

ABSTRACT BOOK

Medical Student Research Forum & Poster Day March 6, 2019



Presented by:

Required Scholarly Project (RSP) Program Steering Committee

Dean's Research Scholar Program

Office for Medical Student Research Programs

Office for Curriculum

Keck School of Medicine of **USC**

MEDICAL STUDENT RESEARCH FORUM & POSTER DAY

March 6, 2019

The Keck School of Medicine of the University of Southern California is committed to training the future leaders of academic medicine. To this end, all KSOM medical students are required to participate in hypothesis-driven research as part of the Required Scholarly Project (RSP) program during their tenure at Keck. In addition, KSOM offers select students the opportunity to participate in the Dean's Research Scholars program, a fifth-year option of intensive mentoring and immersion in research.

This year's Forum represents an important milestone of the current research activities of all second-year students and our Dean's Research Scholars. The works of many of our students have garnered awards at regional and national meetings over the years and, as you read these abstracts, we are confident you will appreciate and enjoy the remarkable efforts and accomplishments of our talented students.

KSOM is dedicated to fostering and promoting medical student research activity. KSOM looks forward to continuing to enhance and expand the training, mentoring and scope of research opportunities provided to our students, and we deeply appreciate the considerable effort, skill and passion with which our faculty support and develop our students into skilled scientists and future leaders.



Donna Elliott, MD, EdD
Vice Dean for Medical Education



MEDICAL STUDENT RESEARCH FORUM & POSTER DAY 2019

March 6, 2019

KECK SCHOOL OF MEDICINE UNIVERSITY OF SOUTHERN CALIFORNIA

The 2019 Medical Student Research Forum and Poster Day is an annual event which allows Keck School of Medicine of USC medical students the opportunity to present their Required Scholarly Projects (RSP) and Dean's Research Scholar (DRS) projects to their peers and the USC community at large. RSP is a longitudinal research experience that spans the duration of medical school, in which all students are required to participate. DRS is a distinguished opportunity for an optional fifth year of medical school dedicated to research. The projects presented by our students represent a wide variety of disciplines, from basic science to clinical and translational research.

We are extremely appreciative of the supportive faculty who have volunteered their expertise to mentor students through these exciting research initiatives. We also thank faculty who have volunteered their time teaching the key principles required to successfully conduct research. To the incredibly dedicated staff, we thank you for your outstanding coordination of all RSP and DRS-related activities.

The Office of Educational Affairs would like to thank all of those involved with organizing this Forum. We also extend special thanks to Laura Mosqueda, MD, Dean, Keck School of Medicine; Donna Elliott, MD, EdD, Vice Dean for Medical Education; Nuria Pastor-Soler, MD, PhD, Assistant Dean for Research Mentoring & Director of Required Scholarly Project; David Hinton, MD, FARVO, Director of Dean's Research Scholars and Stephanie Zia, MD, MACM, Assistant Dean for Career Advising for their support and participation in this Forum. We are very appreciative of the faculty and student judges for reviewing poster presentations. Finally, we are incredibly grateful to our benefactors, the Baxter Foundation, the Wright Foundation, the Medical Faculty Assembly, the Medical Faculty Family and Friends, and Dr. Frank A. Sinicrope for their commitment and support of medical student research.

PROGRAM SCHEDULE

Welcome Address, Mayer Auditorium – 1:00 p.m.

Laura Mosqueda, MD
Dean, Keck School of Medicine of USC

Oral Presentations, Mayer Auditorium – 1:10-2:30 p.m.

Moderator: David Hinton, MD, FARVO
Professor, Keck School of Medicine of USC

Poster Presentations, Harry & Celesta Pappas Quad – 2:45-5:00 p.m.

Dean's Research Scholars
Health, Technology, and Engineering Program
Class of 2021 Medical Students

2019 ORAL PRESENTATIONS

Dean's Research Scholars

Ido Badash

(Mentor: **John Oghalai, MD**)

Endolymphatic Hydrops is a Marker of Synaptopathy Following Traumatic Noise Exposure

Andrew Kwong, Wright Research Scholar

(Mentor: **Mei Chen, PhD**)

Topical Gentamicin Therapy Induces Premature Stop Codon Readthrough and Improves Wound Healing in Junctional Epidermolysis Bullosa Patients Harboring Nonsense Mutations

David Lam

(Mentor: **Joseph T. Rodgers, PhD**)

Priming Injury Results in Improved Neuron Growth and Regenerative Potential

Michelle Connor, Wright Research Scholar

(Mentor: **William Mack, MD**)

Exposure to Air Pollution and Chronic Cerebral Hypoperfusion causes White Matter Damage in Mouse Model

Class of 2021

Brandon Fields

(Mentor: **George Matcuk, MD**)

Quantitative Magnetic Resonance Imaging (q-MRI) for the Assessment of Soft-Tissue Sarcoma Necrosis, Viable Tumor Volume, and Treatment Response

Alodia Girma

(Mentor: **Rosemary She, MD**)

Antimicrobial Effects of Varying UMF-graded Manuka Honeys on Bacterial Organisms

Bing April Pei

(Mentor: **Jo Marie Reilly, MD, MPH**)

Patterns of Use at a Community-Based Laser Tattoo Removal Clinic

Kevyn Ramos-Laguna

(Mentor: **Lilyana Amezcua, MD, MS**)

Film as a Health Communication Tool in Hispanics to Understand Perceptions and Attitudes in Multiple Sclerosis

Surabhi Reddy

(Mentor: **Sonali Saluja, MD, MPH**)

Examining Medical Students' Interest, Attitudes, and Knowledge in Health Systems Before and After a New Curriculum

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The Keck School of Medicine of USC is sincerely grateful to our benefactors who generously support our student research programs.

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Dr. Frank A. Sinicrope

Office of the Dean

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**DEAN'S
RESEARCH
SCHOLARS**

Endolymphatic Hydrops is a Marker of Synaptopathy Following Traumatic Noise Exposure

Ido Badash, Christopher G Lui, Patricia M Quiñones, Juemei Wang, Frank D Macias-Escriva, John S Oghalai, USC Caruso Department of Otolaryngology - Head and Neck Surgery

Background: Over 15% of Americans have noise-induced hearing loss. Following traumatic noise exposure, osmotic changes in the cochlear duct lead to excess endolymph, known as endolymphatic hydrops, which may damage cochlear synapses. We aimed to determine the relationship between endolymphatic hydrops and cochlear synaptopathy in order to identify treatment strategies for preventing noise-induced hearing loss.

Methods: Mice were exposed to 8-16 kHz noise for 2 hours. Following noise exposure, we used optical coherence tomography (OCT), a microscopy technique similar to ultrasound that uses laser instead of sound, to image the cochlea. This allowed us to assess changes in endolymph volume in live mice. One week after noise exposure, we extracted cochleas and dissected the organ of Corti into apical, middle, and basal turns. Using immunohistochemistry and confocal microscopy, we counted hair cell synaptic ribbons.

Results: Time-lapse OCT videos showed that mice exposed to 100 dB sound pressure level noise developed endolymphatic hydrops, while unexposed control mice and those exposed to lower intensity noise (80, 90, 95 dB) did not. Seven hours after noise, mice exposed to 100 dB had greater endolymphatic volume (6.4 nL) compared to those exposed to 80 (4.4 nL), 90 (4.0 nL), 95 dB (4.8 nL) and controls (4.1 nL). Inversely correlated with this increase in endolymphatic volume, we found a significant decrease in the number of synapses per inner hair cell in mice exposed to 100 dB compared to controls across the entire cochlea [apex (12.8 vs 17.5, $p < 0.05$), middle (10.3 vs 19.7, $p < 0.001$) and base (7.8 vs 16.3, $p < 0.001$)]. By contrast, synaptic counts were not significantly different between mice exposed to 80, 90, 95dB, and controls.

Conclusion: Endolymphatic hydrops caused by noise exposure is associated with synaptic ribbon loss in inner hair cells. Treatment of endolymphatic hydrops with osmotic agents may represent a novel technique for preventing synaptopathy and hearing loss following noise exposure.

The Effects of Enhanced Recovery After Surgery Protocol on Free Flap Patients

Brian H. Cameron, BA, Bhavishya S. Clark, MD, LiYang Tang, MD, Niels Kokot, MD, Michael Kim, DO, Mark Swanson, MD
Keck School of Medicine of USC, Los Angeles, California

Objectives: Compare the length of stay, degree of post-operative pain and quantity of post-operative opioid use between patients who underwent free flap surgery and received standard post-operative care versus the recently initiated enhanced recovery after surgery (ERAS) protocol.

Methods: This retrospective cohort study compared 18 patients who were under the ERAS protocol between September 2018 and November 2018 with 50 patients who received standard post-operative care between September 2017 and June 2018. The ERAS protocol emphasizes early ambulation, shorter ICU stays and decreased reliance on opiates. Under this protocol, patients received a non-opioid pain regimen with morphine reserved for post-operative breakthrough pain. Post-operative patient reported pain scores, quantity of opiate usage, length of ICU stay (ICUS), and length of hospital stay (LOS) were all recorded and compared between the two groups.

Results: Patients on our ERAS protocol received fewer total opiates in the first week after surgery (55 MEq v. 104 MEq, $p = 0.01$), and reported less pain on post-operative day 7 ($p =$

0.014). Additionally, they had a shorter ICUS ($p < 0.0002$). Furthermore, ERAS patients have a trend toward a shorter LOS (6.83 days v. 7.14, $p = 0.65$).

Conclusion: Patients in the ERAS group noted lower post-operative pain scores despite less opiate use. In addition, they left the ICU earlier and tend to have a shorter LOS. Further investigation into decreasing opiate usage may yield an optimal pain management strategy that increases patient comfort, decreases hospital length of stay, and lowers post-operative complications.

Orthopaedic Injury Profiles in Methamphetamine Users

John Carney BS, Nicholas Trasolini MD, Hyunwoo Kang MD, Alexis Rounds BS, Adam Murrietta BS, Geoffrey S Marecek MD

Background: Methamphetamine use is prevalent in the United States. There is a paucity of literature regarding methamphetamine use and orthopaedic injuries. The purpose of this study was to determine the prevalence of methamphetamine abuse amongst orthopaedic patients, and to characterize associated injury patterns.

Methods: All orthopaedic consultations at an urban Level 1 trauma center from January 2016 – December 2017 were reviewed. Patients endorsing current methamphetamine use on social history and/or a positive urine toxicology for methamphetamine were classified as methamphetamine users. In addition to methamphetamine use status, diagnoses and mechanism of injury was recorded. Differences in injury type and mechanism of injury were determined by a chi-squared test.

Results: The prevalence of MA use was 10.0%. MA users were more likely to present with hand lacerations and other infection ($p < 0.05$ for all). Regarding mechanism of injury, MA users were more likely to be involved in automobile versus pedestrian, automobile versus bicycle, ballistic, knife, closed fist, other assault/altercation, and animal bite injuries ($p < 0.05$ for all).

Conclusions: MA use is prevalent at our level 1 trauma center. The prevalence and injury patterns of MA abuse warrants deeper study into the effects of this drug on orthopaedic outcomes.

Exposure to Air Pollution and Chronic Cerebral Hypoperfusion causes White Matter Damage in Mouse Model

Michelle Connor, Krista Lamorie-Foote, Kristina Shkirkova, Arati Patel, Qinghai Lui, Axel Montagne, Mikko Huuskonen, Todd E. Morgan, Constantinos Sioutas, Caleb Finch, William Mack

Background: Exposure to air pollution, specifically nanoparticulate matter (nPM), has been associated with white matter damage and neurocognitive decline. Susceptible populations, such as those with underlying cerebrovascular disease, may be at increased risk for neurotoxicity. This study characterizes white matter changes in mice exposed to nPM or chronic cerebral hypoperfusion (CCH), and evaluates the combined effect of these two exposures.

Methods: nPM is collected in an urban area in Los Angeles. Mice are exposed to filtered air or re-aerosolized nPM 5 hours/day, 3 days/week, for 10 weeks (150 cumulative hours). 30 days prior to the end of the exposure, a subset of mice in each group undergo bilateral carotid artery stenosis (BCAS) surgery to induce CCH. This results in four experimental groups: filter, nPM, filter+BCAS, and nPM+BCAS.

White matter damage is assessed through immunohistochemical analysis of myelin associated glycoprotein (MAG) and degraded myelin basic protein (dMBP) in the corpus callosum. MAG is a marker of myelin integrity, while dMBP is specific for myelin degradation. Multiple MRI

sequences are leveraged to characterize the blood-brain barrier, white matter changes, microhemorrhages, and cerebral blood flow.

Results: Mice exposed to nPM or CCH (Filter+BCAS) demonstrated significantly decreased MAG and increased dMBP compared to mice exposed to filtered air. Further, mice exposed to nPM and CCH (nPM+BCAS) had significantly decreased MAG and increased dMBP compared to either exposure alone. All comparisons with $p < 0.01$.

Preliminary MRI results suggest nPM and BCAS result in increased blood-brain barrier permeability and white matter hyperintensities.

Conclusion: nPM and CCH result in white matter damage, with the combined exposure having a more severe effect than either exposure alone. These results add to our understanding of the neurotoxic effects of air pollution and its contribution to neurocognitive disease in a vulnerable population.

Association of Hidradenitis Suppurativa with Cellulitis in the United States

Pierce H. Deng, BA; Andrea J. Borba, MS; Kevin K. Wu, BA; April W. Armstrong, MD, MPH

Background: The relationship between hidradenitis suppurativa (HS) and cellulitis is controversial and not well understood.

Objective: To examine the association between HS and cellulitis in the United States.

