWS and missing data were analyzed using python and its packages.

Results: Of the 61,364 eligible admissions, 20,868 met inclusion criteria, and only 471 (2.26%) met sepsis criteria. Area under the precision-recall curve (AUPRC) ranged from 0.028 to 0.066 and area under the receiver-operating characteristic (AUROC) ranged from 0.521 to 0.701 for all EWS. The median number of missing elements for EWS calculation were: 1 out of 7 for NEWS; 3 out of 9 for NEWS 2; 1 out of 5 for MEWS; 0 out of 4 for SIRS; 1 out of 3 for qSOFA; and, 3 out of 7 for SOFA.

Conclusions: The low AUPRC and AUROC indicate the poor performance of EWS suggesting that these scores are better developed for general clinical deterioration, and not for disease-specific prediction on the general ward. Missing data elements made some of the EWS unreliable predictors, showcasing them as impractical measures for many hospital floors.

105 Sillart, Sydney

Funding Program: T35 NIH NHLBI Training Grant

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Doctoral Program of Study: Medicine

Institution: Washington University School of Medicine

Research Department: Medicine

Mentors: William H McCoy, MD, PhD; Jeffrey Henderson, MD, PhD

Assessing Cutibacterium acnes RoxP's Ability to Bind Porphyrins

Sillart SB, Phillips WE, Henderson JP, McCoy WH

Introduction: Acne vulgaris affects nearly every human being and costs the United States \$1.3 billion dollars a year. Most acne treatments target Cutibacterium acnes, a gram-positive bacterium found on human skin. C. acnes secretes the heme-binding protein RoxP, which has been proposed to act as an essential antioxidant during human skin colonization. While C. acnes RoxP binds heme (iron-protoporphyrin IX), C. acnes has not actually been shown to produce heme, but it has been shown to produce large quantities of other porphyrins: coproporphyrin III (CPIII), protoporphyrin IX (PPIX). We hypothesized that RoxP may not only bind heme but other porphyrins, including those produced by C. acnes. To address this hypothesis, we pursued a biochemical assessment of RoxP-ligand binding.

Methods: C. acnes RoxP-ligand binding was assessed using two approaches: (1) NATIVE gel shift assays of recombinantly-expressed RoxP incubated with several porphyrins (hemin, PPIX, CPIII), (2) developing a fluorescently-tagged hemin for in vitro biochemical and in vivo assays. The latter approach has not been previously reported and required the design and optimization of a novel organic synthesis linking hemin to the Cy5 fluorophore via a 13 carbon spacer. Chromatography, absorbance, mass-spectrometry, and Soret analysis was used to validate the identity of this product. Fluorescence microscopy was performed to interrogate heme biology of C. acnes and other bacteria.

Results: NATIVE gel shifts demonstrated that RoxP binds hemin and PPIX but not CPIII. Cy5-hemin was synthesized, validated, and shown to label some bacteria (C. acnes, C. avidum, Staphylococcus aureus, Pseudomonas aeruginosa) but not others (Escherichia coli, Klebsiella pneumoniae).

Conclusions: This study identified porphyrin features (iron and 2-/4-position vinyl side chains) that enhance RoxP binding and established a new reagent for studying heme biology in a variety of organisms. RoxP's ability to bind a non-hemin porphyrin suggests that it may bind endogenous C. acnes porphyrins. Future work on this project by our group will better define C. acnes RoxP/porphyrin biology to help us better understand and treat acne vulgaris.

108 Sous, Dana

Funding Program: T35 NIH NHLBI Training Grant
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Doctoral Program of Study: Medicine
Institution: Washington University School of Medicine
Research Department: Medicine
Mentors: Carrie C Coughlin, MD

Cutaneous reactions to traditional cancer therapies in children

Sous D, Coughlin CC

Introduction: Cancer therapies have advanced significantly over the past decades, with an increasing use in the pediatric population. One of the biggest challenges of treatment in pediatric oncology lies in the many treatment related side effects, which contribute to morbidity and affect quality of life. Since traditional cancer therapies generally target rapidly dividing tissues, many of these side effects involve the skin, nails and mucosal surfaces. It is important for clinicians to recognize these drug induced eruptions in order to detect and manage symptoms early on and allow for continuation of therapy. Although there are published reviews on cutaneous reactions to antineoplastic agents in adults, there are few such resources focusing on the pediatric population. The purpose of this review is to create a useful resource for clinicians to improve identification and treatment of mucocutaneous reactions to traditional cancer therapies in children.

Methods: A list of commonly used traditional cancer therapies was compiled with the input of both a pediatric dermatologist and a pediatric oncologist. A search of the literature was conducted in PubMed for reactions to each drug involving the hair, skin and nails. This information was then synthesized into a review.

Results: Anticancer therapies discussed in this review include antimetabolites, alkylating agents, antitumor antibiotics, anthracyclines, topoisomerase inhibitors, plant alkaloids, steroids, antibodies and interleukins. Some of the most common cutaneous reactions fall under the category of toxic erythema of chemotherapy. Many reactions in the skin can indicate high levels of drug, signaling toxicity.

Conclusions: This review demonstrates the wide range of cancer therapy-induced cutaneous toxicities in children, which impact both the physical and mental health of this population. Management of these reactions is vital to increase tolerability of these drugs and maintain patients on therapies vital to treatment of their cancers.

112 Truong, Hannah

Funding Program: T35 NIH NHLBI Training Grant
Research Program: Summer Research Program
Doctoral Program of Study: Medicine
Institution: Washington University School of Medicine
Research Department: Medicine
Mentors: Karen Joynt Maddox, MD, MPH; Alina Luke, MPH

Characterization of all-payer utilization of ICD-10 social determinants of health Z-codes in the National Inpatient Sample in 2016

Truong HP, Luke AL, Joynt Maddox KE

Introduction: Social determinants of health (SDoH)—or the social factors that impact health risks and outcomes—are a public health priority. A barrier to understanding their prevalence and influence has been a lack of standardized national data. The inclusion of Z-codes, a subset of which are specifically focused on SDoH in the tenth revision of the International Classification of Diseases (ICD-10), may offer an opportunity to elucidate the impact of these social factors on populations, but there has been no characterization of the utilization of these codes on a national all-payer level. Therefore, in this study, we aimed to examine the prevalence of SDoH Z-codes and to compare the characteristics and outcomes of patients and admissions with and without Z-codes.

Methods: Retrospective cohort study using data from the 2016 National Inpatient Sample. We classified use of social determinant Z-codes (defined as codes x through y) and used multivariate regression models to determine whether the presence of an SDoH z-code was associated with patient outcomes, including mortality, length of stay, discharge home, and total charges.

Results: There were 7,130,900 inpatient hospitalizations in our dataset, of which 1.8% included SDoH Z-codes. The most common codes were for problems related to housing and economic circumstances, upbringing, primary support group, and employment. Compared to people without a Z-code, people with a Z-code were younger, and more often male, black, have Medicaid or be uninsured, and from the lowest quartile median household income. Admissions including SDoH Z-codes were more likely to be non-elective and from large, public, urban, and non-teaching hospitals in the northeast and west regions of the U.S. A markedly higher proportion of admissions that included Z-codes were for mental health and substance use disorders. Patients with SDoH Z-codes had lower rates of inpatient mortality, longer lengths of stay, lower likelihoods of discharge home, and lower total charges compared to patients without these codes.

Conclusions: Since their implementation with the ICD-10 update, social determinants of health ICD codes have been highly under-utilized, representing a missed opportunity to gather key data on their prevalence and clinical implications. Increasing documentation of SDoH Z-codes could lead to identification of potential targets for SDoH interventions.

117 Wieczorek, Jacob

Funding Program: T35 NIH NHLBI Training Grant
Research Program: Summer Research Program
Doctoral Program of Study: Medicine
Institution: Washington University School of Medicine
Research Department: Otolaryngology
Mentors: Joseph Bradley, MD, FACS

Evaluation of Tramadol for the Treatment of Chronic Cough

Wieczorek J, Bradley J

Introduction: Neurogenic chronic cough, which is mostly a diagnosis of exclusion, makes up the plurality of cases seen at specialty cough clinics. This diagnosis has been treated with a variety of medications over the years, but many patients are never able to gain control of their symptoms with current front-line therapies. A pilot study recently showed that tramadol may be effective at treating chronic cough in these patients, however since tramadol is a schedule IV medication, there are concerns about potential abuse/dependence.

Methods: A retrospective analysis was performed on a subset of neurogenic cough patients who had been treated with tramadol. Cough severity as well as risk for opioid abuse was tracked over the course of tramadol therapy and used to determine the effectiveness and safety of this therapy.

Results: Preliminary analyses show that overall, CSI trended downward for patients who were able to tolerate tramadol therapy. Investigation of the opioid dependence measures showed no development of addiction or abuse in any of the subjects in the study. Additionally, a search on the St. Louis Drug Monitoring Database showed that no subjects obtained tramadol from providers other than the senior author.

Conclusions: Tramadol, if shown to be effective in reducing cough severity, can be an effective therapy option for neurogenic cough patients who haven't been able to find relief with standard treatment options. The finding that subjects on long-term tramadol therapy didn't develop dependence or drug seeking behavior should ease some of the worry that providers may have when deciding whether to prescribe this medication. The implications of these two findings are that tramadol has the potential to be a first-line treatment option for patients with neurogenic cough who show low opioid abuse potential.

119 Winkler, Winston

Funding Program: T35 NIH NHLBI Training Grant
Research Program: Summer Research Program
Doctoral Program of Study: Medicine
Institution: Washington University School of Medicine
Research Department: Anesthesiology
Mentors: Brian Fuller, MD

Awareness in Mechanically Ventilated Emergency Department Patients

Winkler W, Pappal R, Fuller B

Introduction: Sedation is a ubiquitous treatment during the mechanical ventilation of critically ill patients. Inadequate sedation might result in patient awareness, in which patients have explicit, and unintended recall of sensory perceptions while intubated and paralyzed. Awareness is associated with devastating psychological sequelae, as up to 70% of patients who experience awareness suffer from post-traumatic stress disorder. Because 300,000 patients are mechanically ventilated in the ED annually in the US, thousands of patients are at risk each year. In this study, we conduct a prospective observational cohort study to determine the incidence of awareness in mechanically ventilated patients in the ED and the association between awareness events and patient- and treatment-related variables.

Methods: A prospective observational cohort study will address the study aim. We will collect baseline demographics, comorbid conditions, vital signs, pertinent laboratory values, and ED treatments. Descriptive statistics, including mean \pm SD, median, and frequency distributions will be used to assess the characteristics of the patient cohort. The incidence of awareness will be described with frequency (%). To assess predictors of awareness, continuous and categorical variables will be compared using an unpaired t test, Wilcoxon test, Chi-square test, or Fisher exact test, as appropriate, at a P value \leq .10.

Results: 133 patients have been screened so far and 67 have been enrolled in the study. There have been 2 potential awareness events. However, these need to be fully adjudicated and data collection is currently ongoing. Descriptive statistics will not be used to describe the patient cohort until data collection is complete. Thus, identification of risk factors associated with the 2 potential awareness events is impossible at this current time.

Conclusions: We hope to provide novel context to a previously understudied issue, as well as identify risk factors for awareness which can be targeted for intervention.

127 Zhang, David

Funding Program: T35 NIH NHLBI Training Grant
Research Program: Summer Research Program
Doctoral Program of Study: Medicine
Institution: Washington University School of Medicine
Research Department: Physics
Mentors: Shankar Mukherji, PhD

Induction of Reactive Oxygen Species in Yeast Using Hydrogen Peroxide

Zhang D, Mukherji S

Introduction: Reactive Oxygen Species (ROS) are oxygen radicals that come from the incomplete reduction of O₂. They are most often formed as by-products of oxidative metabolism, and are implicated in a wide variety of important cellular functions such as apoptosis and autophagy. By oxidizing specific cysteine residues on certain enzymes, ROS can induce a novel class of post-translational modifications that can substantially change protein function and even change gene expression. It is important to discover how to induce ROS production in model organisms in order to better understand the downstream effects of ROS production.

Methods: Specific yeast strains with fluorescently labeled organelles were incubated with hydrogen peroxide. A special dye was then added to the incubating solution that was designed to only fluoresce in the presence of ROS. The yeast cells were then imaged to check for levels of fluorescence. Other yeast cells were incubated in the absence of hydrogen peroxide or dye and were used as negative controls.

Results: As expected, cells that were incubated in hydrogen peroxide showed higher levels of fluorescence, implying that such cells increased endogenous levels of ROS production. These results confirm the results of previous research that investigated the induction of ROS in yeast. External oxidative stress is thought to increase the endogenous production of ROS in order to activate de-oxidizing pathways that can buffer the external oxidative stress.

Conclusions: ROS production is vital to many basic cellular processes such as autophagy and apoptosis. Discovering means of inducing ROS may contribute to further research on the exact mechanisms of consequences of increased ROS production, as may occur as a result of exogenous insult or of local cellular stress.

128 Zike, Valerie

Funding Program: T35 NIH NHLBI Training Grant
Research Program: Summer Research Program
Doctoral Program of Study: Medicine
Institution: Washington University School of Medicine
Research Department: Medicine
Mentors: Andrej Spec, MD, MSCI

Impact of infectious diseases consultation on clinical outcomes in patients receiving amphotericin B

Zike V, Larson L, Spec A

Introduction: Amphotericin B is the first line treatment for invasive mycoses. Prior studies have shown that higher doses and a longer fungicidal regimen are associated with better prognosis. However, amphotericin B is associated with adverse side effects such as nephrotoxicity, infusion reactions, and electrolyte wasting, prompting physicians to use shorter durations and lower doses. An infectious disease consultation is often obtained during treatment. This study aims to evaluate the impact of infectious disease (ID) consultation in clinical outcomes of patients receiving intravenous amphotericin B.

Methods: We assembled a retrospective cohort of 150 patients who received intravenous amphotericin B while hospitalized in our tertiary hospital. Data on comorbidities, laboratory findings, potassium and magnesium repletion, antifungal therapy, mortality, and ID consult were collected. Survival analysis was performed with Cox regression with survival censored past 90 days.

Results: At the time of abstract submission, this research is currently ongoing. We anticipate that the patients with an ID consult will have lower mortality, longer duration of amphotericin B treatment, and less nephrotoxicity than patients who did not receive an ID consult.

Conclusions: While results for this study are still pending, we expect they will indicate that obtaining an ID consult should be standard practice in the care of patients receiving intravenous amphotericin B.

Washington University in St. Louis, Office of the Provost

78 Ngari, Adaoma

Funding Program: Washington University in St. Louis, Office of the Provost

Research Program: Summer Research Program

Doctoral Program of Study: Medicine

Institution: Meharry Medical College

Research Department: Surgery; Washington University School of Medicine

Mentors: Muhammad Masood, MD; Marci Damiano, RN, MSN

Left Ventricular Assist Device Exchange: Comparing Outcomes of HeartMate2 (HM2), HeartMate3 (HM3) and HeartWare (HVAD) Device Exchanges for Pump Thrombosis

Ngari A, Kotkar K, Damiano M, Itoh A, Masood M

Introduction: Left Ventricular Assist Device (LVAD) exchange is the established treatment for LVAD pump thrombosis; however, INTERMACS data convey complications including re-thrombosis in HM2 to HM2 exchanges. This single center retrospective study compared outcomes of LVAD exchanges for pump thrombosis across three groups: HM2 to HM2, HM2 to HM3 and HVAD to HVAD. Secondly, outcomes of single and multiple HM2 exchanges for reasons including pump thrombosis, pump pocket infection and device malfunction were compared.

Methods: Clinical registries INTERMACS and Society of Thoracic Surgeons (STS) were queried to determine patient cohorts. Analysis using Chi-Squared, Kaplan- Meier, Independent T-test and One-Way ANOVA were used. Significance was set at $p < 0.05$.

Results: 83 exchange procedures for pump thrombosis were performed on 68 patients between 1/1/2005 and 12/31/2018 (12 patients received two or more exchanges). 66 (80%) exchanges were HM2 to HM2, 6 (7%) were HM2 to HM3 and 11 (13%) were HVAD to HVAD. Additionally, 65 (83%) patients underwent a single HM2 exchange and 13 (17%) underwent multiple HM2 exchanges. No significant differences in mortality, re-thrombosis, need for subsequent LVAD exchange or adverse events including stroke, infection, bleeding complications or dialysis requirements were found across groups. Kaplan-Meier analysis revealed no significant differences between single and multiple HM2 exchange groups.

Conclusions: This preliminary study revealed no significant differences in post exchange outcomes across groups, however, conclusions are limited by small sample size. Conducting a longer study across multiple institutions with a larger pool of participants would likely yield significant and clinically relevant conclusions.

WUSM Dean's Fellowship

3 Ambastha, Chetan

Funding Program: WUSM Dean's Fellowship
Research Program: Summer Research Program
Doctoral Program of Study: Medicine
Institution: Washington University School of Medicine
Research Department: Orthopaedic Surgery
Mentors: John Clohisy, MD

The fate of the contralateral hip: a midterm outcomes analysis of acetabular dysplasia post-periacetabular osteotomy

Ambastha CG, Abu-Amer W, Nepple JJ, Pascual-Garrido C, Harris MD, Clohisy JC

Introduction: Acetabular dysplasia is a source of hip pain, dysfunction and secondary osteoarthritis, yet factors associated with disease progression are poorly understood. Understanding the incidence of pain and disease progression in the contralateral hip of patients who undergo a periacetabular osteotomy (PAO) for the treatment of symptomatic acetabular dysplasia will facilitate patient counseling and future preventive strategies. Our goal is to determine the incidence of contralateral disease progression in patients who have undergone a PAO at a minimum 5 year follow-up and identify associated risk factors. This information will allow physicians to better counsel patients undergoing a unilateral PAO and will provide novel information regarding risk factors for disease progression associated with acetabular dysplasia.

Methods: This is an IRB approved study. We utilized a prospectively collected database to identify patients who underwent a PAO for the treatment of symptomatic acetabular dysplasia between January 2008 and December 2013. Those with a history of neuromuscular disorders or evidence of significant contralateral hip osteoarthritis on radiographs (Tonnis grade ≥ 2) were excluded. We utilized patient questionnaires to characterize the development of contralateral pain. Univariate logistic regression was used to determine whether various preoperative patient reported outcome measures or radiographic parameters were predictive of pain in the contralateral hip.

Results: Of 219 eligible patients who underwent a PAO, 156 met criteria and were included for analysis. Of these, 96 (62%) had contralateral hip pain at a minimum 5 year follow up. 66 (42%) patients underwent surgery in the contralateral hip. Low LCEA and high tonnis angle were significantly associated with contralateral hip pain. ACEA, BMI, and age at index PAO were not associated with contralateral hip pain.

Conclusions: A significant proportion of patients who undergo a PAO will develop pain in the contralateral hip at a minimum 5 year follow up. Those with lower LCEA and higher tonnis angle in the contralateral hip are more likely to develop symptoms. Many of these patients will require contralateral hip surgery.

6 Barrack, Toby

Funding Program: WUSM Dean's Fellowship
Research Program: Summer Research Program
Doctoral Program of Study: Medicine
Institution: Washington University School of Medicine
Research Department: Orthopaedic Surgery
Mentors: Charles Lawrie, MD; Ryan Nunley, MD; Muyibat A. Adelani, MD

Patient and surgeon satisfaction with and utility of routine follow up one year after primary total hip and total knee arthroplasty

Barrack TN, Lawrie CM, Abu-Amer W, Adelani MA, Clohisy JC, Nunley RM, Barrack RL

Introduction: Guidelines for the optimal timing and number of routine clinical visits for asymptomatic patients have been suggested, however, no consensus exists. The purpose of this prospective survey study was to determine the utility of the routine one-year follow-up visit after primary total hip or knee arthroplasty.

Methods: We prospectively enrolled all patients ≥ 18 yo undergoing primary TKA, THA, UKA, or SRA with a primary diagnosis of osteoarthritis. Those that were pregnant, incarcerated, had a pre-existing functionally-limiting neurological disorder, or undergoing revision TKA or THA were excluded. At one-year follow-up, patients were asked to complete a burden survey including satisfaction (5-point scales) and if the visit was worthwhile (yes/no). Surgeons also completed a burden survey at this time which asked if any intervention was done, if any problems were diagnosed/avoided, and if the visit was worthwhile.

Results: Between 10/1/2017-7/1/2018, 512 patients underwent primary TJA or SRA and agreed to participate in the study. The final cohort consisted of 195 of these in which passive one-year follow-up was obtained and had 102 THAs, 94 TKAs, 5 UKAs, and 1 SRA. Mean age was 62.7 years with 79 males (40.5%) and 378 days mean follow-up. Patients reported a mean 4.71 rating with satisfaction of care provided by their surgeon and mean 4.64 when asked if the visit was worthwhile. When physicians were asked if any problems, issues diagnosed, or complications were avoided because of the visit, 23.03% said yes. When asked if the visit was worthwhile, 66.84% said yes. For visits during which no interventions were performed or ordered, 49.44% of physicians said the visit was worthwhile.

Conclusions: Patients generally thought their follow-up visit was worthwhile. In visits without intervention, over half of physicians thought the visit was not worthwhile. Surgeons may consider restricting their one-year postoperative visits to symptomatic patients.

9 Berrian, Jennifer

Funding Program: WUSM Dean's Fellowship

Research Program: Summer Research Program

Doctoral Program of Study: Medicine

Institution: Washington University School of Medicine

Research Department: Surgery

Mentors: Graham Colditz, DrPH, MD, MPH; Ying Liu, MD, PhD, MPH

The relationship between insurance and disparities in outcomes for breast cancer patients in Missouri

Berrian JL, Liu Y, Colditz G

Introduction: Compared with privately insured women, uninsured and Medicaid-insured women are more likely to have late stage breast cancer and die from breast cancer. Using the Missouri Cancer Registry, this study seeks to further explore these disparities by looking at differences at diagnosis, treatment, and mortality and explore the specific vulnerabilities found in the uninsured breast cancer population.

Methods: Using women diagnosed with breast cancer from January 1, 2007 to December 31, 2016, 35,713 women were included in the final analysis. Of these women, they were categorized based on insurance status, with other covariates including race, socioeconomic status, age, marital status, tumor characteristics, treatment and time to treatment. We then focused on three main outcomes: diagnosis with late breast cancer stage, treatment delay of >60 days, and mortality.