Methods: We performed a cross-sectional analysis of the 2002–2015 National Ambulatory Medical Care Survey and National Hospital Ambulatory Medical Care Survey databases. We evaluated the association between HS and cellulitis through a multivariable logistic regression model adjusting for age, sex, race, ethnicity, obesity, and smoking status.

Results: There were an estimated 3.45 million HS patient visits between 2002 and 2015. Multivariable logistic regression analysis revealed that HS was significantly associated with cellulitis (OR 3.94; 95% CI 2.31–6.74). HS was also associated with female sex (OR 1.67; 95% CI 1.01–2.77), African American race (OR 2.32; 95% CI 1.53–3.53), obesity (OR 2.84; 95% CI 1.41–5.69), and smoking (OR 2.67; 95% CI 1.65–4.33).

Limitations: The databases rely on ICD-9 codes and the diagnoses are unable to be verified by review of medical records.

Conclusion: Results of our study suggest that patients with HS have a significantly higher risk of cellulitis. Infectious comorbidities of HS are important to recognize due to the implications for clinical management.

Supraorbital Craniotomy for Anterior Skull Base Lesions: Indications, Approach, and Surgical Outcomes

Robin Du BS, Ali R Tafreshi BA, Martin Rutkowski MD, Gabriel Zada MD
Keck School of Medicine of the University of Southern California,
Department of Neurosurgery

Introduction: The supraorbital subfrontal approach provides surgical access to a wide range of pathologies and is a useful salvage approach for patients who have undergone prior endoscopic endonasal approaches (EEA). We investigate the indications and outcomes in a series of 51 cases conducted at a single tertiary institution.

Methods: We retrospectively reviewed institutional records of patients who underwent a supraorbital craniotomy from 2011–2019. Patient demographics, preoperative indications, surgical details, pathology, and postoperative complications were analyzed.

Results: Fifty-one patients (mean age 51 years, 62% female) were included whom underwent supraorbital craniotomy for the following indications: Meningiomas (n=15), pituitary adenomas (n=11), craniopharyngiomas (n=6), suprasellar Rathke's cleft cysts (n=3), chordomas (n=2), metastases (n=2), traumatic frontal sinus fractures (n=2), other (each n=10). An eyebrow incision was used in 29 cases (57%). In 24 cases (47%), the supraorbital approach was used as a salvage operation in patients with prior surgery; all but 1 of these patients had prior EEA. Preoperative symptoms included vision loss (82%), headache (51%), and gait imbalance (10%). In 9 cases, the surgery was endoscopic-assisted. Of the 39 tumor cases, 15 (38.5%) underwent gross total resection (GTR); the GTR rate was 25% for reoperations and 53% for first time operations. Postoperative complications included 1 postoperative CSF leak, 2 cases of intraventricular hemorrhage, 2 infections, and 1 case of transient left-sided weakness due to MCA vasospasm. Vision improved in 43% of patients with preoperative vision loss, and headaches improved in 35% of patients with preoperative headache. Over the follow up period, there were 4 cases of tumor progression and 1 with recurrence; 10 patients required reoperation, and 1 patient expired due to progression of a hemangiopericytoma.

Conclusion: The supraorbital approach is a versatile and highly effective approach for the management of a variety of anterior skull base pathologies, including tumors, fractures, as well as cystic, hemorrhagic, and inflammatory lesions. The supraorbital approach can be used as an effective salvage approach for reoperation in patients with complex suprasellar and anterior skull base disease who have undergone prior EEA with minimal complications.

Early Cleft repair vs NAM: Comparing pre-operative severity and post-operative results utilizing a computer engineered AI system

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3. Division of Plastic and Maxillofacial Surgery, Children's Hospital of Los Angeles, Los Angeles, CA

Background: Our group recently published a multidisciplinary approach to perform early cleft lip repair (ECLR), prior to 3 months of age, safely and effectively. One persistent question is whether ECLR may be offered to all cleft lip patients, including those with wide unilateral complete clefts who historically would have received nasoalveolar molding (NAM) at our institution. This study aims to compare the pre-operative cleft severity of ECLR patients to those whom underwent NAM pretreatment and compare postoperative outcomes.

Methods: This is an IRB approved retrospective review of patients who underwent unilateral cleft lip repair at our institution from 1/1/2005-9/11/2018. Patients were divided into two groups: ECLR before 3 months of age and presurgical NAM with cleft lip repair at ages 3-6 months. To assess pre-treatment cleft lip severity we utilized cleft width ratio (CWR, pre-operative cleft width divided by commissure width). An artificial intelligence computer engineering system calculated pre-NAM and preoperative ECLR CWRs. A second subset of wide complete cleft lips ECLR patients was created to compare to the NAM group. Postoperative nasal analysis for symmetry was compared between this subgroup and NAM patients.

Results: 74 ECLR patients (average age at repair 32.24 days) and 25 NAM patients (average age at repair 117.56 days) met inclusion criteria. Mean CWR was 0.456 for the 74 ECLR patients and 0.501 for the 25 NAM patients ($p = 0.165$). Considering only patients with complete cleft lips in the ECLR subgroup, the mean CWRs was 0.520, suggesting this group had more severe clefts. The average lip length, frontal nasal breadth, and commissure length symmetry

ratios for the ECLR subgroup of 27 complete clefts was 0.88, 1.05, and 0.92 respectively compared to 0.93, 1.08, and 0.89 for the NAM group ($p = 0.181$, $p = 0.526$, $p = 0.378$). The average nostril breadth, nostril width, and nasal angle ratios among the ECLR subgroup were 1.09, 1.17, and 1.12 respectively compared to 1.12, 1.19, and 1.14 in the NAM group ($p = 0.480$, $p = 0.613$, $p = 0.640$).

Conclusions: This study confirms that in patients with unilateral cleft lip, early cleft lip repair can be performed in patients who are considered severe and would have previously been recommended for NAM pretreatment. This provides patients with an alternative treatment option to NAM with at least equivalent results.

Understanding Lived Experiences of At-Risk Teenage Boys in Taiwan Through Photovoice

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¹ Keck School of Medicine, University of Southern California, Los Angeles, CA

² Faith Hope Love Academy, Hualien, Taiwan

Objective: At-risk adolescents often have a range of unmet physical, developmental, and mental health needs and may suffer from negative outcomes, including substance use, economic instability, and increased likelihood of becoming adult offenders. This study aims to address the lack of research regarding at-risk boys in Taiwan by: 1) identifying common themes about the lived experiences and health needs of at-risk boys in Taiwan, 2) generating compelling evidence to better advocate for these youth, and 3) empowering participants by helping them share their needs and experiences with stakeholders.

Methods: Photovoice is a qualitative research method in which participants use photography and narratives to communicate their perspectives. Thirteen boys from a Taiwan out-of-home placement facility for adolescent boys with backgrounds in foster care or the juvenile court system participated in this study, which was facilitated by a US medical student of Taiwanese heritage. After receiving in-depth training, participants spent three months taking photos relating to their perceived health needs and sources of resiliency and support. Then, in a series of facilitated individual and group meetings, the most powerful photos were chosen, and narratives were added. Key themes were identified. The photos best reflecting the group's experiences and messages will be compiled into an exhibit targeting local community members and stakeholders. Ethics approval was granted by National Taiwan University and the University of Southern California.

Results: Common themes identified by the participants included the lack of and need for companionship, complex relationships with family, the fear of but also positive impact of the law, the desire to belong in and be accepted by society, and the impact of activities as a means of encouragement and character development. Post-study reflections are also expected to show that the study led to participant empowerment.

Conclusion: The results shed light on the social determinants of health among at-risk Taiwanese youth and should be used to inform policy recommendations regarding resiliency- and health-promoting services.

Association of Insurance Type with Time Course of Care in Head and Neck Cancer Management

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Background: Timely management of head and neck squamous cell carcinoma (HNSCC) requires coordination of care among multiple provider types, including a community otolaryngologist, a tertiary care center with a head and neck surgeon, medical oncologist, and radiation oncologist. Initiation of adjuvant radiation within 6 weeks of surgery has better oncologic outcomes, however this can be difficult to achieve with an increasing complex medical network. Possible risk factors are barriers and delays in referrals and transitions of care in the context of differing insurance policies. Despite the mainstay of Medicare, health maintenance organizations (HMO) and preferred provider organization (PPO) as the predominant insurance entities in the United States, it is not known whether healthcare access disparities exist between these groups especially in the head and neck cancer patient population.

Objective: To determine any differences in time course of care for patients referred to an academic tertiary care center with HNSCC based on insurance type (HMO vs PPO vs Medicare).

Methods: Retrospective study of HMO, PPO, and Medicare patients with HNSCC treated at Keck Medical Center in Los Angeles, California. Patients were included in the study if they were referred by an outside provider after already having a new, biopsy-proven diagnosis of SCC of the aerodigestive tract. These patients subsequently underwent resection of the tumor followed by adjuvant external beam radiation therapy. In addition to patient demographic information and tumor characteristics, duration of chief complaint and the following time points were collected: biopsy by referring physician, first specialty surgeon appointment, surgery, and adjuvant radiation start and stop dates.

Results: There was a statistically significant ($p < 0.05$) increase in time interval for HMO ($n = 32$) patients for chief complaint to biopsy, biopsy to first specialty surgeon appointment, and surgery to start of adjuvant radiation compared to that of Medicare ($n = 31$) and PPO ($n = 41$) patients. 22% of HMO patients, compared to 48% of Medicare patients and 61% of PPO patients, began adjuvant radiation less than or equal to 6 weeks after surgery.

Conclusions: HMO insured patients are less likely to start adjuvant radiation within 6 weeks of surgery and present with a longer duration of symptoms prior to treatment compared to PPO and Medicare insured patients. Delaying radiation after 6 weeks of surgery is a known prognostic factor, with HMO insurances performing the poorest. HMO insured patients are more likely to experience treatment delays in transitions of care between provider types and with referrals to specialists. Further investigation is required to identify insurance type as an independent risk factor of delayed access to care for HNSCC.

Kappa Opioid Agonist Injections: A Novel Drug Treatment to Prevent the Progression of Knee Osteoarthritis

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INTRODUCTION: Osteoarthritis (OA) affects 50 million Americans, at an annual cost of \$100 billion. Pain management is currently a hallmark of OA treatment. One of the most frequently employed treatment strategies involves opioid analgesics. Opioids are highly addictive and have led to an opioid epidemic. One strategy to reduce opioid addiction is to implement kappa-opioid receptor (KOR) agonist medications which have been documented to provide pain-relief without the addictive potential of commonly used opioid medications (which target the mu-opioid receptor). In previous work, we have found that KOR agonist medications and the KOR-signaling pathway are cartilage protective. These preliminary studies have established KOR signaling as a potential therapeutic target for both non-addictive pain-relief and cartilage protection in the treatment of knee OA. The goal of the proposed study is to test a commercially available KOR agonist for its cartilage protective and pain-relieving potential using a rat model of knee OA.

METHODS: Approval for this project was granted by the University of Southern California Institutional Animal Care and Use Committee. Twelve male Sprague-Dawley rats underwent medial meniscal tear (MMT) surgery to induce knee OA. The control group (n=6) underwent weekly intra-articular saline injections. The experimental group (n=6) underwent weekly intra-articular KOR agonist injections with a commercially available KOR agonist, JT09. At six weeks all animals were killed and the knees were tested for the cartilage protective effects of JT09 injections. Testing consisted of joint cartilage thickness and stiffness via microindentation mapping (figure 1) and blinded OA histopathologic grading of Safranin O-Fast Green stained samples with OARSI scores (figure 2).

RESULTS: JT09 injections improved cartilage thickness following MMT surgery to induce knee OA. The medial femoral condyle and medial tibial plateau were significantly thicker in the JT09 injection group ($p=0.0006$ and $p=0.029$, respectively. Table 1). Rats treated with JT09 injections following OA inducing knee surgery had improved histologic grading compared to controls. JT09 injected rats had mean OARSI scores of 2.43 and 2.5 for the femur and tibia, respectively. Control rats had mean OARSI scores of 4.9 and 5 for the femur and tibia, respectively.

DISCUSSION: In a rat model of knee OA, JT09 - a specific KOR agonist - injections decreased cartilage damage as measured by histologic grading and cartilage thickness. Analysis of the articular cartilage biomechanical properties of rats treated with JT09 injections and saline injections is ongoing.

SIGNIFICANCE/CLINICAL RELEVANCE: These preliminary results demonstrate that KOR agonist injections are a potential promising treatment for knee OA. Future studies in larger animal models and human trials will be necessary to determine the true therapeutic potential of this novel drug treatment.

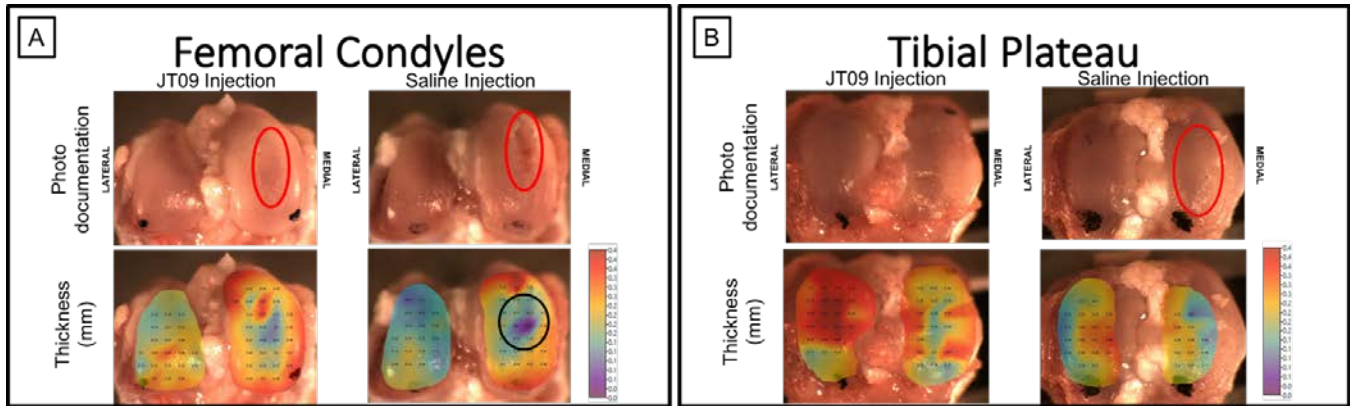


Figure 1. Gross visual and microindentation thickness measurements of the cartilage differences between the JT09 injected and saline injected rat knees following MMT knee OA-inducing surgery and 6 weeks of injections. A) gross damage (red circle) corresponds to area of cartilage thinning (black circle) on microindentation thickness testing. B) Gross visual differences in the medial tibial plateau with greater cartilage damage in the saline injected knee (red circle).

	JT09	Control	P-value
Medial Femoral Condyle	280.2 ± 21.1 μms	212.9 ± 11.5 μms	0.0006
Medial Tibial Plateau	269.3 ± 17.8 μms	226.2 ± 12.5 μms	0.029

Table 1. Mean ± S.D. articular cartilage thickness of JT09 and saline treated rats.

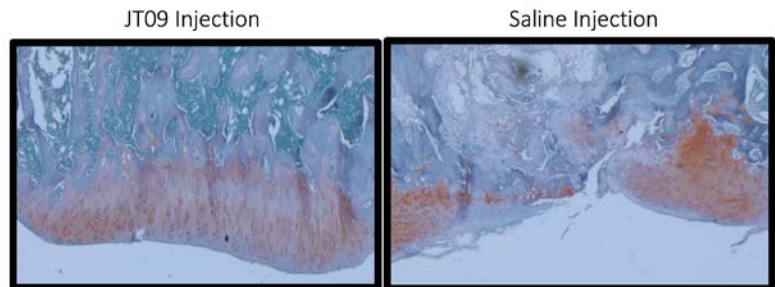


Figure 2. Histologic comparison of tibial plateaus from a sample rat treated with JT09 injection vs saline injection. All samples stained with Safranin O-Fast Green.

Topical Gentamicin Therapy Induces Premature Stop Codon Readthrough and Improves Wound Healing in Junctional Epidermolysis Bullosa Patients Harboring Nonsense Mutations

Andrew Kwong

Background: Herlitz Junctional Epidermolysis Bullosa (H-JEB) is an incurable and fatal inherited blistering skin disease most commonly caused by nonsense mutations in LAMA3, LAMB3, or LAMC2 genes which impairs the ability to produce functional laminin-332, needed for epidermal-dermal adherence. Patients suffer from severe skin fragility resulting in widespread blistering and open erosions. Previously, we demonstrated in vitro that gentamicin induced premature stop codon (PTC) readthrough in H-JEB keratinocytes harboring nonsense mutations and restored functional laminin-332. With this encouraging preclinical study, we performed the first clinical trial investigating topical gentamicin in H-JEB patients with nonsense mutations.

Methods: Patients applied topical 0.5% gentamicin ointment twice daily to selected open wounds for two weeks. Skin biopsies and wound photos were taken prior to and at one month after treatment. Biopsies were evaluated by immunofluorescence with three antibodies against laminin-332 and two antibodies against $\alpha 6\beta 4$ integrin. Computer-assisted planimetry was used for wound area assessments. Lab testing and weekly phone calls were performed throughout to monitor patient safety.

Results: Two H-JEB patients carrying nonsense mutations were enrolled. Topical gentamicin increased laminin-332 expression from 0% at baseline to 60% at 1 month follow-up and $\alpha 6\beta 4$ integrin expression from 40% at baseline to 100% at 1 month follow-up. Treated wound sites showed a 73% average reduction in wound surface area. Furthermore, treated wounds showed a reduction in new blister formation compared to untreated sites. No adverse events were reported.

Conclusion: Topical gentamicin induced PTC readthrough in H-JEB patients and improved wound healing to applied wound sites.

Priming Injury Results in Improved Neuron Growth and Regenerative Potential **David Lam & Kyohei Itamura, Michael Chow, Joseph Rodgers, PhD, Amit Kochhar, MD**

Introduction: We previously identified that the hepatocyte growth factor activator (HGFA) signaling pathway systemically induces adult muscle stem cells into a 'primed' state of increased regenerative potential. When induced by a distant muscle injury, primed muscle stem cells contribute to significant increases in the speed of muscle regeneration and functional recovery.

Regeneration of peripheral sensory and motor function is a significant component of tissue healing. However, it is unknown if peripheral neurons undergo a similar 'primed' response to a distant tissue injury as muscle stem cells do. Previous work found that peripheral neurons possess the same intracellular signaling components that muscle stem cells require to relay the priming HGFA signaling pathway. This suggests that peripheral neurons will similarly undergo increased regenerative potential through this pathway in response to distant injury.

Objective: To determine the response of peripheral neurons to a distant 'priming' injury.

Methods: Primary sensory and motor neurons were isolated from 40-50 day old mice, two days after priming injury to the distal hindlimb. Sensory and motor neurons were cultured for 24 and 48 hours, respectively, and subsequently fixed and immuno-stained with TUJ1 and DAPI. Neurite growth was quantified and data was analyzed via two tailed t-tests.

Results: Neurons isolated from mice with priming injury displayed significant increases in axonal growth *ex vivo*. Primed sensory neurons grew on average 922 ± 657 μm in 24 hours, while control neurons grew 251 ± 67 μm ($p < 0.05$). Similarly, primed motor neurons grew 88 ± 26 μm in 48 hours, while control neurons grew 58 ± 15 μm ($p < 0.05$).

Conclusions: Distant muscle injury activates peripheral sensory and motor neurons to a 'primed' state resulting in an improved axonal regenerative response observed as increased neurite growth. Further studying this mechanism may elucidate a new therapy for nerve repair.

Retinal changes in early-onset Alzheimer disease

Alice Laughlin, John Ringman, Bright S. Ashimatey, Anoush Shahidzadeh, Amir H. Kashani

Purpose: Retinal findings are being investigated as indices of neurodegenerative disease. A cross-sectional, observational pilot study was conducted to investigate retinal changes in individuals with a mutation causing early-onset autosomal dominant Alzheimer disease (AD).

Methods: Retinal images were examined in 14 subjects, each of whom had at least one first-degree relative with the A431E mutation in PSEN1. Not all subjects had all imaging modalities available. Mutation status and Clinical Dementia Rating Sum of Boxes (CDR-SOB) score, representing overall severity of dementia, were determined. Non-mutation-carrying subjects (NCs) and healthy age-matched subjects (HCs) served as controls. Color fundus photographs (CFP), ultra-widefield photographs (UWF), and autofluorescence images (AF) were inspected for fundus lesions. Retinal layer thicknesses were measured using optical coherence tomography (OCT). Retinal microvasculature was assessed using previously described vessel skeleton density (VSD) and vessel diameter index (VDI) metrics from OCT-angiograms (OCTA). Generalized estimating equations and Pearson correlations were used to assess group differences.

Results: Eight subjects were mutation carriers (MCs; 1 homozygote, 7 heterozygotes); six were NCs. In MCs, CDR scores ranged from normal to severe dementia (0-3), with the most severely affected MC being a homozygote. Hypopigmented and/or refractile lesions were identified in CFP images of 3 MCs (Fig 1). Nothing notable was observed on AF images. Mean temporal peripapillary RNFL thickness was greater in MCs compared with NCs (75 vs 64 μ m, $P=0.006$). No differences were observed in mean thickness for other retinal layers. Mean VDI was greater in MCs compared with HCs (2.84 vs. 2.80, $P=0.008$; Fig 2). No difference was observed in VSD between any groups. Among MCs, there was a significant negative correlation between CDR-SOB score and VSD ($R=-0.93$, $P=0.002$)

Conclusions: Retinal biomarkers of AD may include the presence of hypopigmentary lesions as well as alterations in RNFL thickness and capillary density. Further studies are needed to elucidate these changes.



Fig 1. Hypopigmented lesion is observed in the superior nasal aspect.

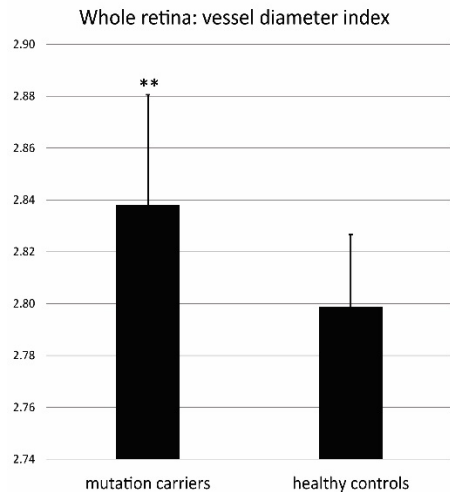


Fig 2. Mean VDI is increased in MCs compared to HCs. **P<0.01

User-Based Manipulation of a Straight Line as a Novel Measure of Metamorphopsia: A Prospective Pilot Study

Jacob Lifton, BA, Andrew A. Moshfeghi, MD, MBA

Objective: We propose a digital method of both quantifying & localizing metamorphopsia in patients with macular disease & aim to assess its agreement with a commonly-used analog metric of metamorphopsia.

Purpose: Metamorphopsia is a visual symptom defined as the perception of an objectively straight line as “wavy,” bent, or otherwise distorted. Current methods of characterizing visual distortions either fail to quantify them, or do not provide adequate spatial information. We seek to improve upon existing methods using a novel software program predicated on user-based manipulation of visual input.

Methods: A new software displays an objectively straight dotted line bisecting a central fixation point; using computer arrows, a patient with metamorphopsia may reshape the objectively straight line until it appears straight to them after which the program calculates the area bound by the original line & the manipulated line (area under the curve/AUC). This method was tried at a distance of 30 cm in 17 patients (19 eyes). Included patients had to have been diagnosed with macular disease in at least one eye & must have had a non-zero M-Charts score in that eye; patients unable to see the entire line were excluded. The relationship between M-Charts scores & AUC was analyzed using linear regressions.

Results: A description of subject characteristics is delineated in Table 1. Including subjects who were not able to normalize the objectively straight line fully, linear regression analysis demonstrated that the software-calculated AUC was significantly correlated with M-Charts metamorphopsia scores in both the vertical ($p = 0.003$, coefficient = 0.38, $R^2 = 0.46$) & horizontal ($p = 0.003$, coefficient = 0.3, $R^2 = 0.54$) orientations.

Conclusion: Manipulation of an objectively straight line until it appears straight to a subject seems to be a viable way to quantify & spatially characterize visual distortions. Assuming constant testing distance & fixation, changes to the line can be “mapped” onto cross-sectional imaging, allowing for correlation between structure & function. Larger studies are needed to validate this proposed methodology.

Figure 1—Screenshot of one subject’s modifications to an objectively straight horizontal line. This subject carried a diagnosis of dry age-related macular degeneration, & M-Charts testing revealed a horizontal metamorphopsia score of 0.2 in the right eye. After making the changes to the line displayed below, the subject confirmed that the line appeared straight (AUC 0.27).

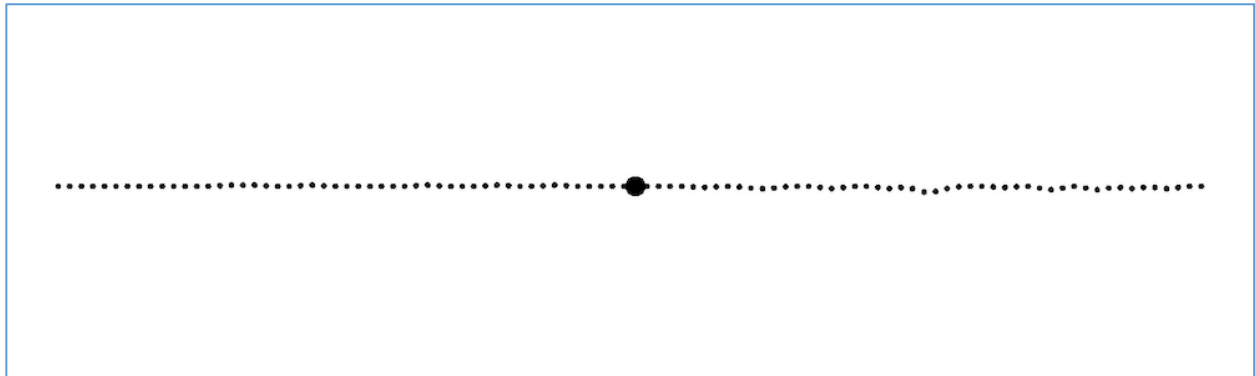


Table 1—Description of subject characteristics and results of metamorphopsia testing.

	Mean (Standard Deviation)
M-Charts (H)	0.37 (0.46)
M-Charts (V)	0.34 (0.38)
AUC (H)	0.86 (1.3)
AUC (V)	0.25 (0.48)
	# of Eyes (Includes Comorbid Diseases)
Central Serous Chorioretinopathy	3
Wet Age-Related Macular Degeneration	3
Dry Age-Related Macular Degeneration	5
Epiretinal Membrane	9 (2 post-op)
Full-Thickness Macular Hole	2 (1 post-op)
Lamellar Macular Hole	1
Diabetic Macular Edema	1

Legend: AUC = Area under the curve. H = Horizontal orientation. V = Vertical orientation.