Results: From diagnosis, the odds of late breast cancer stage were higher for patients with Medicaid (OR = 1.76, 95% CI 1.60 - 1.94) and no insurance (OR = 2.32, 95% CI: 1.94 - 2.78), compared to the privately insured. With treatment, Medicaid and uninsured patients had higher odds of treatment delay (Medicaid OR = 1.717, 95% CI: 1.469 - 2.007 and uninsured OR = 1.70, 95% CI: 1.26 - 2.30). And finally, when looking at mortality, when considering just the sociodemographic covariates, uninsured patients were significantly more likely to die from their disease than any other insurance type (OR = 2.47, 95% CI = 2.04 – 3.00).

Conclusions: This paper shows that for breast cancer patients with Medicaid or no insurance, they are more likely to have a late breast cancer stage, a >60 day treatment delay, and cancer-specific mortality. Our paper demonstrates that for the uninsured population, access to screening and treatment through insurance could decrease the likelihood of death in this vulnerable population.

16 Cogsil, Taylor

Funding Program: WUSM Dean's Fellowship

Research Program: Summer Research Program

Doctoral Program of Study: Medicine

Institution: Washington University School of Medicine

Research Department: Orthopaedic Surgery

Mentors: Lindley Wall, MD, MSc

Congenital upper extremity anomalies: a thematic analysis of online discussion boards

Cogsil T, Kim DJ, Goldfarb CA, Wall LB

Introduction: Online discussion boards are used by many patients and family members to pose questions and share experiences with the broader, specific community. Systematic analysis of the text posted to discussion boards about congenital upper extremity (UE) anomalies will allow physicians to better identify and address patients' questions and concerns.

Methods: Google and Yahoo! internet search engines were used to identify online discussion groups pertaining to congenital UE anomalies. Posts written between January 1, 2009 and January 1, 2019 were collected and analyzed. Each online post was coded by two of the authors (T.C. and L.B.W.) utilizing grounded theory. Text was reviewed in three rounds: open coding, axial coding, and selective coding. This allowed comprehensive, central themes of the discussion boards to emerge.

Results: 305 posts were collected, and a total of 23,293 words were analyzed. Five selective codes were identified from the posts: 1) Connecting With Others, 2) Emotional Aspects, 3) Treatment, 4) Diagnosis, and 5) Function. Connecting With Others was the most frequently assigned selective code, applying to 69% of posts. 118 unique users contributed to posts. Parents of a child with a congenital UE anomaly represented 47% of the authors, patients themselves represented 18%, and administrators represented 17%. The majority of parents were postnatal (84%). Of the 199 posts written by non-administrators, 69% provided information and 31% elicited information. While 65% of the posts eliciting information were seeking technical data, only 41% of the posts providing information were technical. Frequently used words included hand/s (122), extra/s (119), born (84), syndrome/s (64), and surgery (63).

Conclusions: Individuals accessing online discussion boards are commonly searching for both technical and emotional support from others who can either empathize or may have personal experience to share. Through analysis and identification of the themes from these posts, physicians can be proactive in addressing the technical and emotional concerns of individuals with congenital UE anomalies and their families.

17 Cohen, Sarah

Funding Program: WUSM Dean's Fellowship
Research Program: Summer Research Program
Doctoral Program of Study: Medicine
Institution: Washington University School of Medicine
Research Department: Surgery
Mentors: Graham Colditz, DrPH, MD, MPH

Modifiable risk factors in women at high risk of breast cancer: a systematic review

Cohen SY, Stoll CR, Doering M, Colditz GA

Introduction: Modifiable risk factors, such as alcohol use, smoking, obesity, hormonal contraception use and physical activity significantly affect an individual's risk of developing breast cancer. However, it is unclear how modifiable risk factors affect breast cancer risk in women with non-modifiable risk factors, such as family history of breast cancer, BRCA1/2 mutations, or a familial cancer syndrome. This systematic review sought to understand how modifiable risk factors affect individuals with an increased burden of nonmodifiable risk factors and to determine what information should exist on modifiable risk factors to guide patients who have an increased breast cancer risk due to non-modifiable risk factors.

Methods: This review included observational studies that investigated the effect of the interaction between a modifiable risk factor and a non-modifiable risk factor on breast cancer risk. Eligible studies were categorized by modifiable risk factor exposure type and whether they increased, decreased, or had no effect on risk in women with a non-modifiable risk factor.

Results: The literature search resulted in a total of 109 eligible studies. 34 studies included participants with BRCA1/2 mutations, 74 included women with positive family history of breast cancer, and 1 included participants with a familial cancer syndrome (Li Fraumeni). In studies on women with positive family history and studies on BRCA1/2 mutations, few indicated that physical activity increased risk or that HC/HRT, smoking, or alcohol use decreased risk. However, exposure type varied widely among studies, sample sizes were often small, and a limited number of studies existed particularly on BRCA1/2 mutation carriers.

Conclusions: As genetic testing gains popularity and discussing familial medical history becomes more commonplace, an increasing number of women will recognize their high risk of breast cancer and seek avenues to modify that risk. Due to heterogeneity and limited power of existing studies, further studies are necessary to better understand how modifiable risk factors influence breast cancer risk in women with non-modifiable risk factors.

19 Collis, Reid

Funding Program: WUSM Dean's Fellowship
Research Program: Summer Research Program
Doctoral Program of Study: Medicine
Institution: Washington University School of Medicine
Research Department: Orthopaedic Surgery
Mentors: Abby Cheng, MD

Unique considerations in the management of athletes with pre-arthritis hip disorders: an observational cohort study

Collis R, McCullough A, Ng C, Prather H, Colditz C, Clohisey J, Cheng A

Introduction: Pre-arthritis hip disorders (PAHD) such as femoroacetabular impingement (FAI), acetabular dysplasia, and acetabular labral tears are common causes of pain and dysfunction in adolescent and young adult athletes. Operative management is often recommended, but surgery requires a long recovery time, and conservative management may be a reasonable approach for some athletes.

Methods: A retrospective chart analysis was performed of patients in middle school, high school, and college who presented to a single tertiary academic medical center between 6/22/15 and 5/1/18 for PAHD. Extracted variables included patients' self-reported athlete status, decision to choose surgery within one year of presentation, and baseline self-reported pain and functional scores on Patient-Reported Outcomes Measurement Information System (PROMIS) domains and the Hip Disability and Osteoarthritis Outcome Score (HOOS).

Results: Of 298 eligible subjects, 231 (78%) were athletes. Compared to non-athletes, athletes were younger (17 vs 19 years old, $p < 0.001$). They also reported a shorter symptom duration (34.2% less than 6 months vs 10.5%, $p < 0.001$), less pain interference (mean difference (MD) 4.5 points on Pediatric PROMIS ($p = 0.01$), 4.6 on Adult PROMIS ($p < 0.001$)), and a lower prevalence of coexisting depression (4% vs 24%, $p < 0.001$). Athletes were no more likely to choose surgery than non-athletes (124 (54%) vs 43 (64%), $p = 0.13$). Among athletes, those who chose surgery versus conservative care did not differ by demographics, activity level, or behavioral health history. However, athletes who chose surgery reported worse baseline pain interference (MD 4.7 points on Pediatric PROMIS ($p < 0.001$), 4.4 on Adult PROMIS ($p = 0.01$)) and hip-specific symptoms on HOOS subscales (MD 6.9-12.3, $p = 0.04-0.01$).

Conclusions: Similar to non-athletes, only half of athletes with PAHD chose surgical management within one year of presentation. Many competitive athletes with PAHD successfully maintained an active lifestyle with conservative management, but in the appropriate clinical context, severe baseline physical impairment may be a potential indication for earlier consideration for surgical intervention.

21 Del Toro, Drew

Funding Program: WUSM Dean's Fellowship
Research Program: Summer Research Program
Doctoral Program of Study: Medicine
Institution: Washington University School of Medicine
Research Department: Otolaryngology
Mentors: John Chi, MD, MPH; Latoya Jeanpierre

Physical treatments for facial paralysis after iatrogenic injury

Del Toro DE, Jeanpierre LM, Chi JJ

Introduction: Facial Paralysis is a physically and socially deforming disease, the second most common cause being due to common surgical procedures of the head and neck. Therefore, understanding the benefits, or lack thereof, of potential treatments for this condition is very important for patients and physicians. The objective of this systematic review was to assess whether physical therapy lead to reductions in rates of incomplete recovery, rates of synkinesis, measures of facial paralysis, and time to recovery.

Methods: A medical librarian searched published literature for records discussing "facial paralysis" and "physical therapy." The librarian created search strategies using a combination of keywords and controlled vocabulary in all available medical databases. Two authors independently screened titles and abstracts to identify eligible articles. Studies were excluded if: 1) studies were not facial paralysis focused, 2) patients did not have a diagnosis of iatrogenic facial paralysis, 3) patients did not undergo physical therapy, or 4) the study design was a case report. Any discrepancies were addressed and resolved with the senior author.

Results: Overall, out of the 1386 unique articles identified, 241 were selected for full text review. Of the 241, full texts were found for 235 and a full text review is in progress. After data extraction and synthesis, we expect to find low to medium quality evidence revealing the benefits of physical therapy exercises after iatrogenic injury.

Conclusions: The preliminary results of this study suggest that more high quality research on physical therapy to treat iatrogenic facial paralysis is required to establish a standard of care. Within the literature, measurements of facial paralysis and reported treatment outcomes are not uniformly reported. Moreover, there were a wide variety of physical therapy techniques and assessments found in our search. Upon its completion, this systematic review should serve as a call to action for future randomized controlled trials and potentially allow physicians to comfortably refer patients with iatrogenic facial paralysis to physical therapy.

24 D'Souza, Alden

Funding Program: WUSM Dean's Fellowship
Research Program: Summer Research Program
Doctoral Program of Study: Medicine
Institution: Washington University School of Medicine
Research Department: Orthopaedic Surgery
Mentors: Jacob Buchowski, MD, MS; Owoicho Adogwa, MD

Spine-Related Events from Spinal Metastases Originating from Non-Small Cell Lung Cancer

D'Souza AV, Jennings J, Adogwa O, Shlykov M, Buchowski J

Introduction: Spinal metastases are common complications of late-stage non-small cell lung cancer (NSCLC) and frequently lead to spine-related events, such as spinal cord compression, pathological vertebral fracture, or nerve root compression. Broadly, spinal metastases have been extensively studied, but there is a lack of research on spinal metastases originating from NSCLC. Rates of NSCLC metastases are increasing in recent years due to prolonged survival times for NSCLC patients. This study investigates correlations between spine-related events, quantity of spinal metastases, visceral lesions, and predictors such as age and smoking status.

Methods: A retrospective chart review was performed on 340 patients from Barnes-Jewish Hospital who had NSCLC with spinal metastases. Data was extracted from physician notes and death dates were acquired either through notes or the Social Security Index. The Kaplan-Meier method was applied in a preliminary analysis.

Results: Approximately 39% of our patients (S.E. 10.2%) had a spine-related event, 78% of which were pathological fractures. Only 21% had spinal cord compression. Survival analysis was conducted for each type of carcinoma based on the diagnosis to SRE and diagnosis to death. Kaplan-Meier analyses to SRE and to death showed slowest rates in adenocarcinoma, followed by squamous cell carcinoma, then large cell carcinoma. In further analyses, we will explore the relationship between age, radiotherapy, and/or chemotherapy in relation to SREs.