Organ of Corti vibrations in awake mice

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Our understanding of cochlear mechanics is entirely shaped by measurements conducted in anesthetized animals. Recently, experiments have shown that anesthesia may have a significant impact on otoacoustic emissions, an indirect measure of outer hair cell function. Because outer hair cells function to mechanically alter sensitivity and frequency resolution in the cochlea, the anesthesia-induced change in emissions suggest that the mechanics of the cochlea may also be changed in an anesthetized animal. Here, we examined the direct effect of anesthesia on the sound-induced vibrations of the organ of Corti in mice. We measure radial motion in the organ of Corti using volumetric optical coherence tomography vibrometry (VOCTV), a noninvasive approach, in both the awake and anesthetized state. We show that organ of Corti vibrations are larger in mice when measured in an awake state compared to an anesthetized state. These findings indicate that efferent input to the cochlea may play a significant role in the mechanics of hearing and that the current body of literature consisting of measurements made in animals in the anesthetized state may not adequately characterize hearing in the awake state. We demonstrate the utility of VOCTV to investigate cochlear mechanics in an awake animal model for the first time.

NEOADJUVANT CHEMOTHERAPY PLUS CYSTECTOMY FOR LOCALLY ADVANCED VARIANT HISTOLOGY BLADDER CANCER

Azadeh Nazemi, Saum Ghodoussipour, Jie Cai, Gus Miranda, Siamak Daneshmand

INTRODUCTION AND OBJECTIVES: Urothelial carcinoma of the bladder may present as pure urothelial carcinoma (UC) or with variant histologic features. Variant histology has been shown to increase the likelihood of locally advanced disease and metastasis. Radical cystectomy (RC) is the mainstay of treatment in all forms of muscle invasive bladder cancer and while there is proven benefit of neoadjuvant chemotherapy (NAC) in UC, its effect on histologic variants remains unclear. This study aims to evaluate how NAC affects oncologic outcomes for histologic variants.

METHODS: Using our IRB approved, prospectively maintained bladder cancer database, we identified 229 patients with variant histology who underwent RC for cT2-T4N0M0 disease with curative intent between 2003 and 2016. Clinical histology was identified at the time of TURBT and final pathology after RC. Primary outcome was overall survival (OS) and secondary was recurrence free survival (RFS). Multivariate Cox proportional hazards regression and log-rank tests were used to assess significance.

RESULTS: Of the 229 patients, 152 (66.4%) had cystectomy alone and 77 (33.6%) received NAC before cystectomy. After controlling for differences, 5-year OS was 60% in those who received NAC and 51.8% in those who received cystectomy alone ($p=0.23$). Five year RFS was 60.7% in those who received NAC and 55.0% in those who did not ($p=0.61$). When stratified by final pathology, there was no survival benefit with NAC compared to cystectomy alone in patients who had a complete response (pT0; 76.2% vs 83.3%, $p=0.55$), residual non-muscle invasive disease (pTis/Ta/T1; 84.6% vs 70.7%, $p=0.42$) or residual muscle invasive disease (pT2-T4; 43.8% vs 48.1%, $p=0.93$). When stratified by residual disease, RFS did not improve with the addition of NAC in patients who had pT0 (83.8% vs 91.7%, $p=0.67$), pTis/Ta/T1 (84.6% vs 85.7%, $p=0.62$), or pT2-T4 disease (36.5% vs 50%, $p=0.2$).

CONCLUSIONS: Overall, histologic variants had an improved OS and RFS with the addition of NAC compared to cystectomy alone, but this difference was not statistically significant. The use of NAC for variant histologic subtypes of bladder cancer was associated with improved OS.

Randomized controlled trials are need to assess the potential benefits of NAC in patients with variant histology.

Clinical Utility of Triplicate En Face Image Averaging for Optical Coherence Tomography Angiography in Glaucoma and Glaucoma Suspects

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Purpose: Multiple *en face* image registration and averaging can be used to improve image quality for optical coherence tomography angiography (OCTA), but little is known regarding its effect on quantification in the radial peripapillary capillary (RPC) layer. We performed a cross-sectional clinical study to test the hypothesis that triplicate averaging of the RPC layer would improve visualization and increase diagnostic accuracy of OCTA in glaucoma.

Methods: We analyzed 6x6mm triplicate images of the optic nerve head in primary open angle glaucoma (POAG) eyes and glaucoma suspect (GS) eyes using spectral domain-OCTA. Images from the RPC layer were registered using the first image as a reference, and the three frames were then averaged using a custom MATLAB program. Parameters of global entropy (GE), global standard deviation (GSD), local texture correlation (LC), local homogeneity (LH), signal-to-noise ratio (SNR), and intercapillary distance (ICD) were used to measure the change in visualization with averaging. RPC blood flow parameters of vessel area density (VAD), vessel skeleton density (VSD), and flux were calculated in a 2.8mm annulus excluding the optic disc. The difference in diagnostic accuracy was assessed using the area under the receiver operating curve (AUC) for VAD, VSD, and flux in the annulus.

Results: 37 POAG eyes and 91 GS eyes were included. 3-frame averaging resulted in decreased GE and GSD ($P_s < 0.0001$), and increased LC, LH, SNR, and ICD ($P_s < 0.0001$). Averaged images also had decreased

VAD, VSD, and flux ($P_s < 0.0001$). There was a significant increase in AUC for VAD in the averaged images (AUC=0.9159) compared to the single image (AUC=0.8881, $p=0.0350$), with trends toward increased AUC for VSD (AUC=0.8634 vs 0.8314, $p=0.0710$) and flux (AUC=0.9327 vs. 0.9240, $p=0.1329$).

Conclusions: Our data demonstrate that 3-frame image averaging significantly improves visualization of the RPC layer and results in increased diagnostic accuracy of VAD in glaucoma, which suggests that image averaging is suitable and advantageous for clinical application.

Salivary detection of the mucosal immune response to human papilloma virus (HPV) vaccination

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University of Southern California

Objectives: Persistent high risk human papillomavirus (HPV) infection is causally associated with cancers of the cervix, vulva, vagina, penis, anus, and oral mucosa. HPV L1 viral-like-particle (VLP) vaccines have been shown to protect against development of HPV-16 and HPV-18-associated cervical cancer, with many studies suggesting that HPV-specific antibodies at sites of infection are the primary mechanism of protective immunity. The primary aim of this study is to determine whether saliva screening can be used as a noninvasive method to detect the oral mucosal immune response to high risk HPV serovars after vaccination with the HPV L1 VLP vaccine.

Study Design: Pilot study at a single academic institution

Methods: Serum samples were collected by venipuncture and saliva samples were collected after oral rinses with normal saline from healthy volunteers who received the HPV vaccine (n=5 female, 7 males) and never-vaccinated individuals (n=5 females, n=7 males). Samples were assayed for anti-HPV16 immunoglobulin G (IgG) and immunoglobulin A (IgA) by a HPV16 L1 virus-like particle-linked immunosorbent assay (ELISA).

Results: The optimal standard concentration range was determined using serial dilutions of sera and saliva samples of vaccinated participants, which demonstrated excellent assay linearity ($R^2 > 0.9$). All vaccinated participants had detectable titers of anti-HPV16 IgG and IgA in serum. Anti-HPV16 specific IgG and IgA antibodies were detectable in saliva of vaccine recipients at levels several logs lower than that of serum. Anti-HPV16 specific IgG and IgA antibodies could also be detected in sera and saliva of non-vaccinated participants at significantly lower titer levels than vaccine recipients.

Conclusions: This study validates the application of saliva screening as a tool to assess the mucosal immune response to HPV vaccination and is the first to our knowledge to show the presence of anti-HPV IgA in saliva. Further work is needed to show whether this local immune response is sufficient for protection against infection by HPV and subsequent development of HPV-associated head and neck cancers.

Limb Salvage Outcomes in Stimulant Abusing Patients: Crystal Clear?

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2. Division of Plastic and Reconstructive Surgery, Department of Surgery, University of Southern California, Los Angeles, CA
3. Case Western Reserve University

Background: The sequelae of stimulant (ST) abuse, particularly methamphetamine and cocaine, include alterations in vascular smooth muscle tonicity, perturbations of intracapillary oxygen gradients, and induction of an atherogenic inflammatory state. These physiologic changes may affect outcomes in soft tissue reconstruction, especially in lower-extremity (LE) trauma, which already compromises vasculature surrounding the zone of injury. Little data exists in the literature regarding limb salvage outcomes in the setting of ST abuse. We sought to evaluate our experience with LE salvage in patients with a history of ST abuse to determine its effect on outcome.

Methods: A retrospective study from March 1st, 2008 to December 31st, 2015 was performed at a single institution. All patients testing positive [ST(+)] on admission for stimulants (methamphetamine, cocaine, or both) and who received local or free flap reconstructions were included. ST(+) patients were compared against controls [ST(-)] matched for age, BMI, pre-morbid ambulatory status, smoking status, mechanism-of-injury, Gustilo-Anderson classification, and time-to-flap. The primary outcome was final ambulatory status (ambulatory vs. assisted device vs. wheelchair) and secondary outcomes included flap complications (infection, bleeding, flap loss, need for revision/amputation) and functional outcome scores (Short Form-36).

Results: Eighteen ST(+) patients were identified. ST(+) and ST(-) patients did not have differences in demographics, wound characteristics, or flap (local and free) complications. When disaggregating flap outcomes, more ST(-) patients receiving local flaps trended toward a return to full ambulatory status (7 vs. 3, $P=0.07$) and fewer required walking assist devices (2 vs. 6, $P=0.07$). Similarly, fewer ST(+) patients receiving free flaps returned to full ambulatory status compared to ST(-)-controls (2 vs. 7, $P<0.01$). No differences were found in flap complications (2 vs. 4, $P>0.05$) and SF-36 scores (37.0 ± 15.6 vs. 26.5 ± 6.4 , $P>0.05$) between ST(+) and ST(-)

receiving free flaps. ST(+) patients receiving free flaps had fewer months of follow-up than controls (1.2 ± 1.0 vs. 4.8 ± 3.4 , $P=0.03$). Logistic regression demonstrated that ST(+) patients receiving any flap were 88% less likely to return to full ambulatory status compared to controls ($P=0.02$).

Conclusions: Durable soft tissue coverage can be provided in ST(+) patients with similar wound healing outcomes to ST(-) patients. However, ST(+) patients receiving local and free flaps had worse functional outcomes than controls. We are hesitant to ascribe causality to why ST abusers were less likely to return to pre-morbid ambulatory status. The less consistent follow-up and non-compliance with post-operative weight-bearing status and physical therapy demonstrated by this patient group may play a role.

Population-Based Survivorship of Computer Navigated Versus Conventional Total Knee Arthroplasty

Djani Robertson, H. Paco Kang, Joseph K. Antonios, Daniel A. Oakes, Jay R. Lieberman, Nathanael D. Heckmann

Introduction: The goal of computer navigation in total knee arthroplasty (TKA) is to improve the accuracy of alignment. However, the relationship between this technology and implant longevity has not been established. The purpose of this study was to analyze survivorship of computer-navigated TKAs compared to traditionally instrumented TKA.

Methods: The PearlDiver Medicare database was used to identify patients who underwent a primary TKA using conventional instrumentation versus computer navigation between 2005 and 2014. Conventional and computer-navigated cohorts were matched by age, gender, year of procedure, geographic region, and comorbidities. Kaplan-Meier curves were generated to estimate survivorship with aseptic mechanical complications, periprosthetic joint infection, and all-cause revision as endpoints.

Results: During the study period, 75,709 patients who underwent a computer-navigated TKA were identified and matched to a cohort of 75,676 conventional TKA patients. There was a small but decreased revision rate secondary to mechanical complications at 5 years with navigation (96.1% vs 95.7% event free survival) but no differences in revision rates due to periprosthetic joint infection (97.9% vs 97.9% event free survival). In patients <65 years of age, use of computer navigation was associated with decreased all-cause revision (91.4% vs 89.6% event free survival) and revision secondary to mechanical complications (89.6% vs 87.8% event free survival) at 5 years.

Discussion/Conclusion: Use of navigation improves survivorship of total knee arthroplasty at 5 years in patients <65 years of age secondary to mechanical etiologies. Though absolute differences in survival were small, larger differences in survival may be observed with longer term follow up. Navigation may be most beneficial in patients <65 years of age, where mechanical complications such as aseptic loosening are a common cause of failure.

Pain >4 days is Predictive of Concomitant Osteomyelitis in Children with Septic Arthritis

Ali Siddiqui, BS; Lindsay M. Andras, MD, Kenneth D. Illingworth, MD; David L. Skaggs MD, MMM

Background: Delayed diagnosis and treatment of osteomyelitis or septic arthritis may lead to debilitating sequelae. There is no evidenced-based consensus on the risk factors for concomitant osteomyelitis and septic arthritis. The purpose of this study was to investigate clinical parameters predictive of concomitant osteomyelitis in pediatric septic arthritis patients.

Methods: Retrospective review was conducted on all septic arthritis patients between January 2004 and October 2016 at a tertiary care pediatric hospital. Medical charts were reviewed for

information including symptoms, diagnosis of osteomyelitis, serum laboratory studies, joint fluid analyses, imaging results, surgeries, and reoperations. Positive diagnosis of osteomyelitis was defined as hyper-intense signaling of osseous structures on T2-weighted magnetic resonance imaging (MRI).

Results: 71 patients with 73 septic joints were included. Mean age was 6.9 ± 4.6 (0.1-17.7) years and mean follow-up was 14.9 ± 24.1 (1.0-133.1) months. The diagnoses were as follows: 36/71 (51%) septic hip, 24/71 (34%) septic knee, 5/71 (7%) septic elbow, 3/71 (4%) septic ankle, 2/71 (3%) septic shoulder, and 1/71 (1%) polyarticular septic arthritis. Septic arthritis with concomitant osteomyelitis occurred in 43/71 (60%) patients while 28/71 (39%) patients had septic arthritis alone. Inflammatory markers including white blood cell count, erythrocyte sedimentation rate, and C-reactive protein were not predictive of concomitant osteomyelitis. Pain > 4 days prior to presentation, limited weight-bearing for > 3 days prior to presentation, positive joint fluid bacterial culture, and positive blood culture were associated with concomitant osteomyelitis on univariate analysis. Twenty-four septic arthritis patients had pain for > 4 days prior to admission, and 96% (23/24) of those had concomitant osteomyelitis whereas 43% (20/47) of patients with pain for ≤ 4 days had osteomyelitis. Multivariate logistic regression revealed that positive joint fluid bacterial culture ($p = 0.03$) and pain for > 4 days prior to admission ($p = 0.006$) are independent risk factors for concomitant osteomyelitis in children with septic arthritis.

Conclusion: Pain for > 4 days prior to presentation is an independent predictor of concomitant osteomyelitis, with 96% of patients having osteomyelitis in addition to septic arthritis. In children with septic arthritis presenting with pain for > 4 days, MRI should be strongly considered to evaluate for osteomyelitis.

Utilizing Digital Nutrition Videos to Help Food Insecure Families Bridge the Gap from Farm to Table

Katharine B. Stiers; June Tester, MD MPH; Gregory Harlan, MD MPH

Background: Fewer than 1 in 10 Americans eat the recommended amount of fruits and vegetables, which has been linked to the considerable rise in metabolic diseases (1,2). Low-income families are faced with additional obstacles to eating healthy, with access to ample fast food sites but few affordable healthy food options. In our 2017 pilot study, we found that even after eliminating the barrier of access to healthy food by providing home food deliveries, there was only a moderate increase in vegetable and whole grain consumption. Key barriers are unfamiliarity with these foods and a perceived lack of time to prepare them (3). Our intervention aims to eliminate the discomfort around cooking whole grains and vegetables, and make healthy eating feel more accessible to food insecure families.

Methods: The study participants are 150 food insecure families with children ages 8-17 at UCSF Benioff Children's Hospital Oakland clinic. Enrollment was planned for Nov 2018 but delayed until Feb 2019. Families will receive a weekly delivery box of fresh produce and whole grains for 12 weeks from Phat Beets Produce, an Oakland CSA-delivery program. The intervention includes weekly text messages to families with "how-to" cooking videos corresponding to their box contents, and introductory culinary skills videos featuring local minority chefs. A weekly short survey will assess the previous week's videos.

Results: 9 of the 10 videos have been recorded. After 12 weeks, participants will complete a thorough post-study survey. The study will evaluate two aspects: the feasibility and utility of the videos, and changes in participants' anthropometric data and eating behaviors.

Conclusion: Increasing the availability of nutrition education through digital technology addresses key barriers to healthy eating, and thus has the potential to significantly reduce the

prevalence of metabolic diseases, increase their cooking confidence, and improve health outcomes for food insecure families.

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siRNA-Induced Knockdown of *ADCY3* Inhibits Proliferation of Human Malignant Meningioma Cells

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Introduction: Meningiomas are the most commonly-occurring primary central nervous system (CNS) tumor, comprising 33.8% of such tumors. Malignant meningiomas, a subtype of aggressive meningiomas, demonstrate a 10-year survival rate as low as 34.5%. These tumors also have a median time to recurrence of only 2 years. To date, few functional genomics studies exist that examine the behavior of malignant meningioma cells. Recent research has identified several genes that are upregulated in human malignant meningiomas. One such gene, *ADCY3*, codes for adenylyl cyclase 3, and is implicated in CNS disease. This study aims to examine the effects of *ADCY3* knockdown on viability and proliferation of malignant meningioma cells.

Methods: The human malignant meningioma cell line, CH157, was cultured in DMEM+FBS. These cells have a doubling time of 17 hrs. These cells were transfected in a 12-well plate with the Qiagen FlexiTube siRNA Gene Solution for *ADCY3*, which contains four target siRNAs. The Qiagen AllStars Negative Control siRNA was used as a control. qPCR was used to confirm *ADCY3* knockdown. A single 20-hour cell proliferation assay was performed using the siRNA that induced the greatest amount of knockdown. Cells were counted using the Invitrogen Countess II FL automated cell counter.

Results: All total cell RNA extracted from the CH157 cells was relatively pure, with the lowest Absorbance at 260nm:280nm being 2.09, and the lowest Absorbance at 260nm:230nm of 1.96. The concentration of the retrieved cellular RNA ranged from 180 to 449 ng/μL. Of the four siRNAs examined, one (siRNA 1) demonstrated a 50% knockdown of *ADCY3*. siRNA 1 transfection induced a 7% reduction in cell viability compared to control (31% living cells vs. 39%, respectively). siRNA 1 transfection also induced a 56.1% reduction in cell proliferation compared to control (1.20 x 10⁵ cells/mL vs. 2.14 x 10⁵ cells/mL, respectively).

Discussion: Knockdown of *ADCY3* appears to reduce the viability and proliferative behavior of human malignant meningioma cells in culture. A cell invasion assay should be performed to observe possible effects of gene knockdown on migratory and invasive behavior. Knockdown of

other genes (GAS7, LAG3, LRR32, and SPON2) should be performed to explore genes that may be candidates for gene therapies

Multipotent SOX2-positive taste epithelial cells and their response to differential Wnt signaling using lingual organoid culture

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Taste is the sensory modality that guides consumption of nutrients and avoidance of toxins. In humans, taste is accomplished when stimuli are transduced into electrochemical signals by receptor cells within taste buds. Buds reside in papillary structures anteriorly (fungiform), posteriorly (circumvallate or CVP), and laterally (foliate) throughout the tongue. Taste cells regenerate throughout life with taste perception being tightly conserved despite frequent cell turnover. Loss of this tight regulation—often a side effect of anti-cancer therapy—underlies perceptive dysgeusia (altered taste) or ageusia (loss of taste) (Ovesen et al., 1991 Clin Nutr). Recent work has uncovered the importance of the SRY-box transcription factor, SOX2, as a regulator of cell renewal. We know: (1) SOX2 is absolutely required for the renewal of TRCs (Castillo-Azofeifa et al., 2018 Dev); and (2) all types of TRCs are derived from epithelial cells expressing SOX2 (Ohmoto et al., 2017 Chem Senses). Despite the multipotent nature of SOX2-expressing cells—to date—there is no description of their potency using organoid culture technology. Intriguingly, SOX2 expression levels are highly variable in taste epithelium, and the degree to which SOX2 level correlates with multipotency is unknown. We used fluorescence-activated cell sorting of CVP epithelium from SOX2-GFP mice to collect high and low GFP⁺, as well as GFP^{neg}, cell populations and assessed each group's capacity to generate TRC-containing lingual organoids. We find cells with either high or low SOX2-GFP expression robustly generate organoids, while GFP^{neg} epithelial cells do not. Further, we find organoids derived from differentially fluorescent SOX2-GFP populations have distinct growth behavior, proliferation kinetics, morphologies, and expression of LGR5, a known marker of taste stem cells. We are now testing how these very same properties are influenced when organoids are grown in conditioned media containing varied levels of Wnt protein as well as additional activators/inhibitors of this crucial signaling pathway.

Feasibility and acceptability of a brief telephone interview with 911-bystander callers of recent out-of-hospital cardiac arrest incidents in the City of Los Angeles

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BACKGROUND/STUDY OBJECTIVE: Sudden cardiac arrest is the most common cause of death in the United States, affecting 360,000 patients in the United States and nearly 5,000 individuals in the City of Los Angeles each year. Bystander CPR is the most important modifiable determinant of survival in patients with out-of-hospital cardiac arrest (OHCA) and its prevalence in Los Angeles ranges from 20-70% between different neighborhoods and ethnic groups. Although the body of scientific literature on OHCA patients, prehospital interventions and hospital outcomes has grown extensively in the last 20 years, surprisingly little has been

written about the bystanders themselves. For example, it is unknown what factors promote layperson recognition and action in the face of a collapsed patient, responsiveness to telecommunicator CPR instructions, and how bystanders cope with the aftermath of witnessing OHCA. The objective of this study was to describe the feasibility of identifying and contacting second party 911-OHCA callers within three months of their original 911-call and examine the acceptability of a brief telephone survey asking about determinants of bystander response.

METHODS: The Los Angeles Fire Department (LAFD) is the sole-provider for 911-telecommunications and field response for OHCA for the City of Los Angeles, serving a population of 4.1 million residents spanning 480 square miles. Consecutive cases of OHCA were identified by retrospectively reviewing LAFD electronic health records to identify cases meeting inclusion/exclusion criteria. Inclusion criteria were: (1) LAFD-attended OHCA patients, (2) resuscitation was attempted, and (3) second-party caller provided an emergency call-back number to 911-telecommunicators. Exclusion criteria were: (1) traumatic cardiac arrests, (2) cases witnessed by EMS, (3) cases occurring in a medical clinic or nursing home, or (4) cases where 911-calls were handled by non-LAFD dispatch center. Once identified, the bystanders' callback phone numbers were isolated from LAFD's computer assisted dispatch system and an exploratory cross-sectional telephone survey was administered to those 911-callers within 3 months of the OHCA incident. Utilizing a 5-point Likert scale, 911-callers were surveyed across various survey domains, including: willingness to discuss their 911-experience, prior experiences, impact on bystanders' own well-being, willingness to participate in further research, sources of influence, and basic demographic information.

RESULTS: From September 2018-December 2018, there were a total of 999 cases of LAFD-attended OHCA cases. Of these, 351 (35.1%) of calls met inclusion/exclusion criteria and were subsequently contacted, yielding an overall response rate of 39.1% (N=138). The average age of bystanders surveyed was 44.7 years (13-92) with 83 (60%) being female. Of the total responses, 101 (73.1%) surveys were ultimately completed with 30 (21.7%) survey refusals and 7 (0.05%) having refused making the initial 911-call. The average duration between the incident date and date of survey completion was 45.1 days (7-83 days). 55 (54.4%) of bystanders were either "willing" or "very willing" to discuss their 911-experience when surveyed, which corresponded to a 4 or 5 on the Likert scale, respectively. 34 (33%) of bystanders surveyed were either "very not willing" or "not willing" to discuss their 911-experience, which corresponded to a 1 or 2 on the Likert scale, respectively. Of the cases in which 64 respondents who either refused the survey or were unwilling to speak of the event, 36 (56%) were either pronounced dead in the field or in the ED upon arrival; while, of 55 respondents who were willing to discuss the event, 22 (40%) of the cases were pronounced dead in the field or in ED ($p=0.038$). CPR was initiated by a non-medical personnel bystander in 68 of the 138 contacted cases (49%). Of the cases in which 64 respondents who either refused the survey or were unwilling to speak of the event, resuscitation was initiated by a non-medical personnel bystander in 30 (47%) of the cases; while, of 55 respondents who were willing to discuss the event, resuscitation was initiated by a non-medical personnel bystander in 26 (47%) of the cases.

CONCLUSIONS: When surveyed within 3 months of the initial event, second-party callers who witness a patient with OHCA are slightly more likely than not to be open to discussing their 911-experience. There is a statistically significant correlation between survey refusal and/or unwillingness to discuss the event with a negative field outcome, such as pronouncement of dead in the field or the ED upon arrival. The proportion of cases in which resuscitation was initiated by a non-medical personnel bystander was the same between those who were willing to discuss the event versus those who were unwilling or refused the survey.

Effect of Online Care on Functional Impairment and Depression in Patients with Psoriatic Diseases

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Patients with psoriasis and psoriatic arthritis are at substantial risk for functional impairment and depression when their psoriatic diseases are not controlled. Little is known about the effect of different healthcare delivery models on their function and psychological wellbeing. Through a randomized controlled equivalency trial, we evaluated how a novel online model that facilitates collaboration among physicians and patients affects psoriasis and psoriatic arthritis patients' functional status and mental health. A total of 300 psoriasis patients were enrolled and subsequently randomized 1:1 to online or in-person care. 26.0% of patients reported a physician-given diagnosis of psoriatic arthritis. Functional impairment and depression were assessed at baseline and at three-month intervals throughout the twelve-month study period using the 5-level EurQol-5 Dimensions (EQ-5D-5L) and the Patient Health Questionnaire-9 (PHQ-9). Both online and in-person groups showed overall improvement in EQ VAS (EuroQol Visual Analogue Scale), with adjusted group difference -0.002 (95% CI -2.749, 2.745) lying within the equivalence margin of ± 8 . Both groups showed overall improvement in EQ-5D-5L index, with adjusted group difference 0 (95% CI -0.003, 0.003) lying within the equivalence margin of ± 0.1 . Both groups also showed overall improvement in PHQ-9 score, with adjusted group difference -0.33 (95% CI -1.20, 0.55) lying within the equivalence margin of ± 3 . In conclusion, the online health model was equivalent to in-person care in improving mental health and functional outcomes in patients with psoriasis and psoriatic arthritis.

ANESTHESIOLOGY

Effect of outpatient ketamine infusions in CRPS patients
Jennifer Ding, Faye Weinstein, Talin Evazyan, Veronica Acevedo

Purpose: As a consequence of largely disappointing clinical results of pharmacological and non-pharmacological modalities to treat chronic pain, there is a strong case in favor of prolonged ketamine infusion in the management of neuropathic pain, especially complex regional pain syndrome (CRPS). Prolonged ketamine infusions maintained at a sub anesthetic level and dosed over a 10-day period on an outpatient basis have produced reductions in pain that persist for weeks. Ketamine has also been useful in the treatment of depression, producing reductions in depression severity scores within hours after a single infusion. The purpose of this study is to observe and evaluate the results from a ketamine infusion clinic on the treatment of CRPS.