Conclusions: Preliminary results reveal that carcinoma type can help predict SRE incidence and survival rates, but the low patient count for large cell carcinoma prevents meaningful conclusions. As the research moves forward, the predictive value of these variables could be shifted for NSCLC patients, thus altering the standard of care. It could also alter counseling for patients based on variables that are more specific to them, such as their carcinoma type.

25 Elson, Lauren

Funding Program: WUSM Dean's Fellowship
Research Program: Summer Research Program
Doctoral Program of Study: Medicine
Institution: Washington University School of Medicine
Research Department: Medicine
Mentors: Karen Joynt-Maddox, MD, MPH

Trends in hospital mortality for uninsured rural and urban populations, 2012-2016

Elson LE, Luke AA, Barker AR, McBride TD, Joynt Maddox KE

Introduction: Rural-urban health disparities have received increasing scrutiny as rural individuals continue to have worse health outcomes than urban individuals. However, little is known about how insurance status contributes to urban-rural disparities. The purpose of this study is to characterize how rural uninsured patients compare to the urban uninsured, to determine whether rurality among the uninsured is associated with worse clinical outcomes, and to examine how clinical outcomes based on rurality have changed from 2012 to 2016.

Methods: Hospital discharge data from the National Inpatient Sample (NIS) was used from January 2012 to December 2016. 1,478,613 uninsured patients were included, of which 233,816 were rural. Admissions were broken into six groups based on rurality. Baseline, admission, and discharge characteristics were compared. A series of logistic regression models were used to determine the independent association between rurality and hospital mortality.

Results: Demographic and clinical characteristics differed significantly between rural and urban uninsured patients: rural patients were more often white, lived in places with lower median household income, were more often admitted electively, and were more often transferred. Rurality was associated with significantly higher in-hospital mortality rates (1.44% versus 1.89%, OR 1.32, $p < 0.001$), and this association strengthened after adjusting for medical comorbidities and hospital characteristics. Further, disparities between urban and rural mortality were found to be growing, with the gap almost doubling between 2012 and 2016.

Conclusions: Rural and urban uninsured patients differed significantly, specifically in terms of race and median income. Among the uninsured, rurality was associated with higher in-hospital mortality, and the gap between urban and rural in-hospital mortality was widening. Our findings suggest that the rural uninsured are a vulnerable population who are in need of informed, tailored policies to reduce these disparities nationwide.

27 Evie, Hosannah

Funding Program: WUSM Dean's Fellowship
Research Program: Summer Research Program
Doctoral Program of Study: Medicine
Institution: Washington University School of Medicine
Research Department: Surgery
Mentors: Matt Wood, PhD; Susan Mackinnon, MD

Effects of Alternating Versus Direct Current Electrical Stimulation Devices on Nerve Regeneration Following Repair

Evie HP, Schellhardt L, Hunter D, Mackinnon S, Wood M

Introduction: Electrical stimulation (ES) has been shown to be useful in improving nerve regeneration, via increasing axonal growth and preferential reinnervation of motor pathways following injury. Most of the experiments that have shown this improvement involve the use of alternating current (AC) ES protocols. However, there is some evidence, but limited mechanistic understanding, that direct current (DC) ES could also improve nerve regeneration. We compared two ES devices using either AC or DC ES protocols in a rat tibial cut/repair model to measure their effects to regeneration. We hypothesized that AC ES, but not DC ES, will augment and improve nerve regeneration after surgical repair.

Methods: Twenty seven (27) male Lewis rats were randomized into three groups: No ES, DC ES at 0.5 mA constant current for 1 hour, and AC ES at 0.5 mA constant current for 1 hour. All groups underwent a tibial nerve cut and repair surgery followed by ES (or no ES). Walking track analysis was conducted on a cohort of $n=9$ rats per group. Before, and then twice weekly up until the 8 week endpoint, rat walking tracks were measured and scored using the tibial function index (TFI). Gridwalk was conducted at the end of the experiment on all rats.

Results: The cohort of rats assessed using walking track analysis demonstrated no impaired function prior to surgery and severely impaired function (based on TFI) at day 10 to 17 after surgery. Walking track and grid walk analysis showed no difference between the groups at the 8 week endpoint. This was despite the fact that DC ES caused swelling and loss of myelin at the periphery where it touched the nerve during ES application.

Conclusions: The results show no difference between the groups. This outcome may be attributed to the walking track and grid grip tests not being sensitive enough to pick up any differences due to E-stim. Another possibility was that the study was ended prematurely before group differences become apparent. Based on the results, application of DC ES does not seem to impair functional recovery.

31 Ganapathy, Pramodh

Funding Program: WUSM Dean's Fellowship
Research Program: Summer Research Program
Doctoral Program of Study: Medicine
Institution: Washington University School of Medicine
Research Department: Orthopaedic Surgery
Mentors: Alexander Aleem, MD

Risk factors for instability following reverse total shoulder arthroplasty: a retrospective case-control study

Ganapathy PK, Bechtold DA, Keener JD, Aleem AW

Introduction: Though reverse total shoulder arthroplasty (RTSA) is a procedure performed for a variety of indications, instability of the prosthesis following surgery remains a potential complication. While previous studies have attempted to elucidate the risk factors and etiology involved in instability, its causes remain poorly understood. In this study, we examine a cohort of patients with instability following RTSA in order to determine potential risk factors. Better understanding of instability and its risk factors may allow for improved surgical techniques to decrease incidence of this complication.

Methods: A cohort of 34 patients with instability following RTSA were gathered and compared in a 1:3 ratio to age-, sex-, and BMI-matched controls to determine potential risk factors for post-operative instability.

Results: Analysis has not yet been completed, but results are anticipated later this year.

Conclusions: Analysis has not yet been completed, but results are anticipated later this year.

35 Hagberg, Lindsey

Funding Program: WUSM Dean's Fellowship
Research Program: Summer Research Program
Doctoral Program of Study: Medicine
Institution: Washington University School of Medicine
Research Department: Orthopaedic Surgery
Mentors: Jeffrey Nepple, MD, MS; John Clohisy, MD; Charles Lawrie, MD

Characterizing acetabular and proximal femoral cysts in young adults with developmental dysplasia of the hip

Hagberg LM, Hillen TJ, Clohisy JC, Nepple JJ

Introduction: Formation of bone cysts in the acetabulum and femur in developmental dysplasia of the hip (DDH) results from abnormal biomechanics of the hip. Cyst formation is generally permanent and may compromise the outcomes of hip preservation surgery in some cases, but this remains poorly investigated. The purposes of this study were 1) to determine the prevalence of acetabular and femoral cysts; 2) to describe the location and size of cysts; 3) to determine the association between cyst features and patient clinical characteristics.

Methods: We performed a retrospective cohort study of acetabular and proximal femoral cysts in patients with DDH. We used pre-operative CT scans from patients that underwent periacetabular osteotomy for symptomatic DDH. There were 270 hips in 247 patients with a mean age of 25.3. We analyzed CT scans in three planes and identified the presence/absence of cysts and their location. Acetabular location was classified according to 3 zones on both the coronal and sagittal images. Proximal femoral location was classified as head-neck junction or femoral head.

Results: There were 40 acetabular cysts in 36 hips (13.3%) with 60% measuring greater than or equal to 5mm. The majority of these cysts were located in the anterior rim of the acetabulum (65%, 26/40) and were large, which we defined as ≥ 5 mm (69.2%, 18/26). The second most common location was the lateral rim (20%, 8/40) and 37.5% (3/8) were large (≥ 5 mm). There were 15 proximal femoral cysts in 14 hips (5.2%). Most were located in the anterior/anterosuperior femoral head-neck junction (66.7%, 10/15) and were small (60%, 6/10), which we defined as < 5 mm. Femoral head cysts were less common and present in 20% (3/15) and were large (66.7%, 2/3).

Conclusions: The prevalence of acetabular cysts was 13.3%, with most located in the weight-bearing portion of the acetabular rim. Femoral cysts were present in 5.2% and were commonly located at the head-neck junction. This may be due to associated impingement in these patients. Large acetabular and femoral cysts were present in 60% and 46.7% respectively. Future studies will investigate the role of acetabular and femoral cysts in the outcomes of hip preservation surgery in this population.

38 Holten, Anna

Funding Program: WUSM Dean's Fellowship
Research Program: Summer Research Program
Doctoral Program of Study: Medicine
Institution: Washington University School of Medicine
Research Department: Orthopaedic Surgery
Mentors: Cara Cipriano, MD, MSCI

Gender Diversity of Orthopaedic Surgery Society Awards Over Time

Holten AK, Cipriano CA, Gerull KM, Rhea LK

Introduction: Awards given by medical societies have been suggested as measures of inclusion in a society. The history and current gender distribution of awards has not been studied in orthopaedics. We aimed to study orthopaedic subspecialty society awards over time overall and with respect to award type and blinding.

Methods: 20 orthopaedic societies were surveyed and the gender of each award recipient from the earliest record of that award through December 2018 was coded. The awards were categorized based on the type of accomplishment they recognized and if the award was granted through a blinded or unblinded process. The results of the recipients who had MD equivalent degrees were statistically analyzed.

Results: 1) The proportion of women receiving awards when the awarding process was unblinded (5.2%, 34/658) is similar to the current proportion of women practicing in orthopaedics (5.3%), but lower than the proportion of women in academic orthopaedics (19.3%). 2) Women were most significantly underrepresented in leadership awards (1.8%), when compared to other categories such as Work (9.6%) and Diversity (26.3%). 3) Societies with diversity statements and task forces are not associated with higher rates of diversity.

Conclusions: Awards are an impactful tool to measure diversity and inclusion in medical societies because of their role in granting physicians visibility within the field and their ability to be used as a proxy for examining institutional support. Our findings that women surgeons are not represented by orthopaedic society awards, in particular Leadership awards, provide further evidence that the award process may be gender biased. We encourage all societies to track the demographic information of award recipients in order to increase accountability within their organization and for the field of orthopaedics broadly.

46 Johnson, Emily

Funding Program: WUSM Dean's Fellowship
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Doctoral Program of Study: Medicine
Institution: Washington University School of Medicine
Research Department: Neurology; Stanford University
Mentors: Martha Morell, MD, PhD; John Zempel, MD, PhD

Responsive neurostimulation for medically refractory epilepsy in patients with autism spectrum disorder

Johnson EA, Fields M, Mirro EA, Morrell M

Introduction: Epilepsy in autism spectrum disorders (ASD) has prevalence between 8-26%. Medically refractory epilepsy (MRE) is more common in persons with ASD who have severe intellectual disability. Epilepsy in children with ASD is associated with increased mortality and poor prognosis. In addition, the often multifocal nature of their epilepsy renders these patients poor epilepsy surgery candidates. The RNS System provides stimulation directly to seizure foci in response to epileptiform electrographic events as a method of treatment for MRE. The RNS System in combination with traditional pharmacological management has proven efficacious in the adult MRE population. We hypothesized children with ASD and MRE may benefit from RNS System therapy.