Methods: This retrospective chart review includes 30 adult CRPS patients who received ketamine infusions at the Keck outpatient pain clinic between July 2014 and July 2017. Patients initially received 10 daily treatments in two consecutive weeks and then were placed on a decreased infusion schedule. Data extracted includes NRS pain scores from nursing notes, pain and symptoms from the ESAS, CRPS symptoms and signs on exam from the CSS17, depression scores from the PHQ9, and symptoms and function from the SF36. NRS pain scores were recorded at every visit, and the assessment forms were generally completed at the first visit and once again during the study period.

Results: Preliminary results indicate that the PHQ9 sum score for Visit 2 is higher than Visit 1. This seems to be because some patients who had no or low levels of depression at Visit 1 had increased depression scores at Visit 2. However, patients with higher levels depression at Visit 1 had improvements in depression scores at Visit 2. We expect pain scores and symptoms to decrease over the course of treatment, and we expect depression and function scores to improve.

Conclusion: The results of this study will assist in evaluating the effect of ketamine infusions on pain, symptoms, and depression in CRPS patients at the Keck outpatient pain clinic.

Point-of-care ultrasound (POCUS) to assess volume status after prolonged overnight fasting in healthy adult volunteers

Jennifer Pan, Mandeep Singh, MD, Kevin Blaine, MD, Catherine M. Kuza, MD, Candice Tay, MD, Shihab Sugeir, MD, Allison Moriarty, MD, Philip Lumb, MD

Background: Point-of-care ultrasound (POCUS) assessment of inferior vena cava (IVC) diameter and collapsibility with respiration correlates with volume status and fluid responsiveness. POCUS examination of IVC diameter could be used to assess volume depletion associated with prolonged preoperative fasting.

Methods: A prospective, repeated-measures design was performed to examine the ability of POCUS to detect changes in IVC diameter using dynamic and static maneuvers in healthy volunteers during a controlled, 16-hour fast. The primary endpoint was the change in IVC diameter during the passive leg raise (PLR) maneuver. Secondary endpoints included effects on caval index and changes in orthostatic vital signs.

Results: Thirty-eight healthy volunteers were included for analysis. Vital sign measurements, including weight, supine blood pressure, and heart rate, decreased progressively throughout the fast. There was no association between fasting time and inhaled or exhaled IVC diameters, caval index, or the 'sniff test' maneuver. The effect of PLR on IVC diameter produced no difference at 8 and 12 hours but did show a modest response at 16 hours ($+18.7 \pm 26.8\%$, $p=0.019$).

Conclusions: In healthy volunteers, POCUS detects significant changes in IVC diameter with PLR after a fasting duration of 16 hours, suggesting volume depletion. Healthy individuals may have robust compensatory mechanisms for maintaining intravascular volume status during fasting. POCUS may have a role in assessing changes in volume status due to prolonged but not routine preoperative overnight fasting.

Predicting the blood pressure difference between the brain and heart, post induction of general anesthesia in a beach chair position

Rocky Patel (Medical student), Dr. Jack Berger (Advisor)

Goal: The purpose of this study is to determine if it is possible to predict the blood pressure difference between the brain and the heart post induction of general anesthesia in beach chair position using non-invasive preoperative blood pressure measurements. This unique position is of interest due to differences in blood pressure throughout the body and the tendency for blood to pool, leading to hypoperfusion of the brain during surgery.

Methods: Blood pressure measurements on 8 patients undergoing shoulder surgery in a beach chair position were taken both preop and post induction of anesthesia. Preoperatively four total blood pressure measurements were obtained on the non-operative arm. Two while sitting and two while supine. For each position blood pressure was taken with the arm up and the arm down. Two more similar blood pressure measurements were obtained post induction of anesthesia in the beach chair position. The arm up position correlates to the blood pressure at the brain and the arm down position correlates to the pressure at the heart. Data on sex, age, distance from middle ear to middle blood pressure cuff, and previous history of diabetes and hypertension was also collected.

Results: Based on the data collected on 8 patients, the mean decreases in MAP post induction of anesthesia between the brain and the heart was 10.33. The mean difference in MAP preoperatively while sitting was 17.66 and while supine was 15.41. The p value between preop while sitting and post induction was .21, indicating no significant difference. The p value between preop while supine and post induction was .364, also indicating no significant difference.

Conclusion: Since there is no significant difference between preop and post induction blood pressures it is possible to predict the drop in blood pressure post induction of anesthesia. For this data and conclusion to be stronger more patients need to be studied.

BIOKINESIOLOGY & PHYSICAL THERAPY

Effect of a 16-week Exercise Intervention on the Triglycerides and Glucose Index in Obese Breast Cancer Survivors

Nathalie Sami, Kyuwan Lee, Christina M. Dieli-Conwright

Goal: Metabolic syndrome is a well-studied complication of breast cancer treatment and can be attenuated with exercise. Insulin resistance, a physiologic alteration of metabolic syndrome, can lead to complications such as type 2 diabetes. The Triglycerides and Glucose Index (TGI) is a clinical marker of insulin resistance and may be a useful index to target with structured exercise in high-risk groups, such as cancer survivors. The aim of this study was to determine if a 16-week exercise intervention attenuates TGI in obese breast cancer survivors.

Methods: One hundred sedentary, obese breast cancer (Stage I-III) survivors who completed treatment (chemotherapy and/or radiation) within the previous 6 months were randomized to the exercise (EX) or control (CON) group. The EX group participated in a 16-week supervised moderate-to-vigorous intensity aerobic and resistance exercise intervention 3 times/week. The CON group was asked to maintain their current activity level. At baseline and post-intervention, fasting plasma was measured for triglycerides and glucose levels. TGI was calculated using the formula: $\text{Ln}(\text{TG}[\text{mg/dL}] \times \text{glucose}[\text{mg/dL}]/2)$. Within group differences and between group differences were calculated using mixed model repeated measures analysis.

Results: Participants were 53 ± 10.4 years old, obese (BMI $33.5 \pm 5.5 \text{ kg/m}^2$), and Hispanic (63.1%). At baseline, there were no differences in triglycerides (EX 248.1 ± 26.9 , CON 231.8 ± 24.1) and glucose (EX 109.6 ± 17.1 , CON 103.3 ± 14.0) levels between the two groups ($p > 0.05$). At 4 months, TGI significantly improved in EX ($-28.2 \pm 3.6\%$) when compared to baseline ($p < 0.001$), and CON ($3.0 \pm 0.2\%$; $p < 0.001$).

Conclusion: A 16-week exercise intervention significantly reduced TGI in obese, sedentary breast cancer survivors. Prescribing exercise post-treatment to breast cancer survivors should be considered in order to target insulin resistance and diminish the risk of associated complications, such as type 2 diabetes.

Effect of a 16-week Aerobic and Resistance Exercise on Quality of Life in Overweight and Obese Breast Cancer Survivors

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Goal: Breast cancer survivors not only experience a decline in physical functioning due to cancer-related treatment, but emotional well-being is also negatively impacted. This investigation examined the effects of a 16-week aerobic and resistance exercise intervention on patient-reported outcomes in ethnically diverse, sedentary, overweight or obese breast cancer survivors.

Methods: One hundred overweight or obese breast cancer survivors who were within 6 months of completing adjuvant treatment for stage I-III breast cancer were randomized into either the Exercise ($n=50$) or Control ($n=50$) groups. The 16-week exercise intervention involved moderate-vigorous (65-85% heart rate maximum) aerobic and resistance exercise performed three times per week. QOL, fatigue, and depression were assessed at baseline, post-intervention, and 3-month follow-up (exercise group only). Differences in mean changes for outcomes were evaluated using mixed-model repeated measure analysis.

Results: At baseline there was no significant difference in QOL, fatigue, or depression between the two groups ($p>0.05$). At postintervention, the exercise group experienced significant improvements in QOL (between group difference: 14.7, 95% CI: 18.2, 9.7; $p<0.001$), fatigue ($p<0.001$), and depression ($p<0.001$). The exercise group experienced a 20.3% increase in QOL, a 59.2% reduction in fatigue, and a 35.8% improvement in depression scores. At 3-month follow-up, all patient-reported outcomes remained significantly improved compared to baseline in the exercise group ($p<0.01$).

Conclusions. A 16-week aerobic and resistance exercise intervention in ethnically-diverse overweight or obese breast cancer survivors significantly improved patient-reported outcomes suggesting that supervised clinical exercise programs including aerobic and resistance exercises should be integrated into breast cancer treatment and care.

Supervised, Clinical Aerobic and Resistance Exercise Improves Physical Fitness in Overweight and Obese Breast Cancer Survivors

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Purpose: Due in part to the nature of cancer-related treatments, breast cancer survivors (BCS) are less physically active than age-matched counterparts rendering them less physically fit. Physical inactivity and reduced fitness can result in muscle atrophy, weight gain, and an increased risk of diabetes and hypertension, known predisposing risk factors to the development of cardiovascular disease, among other diseases. Exercise is an effective method to improve physical fitness in BCS. Few studies have focused on the early survivorship period, minority populations, sedentary and obese women, or tested a combined exercise program. Here, we report the effects of a 16-week supervised, clinical aerobic and resistance exercise intervention on physical fitness in ethnically diverse, sedentary, and overweight or obese BCS.

Methods: One hundred overweight or obese, sedentary women diagnosed with stage I-III breast cancer were randomized to either the Exercise (EX, $n=50$) or Control (CON, $n=50$) groups. The exercise intervention consisted of 3 weekly sessions including moderate-vigorous (65%-85% heart rate maximum) aerobic exercise and resistance exercise (65-85% one-repetition maximum). Physical fitness was assessed at baseline, post-intervention, and a three-month follow-up (exercise group only) using a submaximal treadmill walk test to estimate $VO_2\max$. Maximal voluntary muscle strength was evaluated by a 10-repetition maximum (10-RM) method for the following exercises: chest press, latissimus pulldown, knee extension, and knee flexion. The CON group was offered the exercise program after the 16-week study period. Differences in mean change for outcomes were evaluated using mixed-model repeated measure analysis.

Results: Participants were 53 ± 10.4 years old, primarily overweight ($BMI>25.0 \text{ kg/m}^2$; 54%) and Hispanic (63.1%), had undergone a mastectomy (90%) and chemotherapy + radiation therapy (76%). At baseline, there were no differences in physical fitness between the 2 groups ($p>0.05$). Post-intervention, all physical fitness measures significantly improved (mean percent increase: 43%) in EX when compared to baseline and CON ($p<0.001$). At the three-month follow-up, all physical fitness variables in the EX group remained significantly improved in comparison to the baseline ($p<0.01$).

Conclusion: This 16-week supervised aerobic and resistance exercise intervention significantly improved the physical fitness in ethnically-diverse and overweight or obese BCS. These findings

support the integration of supervised clinical exercise programs into breast cancer treatment and care.

Funding: This project was supported by NIH/NCI K07CA160718

	EX (n = 50)	CON (n = 50)
Age (years), mean (SD)	52.8 ± 10.4	53.6 ± 10.1
Menopausal status		
Premenopausal	23 (44)	22 (44)
Postmenopausal	27 (56)	28 (56)
BMI (kg/m²), mean (SD)	33.5 ± 5.7	33.7 ± 5.2
BMI category		
Overweight, BMI < 30	26 (52)	27 (54)
Obese, BMI ≥ 30	24 (48)	23 (46)
Race/ethnicity		
Non-Hispanic white	11 (21)	15 (31)
Hispanic white	28 (56)	27 (53)
African American	3 (6)	1 (2)
Asian/Pacific Islander	8 (17)	7 (14)
Disease stage (grade)		
I	20 (40)	21 (42)
II	19 (38)	19 (38)
III	11 (22)	10 (20)
Treatment in addition to surgery		
Radiation only	4 (8)	6 (13)
Chemotherapy only	8 (15)	5 (11)
Radiation & chemotherapy	38 (76)	39 (78)
Physical activity questionnaire (min per week of moderate to vigorous intensity recreational activity), mean (SD)	9.9 ± 8.2	9.0 ± 8.4

DENTISTRY – OMFS

Epidemiology of Cervical Spine Injury In Conjunction With Isolated Mandible Fracture at LAC+USC Medical Center

Stephen Kelson D.D.S., Rozbeh Hossieni D.D.S. M.D., Kyle Yip M.S. D.D.S. M.D.

Background/Introduction: The literature is highly varied with respect to incidence of cervical spine injury in the context of mandible fractures. Increased knowledge of common co-presenting pathology allows providers to more rapidly assess the trauma patient and provide higher quality care. The purpose of this study is to clarify the incidence of cervical spine injuries that present in conjunction with an isolated fracture of the mandible.

Methods: The study is a structured chart review, specifically a retrospective cohort study. Patients were selected from persons presenting to the LAC+USC Medical Center, Emergency Department who were found to have a mandibular fracture. Qualifying patients were identified by means of reviewing trauma logs from the consulting service responsible for care of acute facial trauma. Exclusion criteria included persons with a history of previous cervical spine injuries and persons with other co-presenting facial fractures.

Results: *Data collection is ongoing.* However, upon review of 127 patients with isolated mandible fractures, 0 cases with cervical spine injury have been noted. Of these 127 patients, 108 did not warrant further diagnostic imaging following panoramic radiograph of the mandible, or computed tomography of maxillofacial region. 19 Patients did warrant computed tomography of cervical spine region due to higher index of suspicion for cervical spine injury. 0 patients demonstrated cervical spine injury. Of note, 1 patient sustained fracture of the styloid process.

Conclusions: *Although data collection is ongoing,* the data suggests that incidence of cervical spine injury with concurrent isolated mandible fracture is significantly lower than values currently reported in oral and maxillofacial surgery literature. Assuming LAC+USC Medical Center is representative of national values, the incidence of cervical spine injury with isolated mandible fracture is rare, likely presenting in <1% of cases.

Bupivacaine supplementation for post-operative analgesia following third molar extraction: a split-mouth, randomized controlled trial

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Background: Supplemental injections of bupivacaine after completion of third molar extractions have been studied as a method to reduce post-operative pain. This study aims to evaluate the efficacy of local infiltrations of bupivacaine following third molar extractions in reducing post-operative pain.

Methods: Healthy subjects (ASA I) with bilateral, symmetrical impacted third molars that are indicated for extraction will be selected for the study. In a split mouth design, one side of the mouth will be randomly selected as the treatment group (TG) and the other side as the control group (CG). Both groups will be anesthetized pre-operatively with 2% lidocaine w/1:100,000 epinephrine. After surgery completion, the TG will receive a supplemental buccal infiltration of 0.5% bupivacaine w/1:200,000 epinephrine. Subjects will be asked to assess their pain (the primary outcome) on each side of their mouth in the post-operative period using the 11-point Number Response Scale (NRS-11). Subjects will also be asked to record the timing and number of post-operative analgesics taken (secondary outcome).

Results: No data is available at this time. We speculate that the TG will see a reduction in pain scores in the first 24 hours following surgery, and likely consumption of analgesics in the same period.

Conclusions: Data from this study will help to assess the viability of controlling post-operative pain with supplemental local anesthesia. This would prove to be a valuable, cost-effective method of improving patient comfort, reducing pain, and ultimately reducing the consumption of analgesics. One especially valuable consequence of this method may be the reduced post-operative consumption of narcotic and subsequently the reduced risk of dependence on narcotics.

DERMATOLOGY

Impact of Pediatric Skin Disorders
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Background: Skin conditions in children are often considered “cosmetic” or insignificant. This verbiage negatively impacts the accessibility of treatments for patients and their families, as research organizations are less likely to award funding, and insurance providers are less likely to offer coverage, stifling interest in drug development and research. The goal of this study is to quantify the extent of stigma associated with dermatological disease in childhood and correlate it with disease severity. We hope to demonstrate to the medical community that skin disease in children can have profound psychosocial impacts due to stigma and discrimination, and that proper treatment and management of these diseases are essential to the child's wellbeing.

Methods: Patients between the ages of 8 and 17 presenting to dermatology with a visible and subjectively severe skin condition will be recruited and consented for the study. The physician will perform a dermatological history and physical exam. The patient will complete the following previously validated questionnaires: stigma scale, depression scale short form, anxiety scale short form, social functioning scale short form, and Skindex-Teen. At least one parent will complete the following previously validated questionnaires: parent proxy stigma scale, parent proxy depression scale short form, parent proxy anxiety scale short form, and parent proxy social functioning scale short form. Collected data will be compiled in REDCap for HIPAA-compliant storage prior to data analysis.

Results: This study is entering the participant recruitment phase, and results and analyses are pending at this time.

Summary/Conclusion: This study seeks to investigate how stigma contributes to mental health outcomes in pediatric patients with visible skin conditions. We expect to find a positive correlation between severity of visible skin condition and increased stigma with associated negative mental health outcomes.

Referring Provider Satisfaction with Teledermatology: Lessons Learned from Educational Training on E-Consults

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Purpose: Store-and-forward teledermatology (e-consult) is an efficient and effective care delivery model compared to face-to-face visits, yet many providers do not utilize established store-and-forward platforms. This study tests the hypothesis that educating providers-in-training on the benefits and uses of store-and-forward teledermatology will improve perceptions and utilization of the e-consult system currently in place at LAC+USC.

Methods: We are performing a series of lectures within the Internal Medicine resident curriculum at LAC+USC educating physicians on store-and-forward platforms and their dermatologic applications. Perceptions are assessed via an anonymous survey on e-consult, repeated pre- and post-intervention. Utilization will be measured via the e-consult platform, comparing participants' e-consults to dermatology and conversions to face-to-face visits 6 months pre- and post-intervention.

Predicted Results: Based on the completed pre-intervention survey, we expect to have data for 68 resident physicians. We expect mean satisfaction with e-consult (assessed with 5 survey questions) and mean perceived value of e-consult (assessed with 9 survey questions) to increase significantly post-intervention. We also expect number of e-consults placed to dermatology by the Internal Medicine resident population to increase significantly post-intervention.

Desired Conclusions: If our intervention does improve perceptions and utilization of e-consult at LAC+USC, we can conclude that achieving “buy-in” from providers is a critical aspect of implementing an e-consult platform. Once perceptions are characterized, “pain points” can be identified and addressed in follow-up studies aimed at further improving the system. In addition, future studies can explore the impact of e-consult utilization on improving efficiency, patient access to dermatologic services, and dermatologic health outcomes system-wide.

A Detailed Analysis of the Reactional States found in Hansen’s Disease
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Background: There are three reactional states observed in the histopathology of Hansen’s disease (HD) which are characterized by inflammatory responses¹. Type 1 reaction is characterized by edema in the superficial dermis and in the granuloma, the presence of foreign bodies, and Langhans giant cells². Type 2 reactions, also known as Erythema Nodosum Leprosum (ENL), have been described as most commonly having granulomas infiltrated by neutrophils, leukocytoclasia, and papillary dermal edema³. The third reaction is seen in patients with Lepromatous Leprosy and are observed to have necrosis in the epidermis and severe, focal endothelial proliferation in large vessels⁴. HD is often challenging to diagnose due to several factors, including a lack of reliable and accessible diagnostic lab tests, and also because practitioners may lack awareness as to the full presentation of this disease⁵.

Methods: A retrospective chart review of 35 biopsy specimens collected from patients being treated at the Hansen’s Clinic during a 7-year time period (from 2011 – 2018). Biopsies from patients of all ages will be included. Biopsies with an uncertain diagnosis will be analyzed and excluded from the study. Clinical presentation of the patient will be beyond the scope of this paper. Findings will be compared to existent literature, and followed by a statistical analysis using RedCap, SPSS or Microsoft Excel.

Expected Results: Upon review of all biopsies we expect to find a general consensus with findings from past papers on these reactional states. Findings such as dermal edema and Langhans giant cells in a type I reaction; neutrophilic infiltration of granulomas in type II; necrotic epidermis and thrombotic vessels in Lucio’s phenomenon.

Summary: HD is a mutable disease and the reactional states it causes cannot reliably be diagnosed histologically. We hope that by providing a detailed analysis of our findings it will not only enhance the scientific community’s understanding of the disease but also contribute towards the improvement in the diagnosis and treatment of patients with this disease.

Treating nonsense-mutated recessive dystrophic epidermolysis bullosa patients with intravenous gentamicin

Daniel Mosallaei, David T. Woodley, Andrew Kwong, Jon Cogan, Yingping Hou, Vadim Lincoln, Gene Kim, David Peng, Douglas Keene, Mei Chen.

Goal: Recessive dystrophic epidermolysis bullosa (RDEB) is a life-threatening skin fragility disorder with systemic manifestations. It is caused by a mutation in *COL7A1*, a gene encoding type VII collagen (C7), a major component of anchoring fibrils (AFs). Over a quarter of patients harbor nonsense mutations in *COL7A1* that cause a premature stop codon (PTC), resulting in a truncated C7 protein. Our lab previously demonstrated topical and intradermal gentamicin promoted PTC read-through and restored functional C7 and AF in the dermal-epidermal junctions (DEJ) of RDEB patients. However, these forms of administration are less viable for covering the complete surface area of the skin and do not address the mucocutaneous manifestations of the disease.

Methods: In this study, four RDEB patients with nonsense mutations were infused with 7.5 mg/kg intravenous (IV) gentamicin daily for two weeks. Patients were clinically characterized prior to treatment, and multiple Test Sites of intact skin and open wounds were selected. Skin biopsies and standardized photographs for wound measurement were obtained at these sites before, at one month, and at three months post-treatment. Response to treatment was also evaluated through patient diaries and weekly questionnaires.

Results: Post-treatment, biopsies confirmed the expression of novel C7 varying between 40-90% of normal human skin with proper localization of AFs in the DEJ. The presence of C7 persisted for at least 3 months. Furthermore, IV gentamicin clinically benefitted our patients, enhancing wound closure, reducing new blister formation, and correcting dermal-epidermal separation. Unwanted side effects from therapy were not observed.

Conclusion: Administration of IV gentamicin in RDEB patients with nonsense *COL7A1* mutations created new and functional C7 and AFs causing reversal of the characteristic histological and clinical disease phenotypes across multiple sites simultaneously.

**EMERGENCY
MEDICINE &
TRAUMA**

Effects of Diabetes Peer Support in a ED-based mHealth Intervention
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Department of Emergency Medicine, KSOM

Background: Text-based mobile health programs and peer support—defined as a person with experiential knowledge of diabetes (DM)—improve glycemic control & self-management in patients with DM. The Text-Med+FANS study will evaluate effects of a family member or friend as a supporter in an ED-based mHealth curriculum on clinical and psychosocial outcomes. In the present analysis, we focused on differences in intervention outcomes in patients with a supporter who also had DM vs patients whose supporter did not.

Methods: Patients received a text-message based diabetes (educational & motivational) curriculum. Supporters were randomly assigned to receive the supporter curriculum via text-messages or paper form. Both intervention groups were included in this analysis. We performed t-tests of 6-month change scores to evaluate for differences in HbA1c, self-efficacy (DES), quality of life (WHOQOL), social support (SSQ), supportive & non-supportive family behaviors, perceived need for DM specific support, received DM specific support & attitudes toward support—based on whether a patient’s supporter had DM or not.

Results: 76 patients were enrolled, 16 with a supporter who had diabetes. 61% of patients were female, 67% of patients preferred Spanish language & the mean baseline HbA1c was 10.67. Patients with a supporter with DM (relative to patients with supporter without DM) improved in tangible support (SSQ-tangible, $p=.01$). There was a trend towards improvements in self-efficacy ($p=.052$) & quality of life (QOL; $p=.09$). All patients had improved HbA1c (-1.47 , $p<0.001$), self-efficacy ($p=.03$), QOL ($p=.02$) & need for DM specific support ($p=.01$)

Conclusion: All patients exhibited improved glycemic control, quality of life, self-efficacy & less DM specific support need. A supporter with DM may benefit patients’ self-care via improved self-efficacy, tangible social support & quality of life.

**Using Mobile Health to Improve Diabetes Management in
Emergency Department Patients**

Alex Chang, Dr. Elizabeth Burner, Department of Emergency Medicine, KSOM

Background: Mobile health (mHealth) offers a low-cost method to increase healthy behaviors among patients with diabetes. In this study, we examine whether social support-augmented mHealth (TEXT-MED+FANS (TEXT-MED+Friends And Family Supporters)) increases diabetes self-care activities compared to minimally augmented social support (TEXT-MED) in ED patients with poorly controlled diabetes after 6 months.

Methods: We recruited ED patients with $HbA1C \geq 8.5$ and a text-capable mobile phone. Patients selected a relative or friend to be their social supporter. All patients received TEXT-MED, a mHealth program for patients with diabetes consisting of educational and healthy lifestyle challenge text messages. Supporters were then randomized to receive a curriculum (FANS) of social support text messages or the same FANS curriculum in paper form (control). The outcomes measured were change in self-report of diabetes self-care activities (SDSCA) and medication adherence (Wilson 3-Item Scale).

Results: Of 98 patients enrolled, 66 had follow-up data for analysis. Overall, all patients improved in days of healthy eating (mean increase 1.4 days, $SD=2.8$, $p=.001$), diet plan adherence ($+0.74$ days, $SD=2.0$, $p=.004$), footcare ($+1.6$ days, $SD=2.8$, $p=.0001$), and

medication adherence (13.0 percentile increase, $p=.002$). Compared to control, TExT-MED+FANS did not significantly improve self-care behaviors but show a trend toward improvement in days of healthy eating (+0.91 days in FANS versus 0.59 control) and exercise (+0.25 days versus +1.14).

Conclusion: TExT-MED patient intervention improved healthy eating, diet adherence, footcare, and medication adherence for all patients. While increased social support offered via TExT-MED+FANS did not result in statistically significant change in self-care, there were observed increases in healthy eating and exercise. mHealth can engage patients in healthy diabetes behavior and may have an even greater effect when involving loved ones.