Methods: We retrospectively evaluated patients with ASD and MRE that underwent RNS System placement. Demographic information, etiology, seizure types, pre-implantation seizure frequency, previous surgical history, RNS implant characteristics, and post-implantation seizure frequency outcomes were collected.

Results: Five patients with ASD and MRE had the RNS System placed at Mount Sinai Medical Center. Patients 1 and 2 reported no change in seizure frequency at 6.8 and 9.8 months post-implantation, respectively. Patients 3 and 4 reported a 25-50% reduction in seizure frequency at 15 and 30 months post-implantation, respectively. At the time of this case series, patient 5 is 3 months post-implantation. Thus implantation is too recent to report initial seizure frequency outcomes. Initial outcomes for 6 additional patients are pending.

Conclusions: There did not appear to be adverse effects of RNS System treatment, but there is not sufficient experience to determine whether RNS System therapy will be an effective treatment for this population. Further evaluation is on-going.

53 Kessler, Skyler

Funding Program: WUSM Dean's Fellowship
Research Program: Summer Research Program
Doctoral Program of Study: Medicine
Institution: Washington University School of Medicine
Research Department: Medicine
Mentors: David Liss, MD; Evan Schwarz, MD

In-hospital use of medication-assisted treatment for opioid use disorder

Kessler SH, Liss DB, Schwarz ES

Introduction: More than 47,000 Americans died from an overdose involving an opioid in 2017, and approximately 2.1 million suffer from opioid use disorder (OUD). The opioid epidemic requires increased access to medication-based treatment of OUD in order to curb the death toll. Currently, few hospitals provide medication-assisted treatment to patients with OUD. The aim of this study was to describe the results of in-hospital administration of MAT for OUD at Barnes Jewish Hospital and to quantify differences between methadone and buprenorphine, the two most common types of MAT. The primary outcome was length of retention in outpatient treatment.

Methods: This was a retrospective cohort analysis of 163 patients who received a consult from the Section of Toxicology for a condition related to OUD. Rates of retention in the outpatient treatment program EPICC were compared using the chi-squared test to determine differences between in-hospital administration of methadone and buprenorphine.

Results: Toxicologists managed the administration of MAT in 88% (143/163) of consults for OUD. A total of 93 patients received MAT and connection with EPICC, with 66% receiving buprenorphine and 34% receiving methadone as their last form of MAT prior to hospital discharge. The rate of retention in outpatient treatment for patients receiving buprenorphine was 44%, 35%, and 23% and for patients receiving methadone was 56%, 53%, and 34% at two weeks, 30 days, and 12 weeks, respectively. There were no statistically significant differences in retention rates, with $P > 0.05$ at each time point.

Conclusions: The results of this study demonstrate that medication-based treatment for OUD may be prescribed effectively for hospitalized patients. While there are no statistically significant differences between the methadone and buprenorphine treatment groups, rates of retention trend higher in the methadone group than in the buprenorphine group at each of the three follow-up time points. Though further research regarding in-hospital use of MAT is required, this study suggests the importance of hospital protocols that provide for access to appropriate treatment for OUD.

65 Lippold, Brandon

Funding Program: WUSM Dean's Fellowship
Research Program: Summer Research Program
Doctoral Program of Study: Medicine
Institution: Washington University School of Medicine
Research Department: Orthopaedic Surgery
Mentors: Ryan Calfee, MD, MSc

The relationship between diagnosed depression and PROMIS depression scores in the hand clinic

Lippold BW, Cochrane S, Dale AM, Calfee RP

Introduction: The PROMIS Depression Computer Adaptive Test (CAT) quantifies depressive symptoms within 7 days prior to examination. This is distinct from any prior formal diagnosis of Depression among patients seeking care in a hand clinic. We tested the null hypothesis that PROMIS Depression scores would not differ between patients who either had, or did not have, a prior diagnosis of depression.

Methods: This cross-sectional study analyzed data from 351 patients presenting to a tertiary hand center between April 21, 2016 and November 22, 2017. Adult patients completed self-administered PROMIS Depression CAT at presentation. Electronic health records were examined to extract any past medical history of diagnosed Depression and antidepressant medication. Mean PROMIS Depression scores were compared by ANOVA (groups: no diagnosed Depression, Depression without medication, Depression with medication). A clinically relevant difference in PROMIS Depression scores between groups was set at 4 points. Scores >60 on PROMIS Depression were categorized as heightened depressive symptoms.

Results: Sixty-two (18%) of 351 patients had a prior diagnosis of Depression. Thirty-four (55%) of these patients reported being prescribed anti-depressant medications. PROMIS Depression scores indicated greater depressive symptoms among patients with diagnosed depression ($p < 0.01$) at the time of presentation. The difference in PROMIS Depression scores was clinically relevant as patients without diagnosed Depression averaged 4 points better than affected patients prescribed antidepressants, and 8 points better than those diagnosed with Depression but not prescribed antidepressants. Heightened depressive symptoms were significantly less likely among patients without a diagnosis of Depression (7%), than in patients diagnosed with Depression (33% with no medication, 29% with anti-depressant medication) ($p < 0.01$).

Conclusions: PROMIS Depression scores remain elevated in patients prescribed antidepressant medication. Surgeons in the hand clinic should be cognizant that patients on antidepressants may still suffer substantial symptoms. Studies should be undertaken to determine surgical outcomes based on antidepressant prescription status.

71 Mahal, Rajwant

Funding Program: WUSM Dean's Fellowship

Research Program: Summer Research Program

Doctoral Program of Study: Medicine

Institution: Washington University School of Medicine

Research Department: Otolaryngology

Mentors: Jay Piccirillo, MD, FACS; Dorina Kallogjeri, MD, MPH

Systems Improvement: Evaluating and Improving Early Hearing Detection Programs Across the US

Mahal RS, Kallogjeri D, Piccirillo JF

Introduction: The Early Hearing Detection Intervention (EHDI) is a system in place across all 50 states that screens children for hearing loss (HL) by 1 month of age, diagnoses children with Hearing Loss by 3 months of age, and begins providing the appropriate intervention by 6 months of age. If an individual fails screening, they must move on to a more costly and time intensive diagnosis process to determine if they have hearing loss. States are required to collect and report data on their EHDI programs to the CDC. It was our aim to review this reporting data to determine the efficacy of states' EHDI, particularly during screening and diagnosis.

Methods: Primary analysis involved assessing the effect of the number of individuals who have not passed screening / total number of individuals screened or the no pass rate (NPr) on the ability of states to detect HL.

Results: Initial analysis indicates that a larger NPr does not result in the diagnosis of additional children with HL.

Conclusions: The results suggest that states with a larger NPr use a greater number of resources on diagnosis per individual identified with HL, compared to states with a lower NPr. Because of this and the large costs associated with diagnosis, it may be more beneficial for states with a large NPr to focus their efforts on reducing NPr rather than what many states traditionally focus resources on, reducing Loss to Follow Up (LTFU).

83 Obiofuma, Chukwuka

Funding Program: WUSM Dean's Fellowship

Research Program: Summer Research Program

Doctoral Program of Study: Medicine

Institution: Washington University School of Medicine

Research Department: Orthopaedic Surgery

Mentors: David Brogan, MD, MSc

The Effect of Increasing Dorsal Angulation of Distal Radius Fractures on Median Nerve Tension

Obiofuma CM, Brogan D

Introduction: Distal Radius fractures are one of the most common types of fractures in the U.S with 650,000 occurring in 2001 and data showing increases in the incidence over time as the population ages. While extensive research shows an association between distal radius fractures and the development of median nerve related pathologies such as carpal tunnel syndrome, none directly track how the severity of the fracture, operationalized in this study by the resulting angle of dorsal angulation, relates to likelihood to develop median nerve pathology. In this study we aim to quantify how increasing dorsal angulation of a distal radius fracture changes the strain of the median nerve, which greatly informs the risk of median nerve pathology.

Methods: An oscillating saw was used to create artificial DRFs in 10 cadaver arms. The median nerves of each arm was exposed with minimal neurulation. The arms were fitted into an apparatus which allowed for the manipulation and fixation of the angle of the distal radius fracture. The change in tension was recorded using an optical solution via an overhead camera and MATLAB image processing. The significance was evaluated using a linear regression model.

Results: We are still in the process of gathering data for this paper. To date less than 40% of the data points have been obtained. However, preliminary data indicates that there is minimal increase in tension associated with increasing dorsal tilt due to a break.

Conclusions: The early results indicate that we overestimated the effect of changing distal radius angulation on the tension placed on the median nerve and that this may not be the link between distal radius fractures and delayed median nerve pathology.

84 Odabas, Arman

Funding Program: WUSM Dean's Fellowship

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Doctoral Program of Study: Medicine

Institution: Washington University School of Medicine

Research Department: Neurosurgery

Mentors: Wilson Z Ray, MD; Matthew R MacEwan, PhD; Ying Yan, MD, PhD

Implantable wireless stimulators deliver therapy and monitor recovery in rat sciatic nerve injury

Odabas AB, Yan Y, Birenbaum N, Ray WZ, MacEwan MR

Introduction: Peripheral nerve injuries (PNIs) recover poorly because of slow axon regrowth across the repair site. One session of electrical stimulation has been shown to accelerate axon sprouting and regeneration in PNIs in both animal and human studies. Multiple doses of electrical stimulation may improve PNI recovery further. A wireless implantable nerve stimulator is used in a rat model to understand whether a longer duration of stimulation is associated with better functional recovery.

Methods: Wireless implantable nerve stimulators were implanted in rats during a surgery to transect the right sciatic nerve and repair it with a 2 cm fresh nerve allograft. Following surgery, rats received 1 hour of stimulation at 20 Hz daily for 0 (control), 6 or 12 days. Biweekly after surgery, electromyograms (EMGs) of the tibialis anterior and gastrocnemius are used to monitor recovery. At the terminal time point of 12 weeks, muscle force testing and muscle mass data will be obtained, and tissues will be harvested for histology.

Results: 1,062 individual EMGs have been recorded from the 24 rats in the experiment and 1,530 more will be recorded. Maximum tetanic muscle force, muscle mass, and axon count measurements will also be obtained. Data will be compared between groups of rats to determine whether a longer course of electrical stimulation accelerates functional recovery from PNI.

Conclusions: Improvements in functional recovery with longer duration of electrical stimulation indicate that wireless implantable stimulators may be a promising new treatment modality for PNIs.

86 Ogbaslase, Abraham

Funding Program: WUSM Dean's Fellowship

Research Program: Summer Research Program

Doctoral Program of Study: Medicine

Institution: Washington University School of Medicine

Research Department: Neurology

Mentors: Gregory Wu, MD, PhD

Neutrophil signaling in the early stages of EAE

Ogbaslase AT, Archambault AS, Wu G

Introduction: Multiple Sclerosis (MS) is an autoimmune disorder that is characterized by demyelination of the white matter of the Central Nervous System (CNS) mediated by CD+ Th1 and Th17 cells. More recently the importance of other immune cell types in the development of disease is being recognized. Selective depletion of neutrophils has been shown to reduce the clinical severity as well as delay onset of disease. The goal of this project was to characterize changes in the expression of various cell surface markers on neutrophils isolated from mice at different points along the time course of disease progression in a mouse model in which MHC II is only expressed on B cells following provision of tamoxifen.

Methods: The mice used in this study were a C57BL6 mouse strain referred to as CD20Cre-BMHCIxIgHMOG. These mice only expressed MHC II on B cells upon administration of tamoxifen. The spleen, bone marrow, CNS parenchyma, spinal cord meninges and brain meninges were harvested from CD20Cre-BMHCIxIgHMOG mice at different stages of disease. Cell surface marker expression was then quantified in the various samples using fluorescence activated cell sorting (FACS).

Results: Cell surface marker expression from pre-symptomatic CD20Cre-BMHCIxIgHMOG mice at different time points appeared to be very consistent. This held true for all tissue compartments that were harvested and all the cell surface markers that were compared. When looking at CD54 expression in the spinal cord two distinct cell clusters were seen, one with higher expression of CD54 and one with lower expression. The CD54hi population expressed CD48 to a much greater degree than the CD54lo population. Additionally, this co-expression of CD54 and CD48 was also observed in the other cell compartments and across time points.

Conclusions: In conclusion, across compartments there appears to be a CD54-CD48 double positive population. However, it is inconclusive as to whether or not this population is present at a higher frequency in the central vs peripheral compartments. In the future data from naïve and sick mice should be included to better interpret changes occurring throughout the disease course.

89 Pearl, Talia

Funding Program: WUSM Dean's Fellowship

Research Program: Summer Research Program

Doctoral Program of Study: Medicine

Institution: Washington University School of Medicine

Research Department: Neurology; Mayo Clinic, Arizona

Mentors: Todd Schwedt, MD; Catherine Chong, PhD; David Dodick, MD; Awadalla, Sylvia, MD

Impact of Depression and Anxiety Symptoms on Patient-Reported Outcomes in Patients with Migraine: Results from the American Registry for Migraine Research (ARMR)

Pearl TA, Dumkrieger G, Chong CD, Dodick DW, Schwedt TJ

Introduction: The association between migraines and depression and/or anxiety has been established many times over; however, the impact of these psychiatric comorbidities on functional impairment in people with migraine has been under-investigated. The purpose of this study was to investigate the relationship between anxiety and depression symptoms on migraine-related disability, pain interference, work interference, and career success in a cohort of patients with migraine.

Methods: 769 patients enrolled in the American Registry for Migraine Research completed the Generalized Anxiety Disorder-7 (GAD-7) and Patient Health Questionnaire-2 (PHQ-2) to measure symptoms of anxiety and depression, respectively. Patients completed questionnaires to measure their levels of disability and interference at work and in their daily activities. In addition, they answered questions regarding education and career interference. Regression models were created to describe the relationship between severity of anxiety and depression symptoms and each outcome of interest. A logistic regression model was developed to describe the relationship between severity of psychiatric symptoms with reporting that migraine had interfered with career success. Each model was controlled for age, sex, headache frequency, years with migraine, and average headache intensity

Results: PHQ-2 scores were positively associated with scores on MIDAS ($p = .0024$); pain interference ($p < .0001$); WPAI scores including absenteeism ($p = .0072$), presenteeism ($p = .0191$), overall work productivity impairment ($p = .0043$), and activity impairment ($p = .0068$). PHQ-2 scores were also associated with reporting that migraine interfered with career success ($p = .003$). GAD-7 scores were not associated with MIDAS scores, pain interference, or WPAI scores. In a post-hoc analysis, GAD-7 scores were associated with pain interference in chronic migraine ($p = .0386$) and in females ($p = .0425$).

Conclusions: Patients with more severe symptoms of depression and anxiety are more likely to have greater functional impairment. A management approach that addresses anxiety and depression in those with migraine is expected to result in improvements in patient functioning.

91 Pfeiffer, Morgan

Funding Program: WUSM Dean's Fellowship

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Doctoral Program of Study: Medicine

Institution: Washington University School of Medicine

Research Department: Surgery

Mentors: Maria B Majella Doyle, MD, MBA; Adeel Khan, MD; William C Chapman, MD

Choledochal cysts: lessons learned

Pfeiffer MA, Khan A, Chapman WC, Vachharajani N, Doyle MBM

Introduction: Choledochal cysts (CC) are rare congenital anomalies characterized by dilation of intra and/or extra-hepatic bile-ducts. Surgery is main stay of treatment given potential for malignant transformation. However, limited data is available on natural history and long term outcomes in resected patients.

Methods: This was a single center retrospective review of patients diagnosed with CC between 2008 and 2018. Patient demographics, clinical data including symptoms, management, malignant transformation and long term outcomes were reviewed. Postoperative complications were evaluated using Clavien-Dindo classification system.

Results: Seventy-nine patients were diagnosed with CC during the study period. 68% were type 1, 6% type 2, 2.5% type 3, 10% type 4, and 4% type 5. The remaining patients' cyst type was not documented. 77% were female. Mean age at diagnosis was 27.2, and the most common presenting symptoms were abdominal pain, hyperbilirubin, and jaundice. Sixty-one (77%) patients underwent surgical resection, 4 underwent interventional radiology treatment, and 14 received no initial intervention. Mean follow-up was 8.05 years. Malignancy was identified in 2 patients: 1 found 12 years following surgical resection and 1 found incidentally at the time of surgical resection. Of patients managed surgically, 49% (30/61) developed at least one complication of which 60% (18/30) were severe (Clavien-Dindo ≥ 3).

Conclusions: The risk of developing cancer related to CC is low, especially in children and adolescents. Due to high surgery-associated morbidity, it may be favorable to follow younger patients with imaging if they are asymptomatic.

98 Sachar, Ryan

Funding Program: WUSM Dean's Fellowship
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Doctoral Program of Study: Medicine
Institution: Washington University School of Medicine
Research Department: Orthopaedic Surgery
Mentors: David M Brogan, MD, MSc

Functional Assessment of SARM1 Dominant-Negative Rats Following Nerve Trauma

Sachar RJ, Brogan DM

Introduction: A SARM1 dominant negative was expressed in mice and consequently demonstrated axonal protective qualities similar to those observed in SARM1-null mice. What remains lacking, however, is a functional motor assessment and a documented motor recovery timeline in SARM1 dominant negative mice after traumatic nerve injury. There is, therefore, a critical need to explore functional recovery after nerve trauma in SARM1 dominant negative models. Our specific aims are to evaluate nerve histomorphology in a SARM1 dominant-negative rat sciatic nerve model after transection and repair, and quantify the electrophysiologic and functional benefits conferred by inhibition of the SARM-1 pathway for Wallerian degeneration. The rationale for this project is that a determination of function in SARM1 dominant-negative rats following nerve injury can demonstrate the potential clinical advantage of future therapies targeted at this pathway.

Methods: We characterize nerve histomorphology in a rat sciatic nerve model after transection and repair at 2 day, 2 week, and 6 week intervals and assessed functional outcomes at 2 day, 2 week, and 6 weeks.

Results: The expected outcomes are to have quantified the axonal protective qualities in SARM1 dominant-negative rats as well as functional outcomes. These results are expected to have an important positive impact because they will provide a strong evidence-based proof of principle for the further development of therapies targeting SARM1 to treat nerve disease and injury.

Conclusions: Our project is ongoing and we cannot reach any conclusions at this point.

101 Shiang, Alex

Funding Program: WUSM Dean's Fellowship
Research Program: Summer Research Program
Doctoral Program of Study: Medicine
Institution: Washington University School of Medicine
Research Department: Surgery
Mentors: Michael Awad, MD, PhD

Ergonomic analysis of endoscopy via sEMG data

Shiang AL, Wang J, Awad M

Introduction: Physicians that perform endoscopy have extremely high rates of work-related injury. A European Association for Endoscopic Surgery study found that 120 out of 556 practicing endoscopic surgeons had previously sought medical help for pain and/or discomfort. While previous work has been done to qualitatively describe the pain associated with endoscopy, describing it quantitatively is a novel pursuit.

Methods: sEMG electrodes were used to measure the strain placed on muscles while physicians performed both upper and lower endoscopic procedures. A total of 27 WashU physicians were recorded during 181 endoscopies. The activity (voltage) from upper trapezius, medial deltoid, and both anterior/posterior forearm compartments was recorded. Prior to recording, physicians were asked to perform a series of isometric contractions against resistance. These maximal voluntary contraction (MVC) values were used for the normalization of each individual's voltage streams. Average MVC values were calculated for each muscle on a given procedure.

Results: Even though much of the data is still being analyzed, there have been some notable results. Thus far there has been more activation of the left forearm muscles of physicians with a small glove/hand size. Those with glove sizes of 5.5-6 had higher MVC values than those with glove sizes of 7.5-8 (L-Ant. Forearm: 9.432 ± 0.814 vs. 6.137 ± 0.918), (L-Post. Forearm: 12.002 ± 0.929 vs. 8.583 ± 0.812). Furthermore, physicians that had performed >300 cases had lower MVC values for both right trapezius and deltoid than those with <300 cases (R-Trap: 7.434 ± 0.419 vs. 9.731 ± 0.834), (R-Delt: 5.921 ± 0.432 vs. 7.397 ± 0.343).

Conclusions: The results based on glove size suggests that those with smaller hands have more forearm muscle strain on their left hands, which is used to hold the head of the endoscope. As for experience level, those with more experience tend to have lower strain on their right traps/delts, which is used to advance the scope through the colon. Further analyses have yet to be done investigating both procedural and patient factors, and the effects they have on the ergonomic strain placed on the practitioner.

107 Sinha, Urvi

Funding Program: WUSM Dean's Fellowship
Research Program: Summer Research Program
Doctoral Program of Study: Medicine
Institution: Washington University School of Medicine
Research Department: Medicine
Mentors: Rupa Patel, MD, MPH, DTM&H

Barriers to prescribing PrEP for HIV at an urban teaching clinic

Sinha U, James AS, Fondahn ED, Gruen J, Fuest S, Escota GV, Patel RR

Introduction: PrEP for HIV is a once-daily pill that reduces HIV risk by over 90%, but only 9% of the 1.1 million Americans at risk for HIV take PrEP. Despite national recommendations, primary care physicians (PCPs) rarely prescribe PrEP. Teaching clinics are an important site for PrEP prescribing because they see poor, uninsured patients and help train future PCPs, yet their barriers to PrEP prescribing have not been studied. This study aims to identify PCP barriers to prescribing PrEP at an urban internal medicine teaching clinic.

Methods: Eighteen qualitative, individual, in-depth interviews of resident and attending PCPs at the study site were conducted, transcribed, and analyzed for themes using a grounded theory approach.

Results: PCPs faced PrEP prescribing barriers at the PCP, patient and clinic level. PCP level barriers included difficulty identifying PrEP patients, inconsistent sexual history taking, confusion about primary care's role in PrEP prescribing, and lack of knowledge and experience with PrEP. A resident-specific barrier was attending physician discomfort with PrEP. Patient level barriers as perceived by PCPs included low risk for HIV due to patients' age, perceived sexual orientation, disability, and poverty, which made access to PrEP and follow-up appointments difficult for patients. Clinic level barriers involved scheduling patient follow-up around the residency program schedule, administrative burden to PCPs, and lack of support staff.

Conclusions: This study provided a deeper understanding of previously identified PCP barriers to PrEP and also uncovered teaching-clinic specific barriers. The results of this study were used to develop quality improvement recommendations for the study site and could inform PrEP implementation at other clinics.

109 Tang, Jonathan

Funding Program: WUSM Dean's Fellowship
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Doctoral Program of Study: Medicine
Institution: Washington University School of Medicine
Research Department: Medicine
Mentors: William H McCoy IV, MD, PhD

Initial biochemical characterization of *Cutibacterium acnes* subsp. *defendens* RoxP

Tang JZ, Phillips WE, Henderson JP, McCoy WH

Introduction: *Cutibacterium acnes* is the dominant bacterium found on human skin in the pilosebaceous unit (PSU). One *C. acnes* subspecies (*acnes*), is associated with *acne vulgaris* and secretes high levels of a heme-binding protein (RoxP). RoxP expression is necessary for *subsp. acnes* to colonize human skin under aerobic conditions. RoxP has been found in all available *C. acnes* genomes including those strongly associated with healthy skin (*subsp. defendens*). Genomic analysis of *C. acnes subsp. defendens* strains identified two possible *subsp. acnes* RoxP orthologs (HypProt, HypAlt). These proteins have 80% and 81% identity to *subsp. acnes* RoxP, respectively. We hypothesized that like *subsp. acnes* RoxP these orthologs bind heme (iron-protoporphyrin IX). To test this hypothesis, we recombinantly expressed and performed initial biochemical characterization of these RoxP.

Methods: Proteins were expressed in *E. coli* with a poly-histidine tag and then purified using immobilized metal affinity chromatography (IMAC). Differential scanning fluorimetry (DSF) was used to determine optimal buffer conditions for each protein. Ligand binding was assessed using spectrophotometry and gel shifts.

Results: HypProt and HypAlt were expressed recombinantly and purified to >95% homogeneity using IMAC. DSF analysis demonstrated that these proteins are stabilized by low pH and high salt. An absorption scan of HypAlt during purification revealed a novel peak at 410 nm suggestive of heme binding. Hemin binding was demonstrated for both orthologs using gel shifts assays. Sequence analysis identified conserved amino acids likely involved in hemin binding.

Conclusions: HypProt and HypAlt are two *C. acnes subsp. defendens* RoxP proteins that bind heme and are stabilized by the low pH conditions found in the human PSU. A comparison of RoxP orthologs from *subsp. acnes* and *defendens* has identified residues likely involved in heme binding. Further characterization of these proteins will help develop new antimicrobials that can specifically target *subsp. acnes* without harming the healthy PSU inhabitant *subsp. defendens*.

111 Trivedi, Prerak

Funding Program: WUSM Dean's Fellowship
Research Program: Summer Research Program
Doctoral Program of Study: Medicine
Institution: Washington University School of Medicine
Research Department: Surgery
Mentors: Kamlesh Patel, MD

Evaluation of provider-specific outcomes through a multidisciplinary team clinic for patients with isolated cleft palate

Trivedi PB, Skolnick GB, Padovano W, Grames LM, Menezes M, Cheung S, Nissen R, Cradock MM, Naidoo S, Patel KB

Introduction: Isolated cleft palate (ICP) is a congenital malformation requiring surgical repair early in life, followed by long-term monitoring. Patients get multidisciplinary care through a team clinic including plastic surgery, otolaryngology, speech-language therapy, dentistry, orthodontics, audiology, and psychology providers. Children with ICP see different providers at different ages; in order to improve resource allocation and reduce the financial burden of team visits, the benefits of the current protocol must be evaluated. The purpose of this study was to determine if the schedule of assessments by providers during cleft team visits is necessary to screen for issues related to ICP. This was done by determining the incidence of provider-specific outcomes and assessing receipt of care over time.

Methods: This was a retrospective cohort study of children with ICP with at least one team visit between January 2000 and July 2019 with an American Cleft Palate-Craniofacial Association approved team at a tertiary academic children's hospital (n=142). Medical records were reviewed for information on baseline characteristics and study outcomes, namely secondary repair, ear tube insertion, speech therapy, hearing loss, dental/orthodontic referral, and behavioral therapy.

Results: Median age at final team visit was 4.80 years (IQR 2.06 to 8.08 years). Secondary palate repair was performed in 31 patients (22%) and was most common above the age of 5 (76 per 1000 person-years). Procedures included fistula/dehiscence repair (43%) and treatment of velopharyngeal insufficiency (53%). Rate of isolated tympanostomy tube insertions was highest between ages 3 and 5 (210 per 1000 person-years), and the rate dropped significantly after the introduction of new AAO-HNS guidelines in 2013 (from 59 to 28 per 1000 person-years, p=0.001).

Conclusions: Patients had low rates of secondary repairs and dental/orthodontic outcomes, but those who received secondary repairs, speech therapy, or behavioral therapy were more likely to need continued care. These results can be used by cleft teams to develop more limited follow-up protocols for children with ICP and improve value-based care.

116 Vittori, Michael, PharmD

Funding Program: WUSM Dean's Fellowship
Research Program: Summer Research Program
Doctoral Program of Study: Medicine
Institution: Washington University School of Medicine
Research Department: Medicine
Mentors: William H McCoy IV, MD, PhD

Analysis of heme binding by Cutibacterium namnetense RoxP

Vittori MR, Phillips WE, Henderson JP, McCoy WH

Introduction: Sebaceous skin covers >20% of the human body and is dominated by Cutibacterium. This bacterial genera has been associated with healthy skin (*C. acnes* subsp. *defendens*), acne (*C. acnes* subsp. *acnes*), and opportunistic infections (*C. namnetense*). All Cutibacteria encode the gene RoxP, but only subsp. *acnes* RoxP has been shown to bind heme and be required for aerobic colonization of human skin. *C. namnetense* RoxP (80.1% identity to subsp. *acnes*) has not been previously evaluated for its ability to bind heme. We hypothesized that *C. namnetense* RoxP binds heme and pursued a biochemical characterization of this protein. By comparing the sequences of heme-binding RoxP orthologues, we will be able to identify residues likely to be involved in heme binding. This work will lead to the design of novel therapeutics that target only pathogenic Cutibacterium species/subspecies and thereby avoid the microbial collateral damage common to standard antibiotic therapies.

Methods: We recombinantly expressed *C. namnetense* RoxP (RoxP C_{nam}) in *E. coli*, used affinity chromatography to purify it, and then assessed heme binding using two assays (NATIVE gel shifts and Soret band absorption). As the three-dimensional structure of RoxP has not been determined, crystallization of RoxP C_{nam} was also pursued.

Results: RoxP C_{nam} was successfully expressed and purified. NATIVE gel electrophoresis demonstrated heme binding by RoxP C_{nam}. A comparison of absorbance spectra of RoxP C_{nam} alone and incubated with heme clearly identified a Soret peak further validating heme binding. Random-matrix crystallization screens produced 15 hits. Four of these conditions were reproduced and underwent initial optimization.

Conclusions: Recombinantly-expressed *C. namnetense* RoxP binds heme and produces crystals appropriate for future structural studies. Further study of how it binds heme and its three-dimensional structure will identify: (1) conserved residues required for heme binding and (2) variable residues unique to RoxP C_{nam}. The identification of these residues will allow for the design of species-specific anti-RoxP agents that treat disease without affecting healthy microbial flora.

118 Williams, Alanna

Funding Program: WUSM Dean's Fellowship

Research Program: Summer Research Program

Doctoral Program of Study: Medicine

Institution: Washington University School of Medicine

Research Department: Psychiatry

Mentors: John Constantino, MD; Mini Tandon, DO; Michelle Horwitz, LMSW

Study to Understand Risk and Resilience Opportunity for Newborns after Delivery (Project SURROuND): A Call for the Systematization of Patient Data Collection

Williams AB, Horwitz M, Blash-Anozie C, Tandon M, Constantino JN

Introduction: Child maltreatment (CM) is known to have highly deleterious effects on human development, and is possibly one of the most preventable causes of psychopathology in the US. Prior studies have shown the ability to predict CM based on variables available in the electronic health record (EHR), suggesting the possibility of preventing CM if families can be partnered with the necessary intervention services before birth or early in a child's life. We aim to establish which approach to screening for these variables: EHR review, EHR review + clinical screen, or predictive risk modelling, is the most effective and feasible, and to examine the ability to engage families to interventions in the context of no CM.

Methods: We recruited women presenting with differing levels of risk based on indicated variables at the time of or before birth. For the six women recruited, we compared data available in the EHR regarding the relevant birth record risk variables to information obtained from additional, non-standard clinical screens administered by research staff that aimed to capture pertinent CM risk data.

Results: Preliminary results have shown that although birth record data can be found in the EHR, the data is not systematically retrievable due to lack of optimized organization for CM risk variables. We have also shown that it is possible to recruit families who present at high risk for CM before abuse has occurred, though it requires sensitive framing regarding potential CM and strong rapport between participants and the research team.

Conclusions: A more readily retrievable, comprehensive clinical screen is needed for use by clinicians in the recommendation of specific preventive services for families at high risk of CM. Significant time should also be invested in building trust with patients so that staff are able to effectively obtain accurate data regarding CM risk indices and engage families in preventive services in the absence of CM. Future studies will include a randomized controlled trial comparing enhanced resource referral based on a family's indicated needs to care as usual to determine if CM prediction can be linked to uptake of services and the mitigation of CM outcomes in at-risk families.

120 Wondra, James

Funding Program: WUSM Dean's Fellowship

Research Program: Summer Research Program

Doctoral Program of Study: Medicine

Institution: Washington University School of Medicine

Research Department: Orthopaedic Surgery

Mentors: Michael Kelly, MD, MSc; Elizabeth Yanik, PhD, ScM; Keith Bridwell, MD

The Clustering Effect of Surgery: Comprehensive Analysis of Patient Reported Outcomes in Adult Symptomatic Lumbar Scoliosis

Wondra JP, Kelly MP, Yanik EL, Bridwell KH

Introduction: Two validated measures of health-related quality of life (HRQOL) in adult symptomatic lumbar scoliosis (ASLS) are the Scoliosis Research Society 22r patient survey and the Oswestry Disability Index (ODI). It is unknown whether surgically treated patients achieve a similar level of final HRQOL regardless of initial disability, or if patients make similar quantitative improvements from their initial starting points. Herein, we review a multicenter, prospective cohort of 171 ASLS patients to evaluate the change in patient reported outcome (PRO) improvement accounting for baseline values. In addition, we calculate the responsiveness to change and determine if any clustering effects were observed after surgery.

Methods: Scatter plots and distributions of postoperative PRO evaluated outcomes for clustering. Correlations between baseline PRO and change in PRO were calculated using Spearman's rho. Effect size (ES) and adjusted standardized response mean (aSRM) were calculated to evaluate responsiveness to change.

Results: Function scores showed a large clustering of 25.2% patients from 3.6-4.0. Pain and Self-Image showed moderate clustering with 19.9% from 3.8-4.2 and 20.5% from 4.0-4.33, respectively. ODI showed minimal clustering. Moderate correlations, ranging from 0.597-0.655, were found between the baseline PRO and change in PRO at 2yr follow-up. Pain, Self-Image, and Subscore, as well as ODI, showed a large ES. Function showed a moderate ES. aSRM and ES calculations were consistent.

Conclusions: Patients with differing levels of initial disability frequently achieved similar 2yr follow-up PRO scores. The correlation between initial PRO scores and change in PRO scores supports that patients with worse initial disability achieve greater improvement from surgery. Further, patients with severe initial disability were most likely to improve. These results have implications regarding the appropriate timing for surgery and outcome expectations. We conclude that pre-surgical PRO data should be considered when predicting expected benefit from surgical treatment of ASLS, and that it should be directly applied to patient-centered informed decision-making tools.

121 Xu, Ziheng

Funding Program: WUSM Dean's Fellowship
Research Program: Summer Research Program
Doctoral Program of Study: Medicine
Institution: Washington University School of Medicine
Research Department: Medicine
Mentors: Allegra Petti, PhD

Single-cell RNA-sequencing and trajectory inference methods reveal clonal architecture and dynamics in relapsed acute myeloid leukemia

Xu Z, Petti A

Introduction: Acute myeloid leukemia (hereafter AML) is a malignancy of the hematological system. Despite an initial sensitivity towards chemotherapy, a majority of the patients with AML ultimately relapse, which is associated with a particularly poor prognosis with long-term survival of <20%.

Methods: The advent of single-cell RNA-sequencing allows us to examine heterogeneity of the disease processes on a single-cell level. Given the relative lack of understanding of the mechanism of AML relapse, we decided to perform a single-cell RNA-seq analysis on the post-allogeneic transplant relapsed AML bone marrow sample.

Results: The initial analysis revealed differential expression patterns between presentation and relapse samples. This indicates that AML relapse is an epigenetically distinct event. A differentially expressed genes test found that the top down-regulated biological pathways involved in relapse include antigen presentation and lysosomal degradation, whereas the up-regulation is comparatively more modest and is centered around pathways involved in nucleic acids catabolism and negative regulators of synthesis. To determine the clonal evolution trajectory of the relapse event, we next performed the trajectory inference on the sample with Monocle3 and Slingshot. The analyses yielded that one of the clusters present in the presentation sample gave rise to the subsequent relapse clusters, suggesting a similar clonal evolution pattern present in AML post-allo relapse. We then decided to focus on the relapse-driving cluster and examined its associated expression changes. A range of genes with significant changes specific to this cluster was recognized. These include a significant down-regulation of LYZ, the lysozyme encoding gene, and S100A8 and S100A9, key regulators of inflammation and immune response.

Conclusions: Studies are currently underway in extending this analysis to a larger number of samples, and we are expecting that the increased sample size will increase the validity as well as the generalizability of our findings. We hope that this study can provide new insights into the pathogenesis and ultimately, further the development of novel therapeutics of relapsed AML.

123 Yang, Zhizhou

Funding Program: WUSM Dean's Fellowship
Research Program: Summer Research Program
Doctoral Program of Study: Medicine
Institution: Washington University School of Medicine
Research Department: Pediatrics
Mentors: David Rosen, MD, PhD

Role of RfaH in regulating Klebsiella pneumoniae lung virulence

Yang Z, Morffy Smith CD, Rosen DA

Introduction: Klebsiella pneumoniae (Kp) exhibits increasing antibiotic resistance and is now considered an urgent threat by the Centers for Disease Control and Prevention. Studies have shown that RfaH, a transcription regulator, is responsible for Kp lung fitness. We aim to validate the role of RfaH in lung infection and to elucidate the mechanism by which RfaH regulates the virulence of Kp in lung.

Methods: Potential downstream effector genes of RfaH were identified in the genome of fully sequenced Kp strain TOP52. qRT-PCR was performed to measure the expression of those genes in Δ rfaH and the wild-type strain. 24-hour murine lung infection experiments were performed to compare the virulence of Δ rfaH and Δ wzi (no capsule production) strains. Lung epithelium cell A549 binding experiment was performed to examine the binding capacity of Δ rfaH strain to lung epithelial cells.

Results: Among multiple potential downstream effector genes of RfaH identified in the TOP52 genome, wzi, type VI secretion system (T6SS) genes and hlyD were selected for further examination. qRT-PCR revealed a significant decrease of wzi expression in Δ rfaH strain while other genes showed no difference. Murine experiments showed an approximately 10-fold decrease in lung fitness of Δ rfaH when compared with Δ wzi and wild type TOP52 strains. Binding capacity of Δ rfaH strain was similar to the wild type and Δ wzi strains in lung epithelial cell binding experiments.

Conclusions: RfaH appeared to play an important role in regulating lung fitness in Kp. Moreover, it is likely that RfaH upregulates Kp virulence in lung by means not limited to increasing capsule production. However, further investigation is needed to elucidate other imperative downstream effectors of RfaH beyond capsular genes. Although T6SS is potentially involved based on genomic analysis, further murine lung infection experiments using T6SS-defective Kp are necessary.

OTHER

50 Kading, Jacqueline

Doctoral Program of Study: Medicine

Institution: Washington University School of Medicine

Research Department: Surgery; University of Michigan

Mentors: George B. Mychaliska, MD; Robert H. Bartlett, MD; Alvaro Rojas-Pena, MD

Evolution of Vascular Access for the Artificial Placenta: From Two-Vessel Single-Lumen Venovenous Cannulation to Single-Vessel Tidal Flow Cannulation

Kading JC, Langley MW, Lautner G, Jeakle MMP, Toomasian JM, Reiber MA, Bartlett RH, Rojas A, Mychaliska GB

Introduction: The modalities of vascular access for the extracorporeal Artificial Placenta (AP) have undergone many iterations over the past decade. We hypothesized that single lumen jugular cannulation using tidal flow ECLS is a feasible alternative to venovenous (VV) umbilical-jugular cannulation and maintains fetal circulation, stable hemodynamics and adequate gas exchange for 24 hours.

Methods: Three preterm lambs at EGA 118-124 days (term 145 days) were delivered via caesarian section and underwent VV ECLS with a single-lumen jugular cannula utilizing tidal flow AP support (Figures 1, 2). Echocardiography was used to document fetal circulation. Hemodynamics, circuit flow and gas exchange were monitored and evaluated. Target fetal parameters were as follows: mean arterial pressure 40-60mmHg, heart rate 140-240 beats per minute (bpm), SatO₂% 60-80%, PaO₂ 25-50mmHg, PaCO₂ 30-55mmHg, oxygen delivery >5ccO₂/dL/kg/min, circuit flow 100 ± 25 cc/kg/min.

Results: All animals survived 24 hours and maintained fetal circulation. The observed mean arterial pressure was 41.52 ± 9.10 mmHg and the mean heart rate 180.98 ± 29.65 bpm. Mean circuit flow was 96.98 ± 17.12 cc/kg/min. Mean arterial SatO₂% 72.22 ± 11.36%, mean PaO₂ of 42.85 ± 10.19 mmHg, mean PaCO₂ of 52.73 ± 8.15 mmHg and mean oxygen delivery of 4.54 ± 1.45 ccO₂/dL / kg/min, consistent with normal fetal blood gas values.

Conclusions: Tidal flow ECLS holds potential to be the vascular access modality of choice in future AP studies and to be successfully miniaturized to human neonatal size.

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30	Bedrick	Bronwyn	CRTC TL1 Predoctoral Interdisciplinary Clinical Research Training Prog.	OT
80	Berrian	Jennifer	WUSM Dean's Fellowship	9
62	Broberg	Curtis	T35 NIH NHLBI Training Grant	11
46	Brown	Corey	Eli Lilly & Company Grant	10
17	Burnham	Jason	CRTC KL2 Career Development Awards	NP
62	Cai	Michelle	T35 NIH NHLBI Training Grant	12
24	Caldwell	Katharine	CRTC Postdoctoral Mentored Training Prog. in Clinical Investigation (MTPCI)	NP
63	Chiang	Sarah	T35 NIH NHLBI Training Grant	13
63	Chibueze	Stanley	T35 NIH NHLBI Training Grant	14
57	Chidambaram	Smrithi	Siteman Cancer Center Leah Menshouse Springer Summer Student Prog.	15
80	Cogsil	Taylor	WUSM Dean's Fellowship	16
81	Cohen	Sarah	WUSM Dean's Fellowship	17
81	Collis	Reid	WUSM Dean's Fellowship	19
30	Cope	Skyler	CRTC TL1 Predoctoral Interdisciplinary Clinical Research Training Prog.	18
64	Coxon	Andrew	T35 NIH NHLBI Training Grant	20
82	Del Toro	Drew	WUSM Dean's Fellowship	21
57	Dorsey	Amelia	Siteman Cancer Center Leah Menshouse Springer Summer Student Prog.	22
64	Dowling	Anna	T35 NIH NHLBI Training Grant	23
82	D'Souza	Alden	WUSM Dean's Fellowship	24
17	Durkin	Michael	CRTC KL2 Career Development Awards	NP
83	Elson	Lauren	WUSM Dean's Fellowship	25
65	England	Patrick	T35 NIH NHLBI Training Grant	26
83	Evie	Hosannah	WUSM Dean's Fellowship	27
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31	Garrad	Evan	CRTC TL1 Predoctoral Interdisciplinary Clinical Research Training Prog.	30
65	Geselowitz	Benjamin	T35 NIH NHLBI Training Grant	32
59	Ghaznavi	Cyrus	Summer Opps Abroad Prog. (SOAP) WUSM Global Health & Medicine (GH&M)	33
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58	Grinwald	Mitchell	Siteman Cancer Center Leah Menshouse Springer Summer Student Prog.	34
21	Guy	Daniel	CRTC Master of Science in Clinical Investigation (MSCI) Degree Prog.	NP
84	Hagberg	Lindsey	WUSM Dean's Fellowship	35
31	Heary	Kartemus	CRTC TL1 Predoctoral Interdisciplinary Clinical Research Training Prog.	NP
32	Hickman	Leonard	CRTC TL1 Predoctoral Interdisciplinary Clinical Research Training Prog.	36
32	Hoang	Sandy	CRTC TL1 Predoctoral Interdisciplinary Clinical Research Training Prog.	37
85	Holten	Anna	WUSM Dean's Fellowship	38
43	Hong	Zachery	DeNardo Education and Research Foundation Grant	39
33	Hooker	Quenten	CRTC TL1 Predoctoral Interdisciplinary Clinical Research Training Prog.	OT
46	Hunter	Kamilya	Eli Lilly & Company Grant	40
33	Jakhar	Ishaan	CRTC TL1 Predoctoral Interdisciplinary Clinical Research Training Prog.	42
54	Jeanpierre	Latoya	Otolaryngology NIH T32 Physician Scientist Prog. (PSP)	NP

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66	Jocher	Brandon	T35 NIH NHLBI Training Grant	45
85	Johnson	Emily	WUSM Dean's Fellowship	46
15	Johnson	Gabrielle	American Assn Neurological Surgeons/Neurosurgery Rsrch & Ed. Fndn (AANS/NREF)	47
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54	Lander	Daniel	Otolaryngology NIH T32 Physician Scientist Prog. (PSP)	59
44	Law	Jody	DeNardo Education and Research Foundation Grant	60
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67	Leo	Ashwin	T35 NIH NHLBI Training Grant	61
67	Liang	Miranda	T35 NIH NHLBI Training Grant	62
36	Liebendorfer	Adam	CRTC TL1 Predoctoral Interdisciplinary Clinical Research Training Prog.	63
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69	Lu	Lillian	T35 NIH NHLBI Training Grant	67
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27	Tang	Simon	CRTC Postdoctoral Mentored Training Prog. in Clinical Investigation (MTPCI)	NP
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