Expanding access to treatment for opioid use disorders, leveraging electronic medical records for success of ED quick start buprenorphine

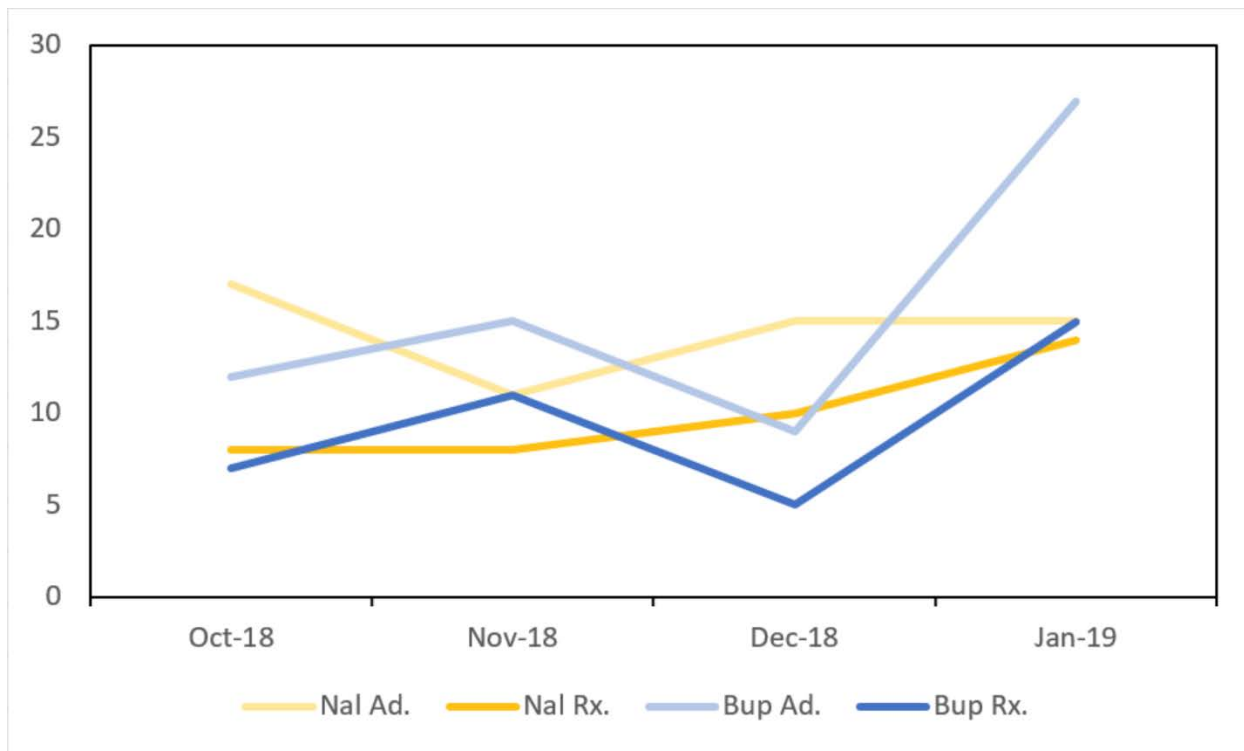
Benjamin Corona, Medical Student; Elias Bench, MD; Rebecca Trotzky-Sirr, MD

Goal/Background: Opioid dependence has become an increasingly alarming epidemic in the United States in the past decade. Medication Assisted Therapy (MAT) is a model that helps patients with opioid use disorders by substituting dangerous opioids with safer medications. One example is buprenorphine which is a partial opioid agonist that can be used as a treatment for acute and chronic pain, opioid withdrawal, and maintenance of patients with opioid use disorders. While buprenorphine can be administered in a hospital setting without any additional training, prescription of the medication requires acquiring a buprenorphine-(X)-waiver. With recent efforts at LAC+USC to increase the number of X-waivered providers, this study hopes to investigate changes in buprenorphine prescribing trends for patients with opioid use disorders.

Methods: A monthly Power Insight form pulls data from the ORCHID electronic medical record to follow patients who visited LAC+USC and were: given a dose or prescription of naloxone, given a dose or prescription of buprenorphine, and/or had an ICD-10 code relating to an opioid use disorder. Following identification of these patients, trends are analyzed to determine changing trends in buprenorphine prescription and identify potential gaps in care.

Results: Records have been drawn monthly since October 2018. Initial results show an increase in buprenorphine administration and prescription in January 2019.

Summary/Conclusion: This study is still in its infancy, but we hope to gain more insight the prescribing and administration of MAT for patients at LAC+USC with opioid use disorders to improve the quality of care they receive.



Romantic Partner Support Does Not Uniquely Improve A1c Level in Diabetes Intervention
 Travis Eurick BS, Elizabeth Burner MD, Dept. of Emergency Medicine, USC KSOM

Purpose: Previous studies have shown that implementation of a text messaging program (TE_xT-MED+FANS) improved various measures of diabetes health maintenance including hemoglobin A1c, weight loss, disease perception, and lifestyle choices. Moreover, TE_xT-MED+FANS has been shown to be even more effective when a social supporter was enrolled into the program alongside the patient. Our study sought to determine whether this effect was greater when a romantic partner was enrolled as a social supporter when compared to a non-romantic supporter.

Methods: Patients in the LAC-USC ED with hemoglobin A1c levels of 8.5 and higher were enrolled into the study along with a spouse/significant other (n=27) or a non-romantic provider of social support (n=48). Each patient was enrolled into a text messaging program offering suggestions for lifestyle changes to improve diabetes management (3 texts per day for 6 months). Half of the supporters received the same text messages as the patients, while the other half of the supporters were given a one-time informational pamphlet. Patient hemoglobin A1c, height, weight, and blood pressure, were taken at enrollment and at 6 months (m).

Results: After 6 months, patients who enrolled a non-romantic supporter saw a mean A1c decrease of 1.61% (\pm 0.35) while patients who enrolled a romantic supporter decreased their mean A1c by 1.20% (\pm 0.52). This difference was not statistically significant (p=0.5006). Combined, all patients saw a mean decrease of 1.47% (\pm 0.29) in A1c over the 6 month period, which was statistically significant (p<0.0001).

Conclusions: This data provides further evidence that when combined with social support, text messaging programs like TE_xT-MED+FANS greatly improve clinical measures of diabetes management. Moreover, the data suggests that the nature of the social supporter's relationship with the patient does not significantly impact diabetes outcomes in this context.

Assessing Opioid Overdose Identification and Naloxone Administration by LAFD and LACoFD Paramedics

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Background: Paramedics may administer naloxone to reverse effects of opioid overdose including respiratory depression, pinpoint pupils, and decreased level of consciousness. However, bradypnea alone is a sensitive test for opioid toxicity and thus paramedics should not administer naloxone without this clinical sign. In this study, we evaluate naloxone administration by LAFD and LACoFD paramedics using respiratory rates ≤ 8 breaths/minute as criteria for appropriate usage.

Methods: Vital signs and medical interventions of every LAFD and LACoFD response in which naloxone was administered between June 2017 and July 2018 were collected from patient care report databases. The proportion of naloxone administrations with pre-administration respiratory rates ≤ 8 breaths/minute was calculated.

Results: A total of 3,896 responses in which naloxone was administered were identified, of which 1,169 (30.0%) were excluded as no pre-administration respiratory rates were recorded by paramedics. Of the remaining 2,727 responses, we found 986 (36.2%) naloxone administrations with pre-administration respiratory rates of ≤ 8 breaths/minute. The mean pre-administration respiratory rate of all 2,727 responses was 12 breaths/minute.

Conclusion: The majority of naloxone administrations by LAFD and LACoFD paramedics were for cases unlikely due to opioid overdose given the sensitivity of bradypnea for opioid toxicity.

Value of an Online Ultrasound Curriculum for the Ultrasound Learner **Stephen Matsuoka, MS2, KSOM;** Talib Omer, MD, Assistant Professor, Department of Emergency Medicine, KSOM

Background: Ultrasound education is a resource-intensive process that requires a high teacher to learner ratio and adequate hands-on training in order to develop proficiency. Pre-recorded lectures covering fundamental concepts could improve time- and cost-efficiency and allow instructors to focus on the development of hands-on skills.

Methods: Online learning modules consisting of video lectures and quizzes were developed to teach fundamental ultrasound concepts for 4th year medical students (n=64) and 1st and 2nd year emergency medicine residents (n=31) completing a 2 week emergency ultrasound rotation. Pre- and post-rotation assessments were given, using questions adapted from American College of Emergency Physicians (ACEP) guidelines on ultrasound. Learners' overall proficiency will be examined by analyzing the percentage of studies performed and interpreted correctly using data from QPath, an existing ultrasound workflow program. A survey is under development to obtain qualitative data on learners' perceived value of the online modules.

Results: Quality improvement data obtained for educational purposes shows a median 26.3% improvement on pre- and post-rotation assessments for students, and a 17.3% increase for residents. Further analysis will be performed to correlate these results with the number of online modules completed, and the percentage of imaging studies performed correctly. Qualitative data will be analyzed to examine learners' attitudes towards the online modules.

Summary: Online modules are an intriguing approach to maximize learners' proficiency during ultrasound training. Further analysis is needed to determine if they have a significant impact on learners' overall proficiency.

Role of Health Literacy in Mobile Health for ED Patients with Uncontrolled Diabetes

Christian Perez, Dr. Elizabeth Burner Department of Emergency Medicine LAC+USC

Background: Mhealth (mobile health) interventions have allowed EDs to aid patients in management of chronic diseases, like diabetes. We know that low health literacy (LHL) is associated with low self-efficacy and poor health outcomes, particularly in diabetes. In this study we evaluate the effects of health literacy on changes in self-efficacy in ED patients in a text-message intervention for uncontrolled diabetes.

Methods: Patients with uncontrolled diabetes ($HbA1C > 8.5$) and family members were enrolled in a mHealth intervention to improve social support and diabetes self-care. The Brief Health Literacy Screen (BHLS) was used to evaluate health literacy levels at enrollment. BHLS of ≥ 5 was categorized as high health literacy (HHL), while < 5 was categorized as LHL. Diabetes specific self efficacy was assessed at enrollment and 3-months using the Diabetes Empowerment Scale Short Form. We examined changes in self-efficacy based on baseline health literacy.

Results: 90 patients were enrolled with 3 month follow-up data available. Baseline HbA1C's ranged from 8.5%-15.5%, with a median (interquartile range) of 10.3% (9.4%-11.7 %). Patients were 54% female with ages ranging from 21-65 with a median of 47 years. 96% reported Latino ethnicity with 71% Spanish language preference. Of Spanish speakers, self-reported English proficiency was: 99% low proficiency; 1% high proficiency. Overall, self-efficacy trended toward improvement for all patients (overall mean increase from 30.9 to 33.7, $p = 0.0004$). Patients with LHL showed a trend toward greater change in self-efficacy vs. those with HHL at their 3 month follow up (LHL mean change in self efficacy: 4.3 vs. HHL mean change in health efficacy 1.9, $p = 0.089$).

Conclusions: In this study of ED patients with diabetes, all patients displayed increased self-efficacy; however LHL patients had slightly greater improvements than HHL patients. Mhealth may be particularly effective for patients with difficulty accessing medical information in more traditional formats.

Effects of Mobile Health with Social Support on Emergency Department Utilization by Patients with Diabetes

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Background: Mobile health (mHealth) - the use of mobile phones to provide medical care and education - offers a low-cost way to integrate a patient's family into their diabetes management. ED-based mHealth programs have reduced ED utilization, but none have involved a family or friend as a social supporter. Increasing social support has been shown to improve health outcomes, particularly in lifestyle-dependent conditions such as diabetes. In this study, we examine changes in healthcare utilization for ED patients using a mHealth tool designed to improve social support and diabetes self-care.

Methods: We recruited ED patients with $HbA1C \geq 8.5$ and a patient-designated supporter. All patients received TExT-MED, a mHealth program for patients with diabetes. Supporters were randomized to receive a curriculum of social support text messages or the same curriculum in pamphlet form (active control). We reviewed EMRs to determine the change in scheduled clinic

visits, Emergency Department/Urgent Care Center (ED/UCC) visits, and hospitalizations in the 6 months preceding and following first intervention text-message.

Results: Of 113 patients who completed the 6 month intervention, 112 had follow-up data for analysis. Overall, patients increased scheduled clinic visits (mean increase 1.4 visits, (95% CI 0.4 to 2.4 , $p < 0.001$)) and decreased ED/UCC visits (mean decrease -1.1 (95% CI -1.5 to -0.7, $p < 0.01$)). Compared to the active control, patients whose supporter received a text message curriculum did not significantly change healthcare utilization.

Conclusion: Overall, the TExT-MED intervention led to a significant decrease in ED or UCC utilization and increased scheduled clinic visits. This intervention directed patients towards less costly care venues. Through reducing the number of unplanned care visits for uncontrolled diabetes, mHealth can reduce costs to health care systems and hospitals, in addition to improving patients' health.

Characterization of the Rates of involuntary Holds in the State of California

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Background/Goal: Approximately 1 in 9 visits to the ED in the United States are due to mental health and substance use disorders, a rate that is increasing over time. A portion of patients seen for mental health-related issues is kept in the hospital under involuntary psychiatric holds. Involuntary holds, in theory, are implemented to reduce harm and ensure proper treatment of patients with mental health conditions. However, holds are often placed in a volatile, pre-hospital setting and in reality, patients may not represent a threat to others, self or be gravely disabled. In addition, the effectiveness of involuntary psychiatric holds in addressing the medical needs of psychiatrically-ill patients has yet to be evaluated. Thus, our goal is to characterize the trends in usage of involuntary holds within the child and adult population within the counties of California over time and identify key factors that impact their utilization.

Methods: Census counts and involuntary hold data per county ($n=57$) in California were collected and 10 representative counties were selected based on data availability and population. Trends of involuntary holds over a span of 10 years (2005-2016) were analyzed and linear and multivariable regression analyses were conducted for factors including per capita income, number of licensed hospital beds, unemployment rate and gender ratio.

Results: Gender ratio (M/F) explained 5.1% of the variability in rates of involuntary holds in the adult population ($p < 0.05$) but was statistically insignificant in the child population. Unemployment rate accounted for 5.9% of the variability in children ($p < 0.05$). A multivariate analysis of per capita income, unemployment rate and gender ratio showed that all three factors cumulatively accounted for 9.9% ($p < 0.05$) and 11.8% ($p < 0.05$) of the variability in the adult and child population, respectively.

Conclusions: These data demonstrate that the rate of involuntary holds may be impacted by unemployment, per capita income, and gender ratio. However, a large portion of the variability remains unexplained, suggesting the need to further evaluate other factors that may impact hold utilization.

FAMILY MEDICINE

Tobacco knowledge, opinions, and use among Mexican Healthcare Workers
Bianka Aguilar, Katia Gallegos, Jo Marie Reilly, Keck School of Medicine and the Mexican Social Security Institute

Goal: This project aims to characterize the use of various forms of tobacco, assess knowledge of tobacco regulation and opinions regarding the various forms of tobacco, in particular electronic and alternative forms of tobacco (ANDS) among healthcare workers in Cuernavaca, Mexico. We hypothesize that 1) the prevalence of ANDS use will be highest amongst younger populations (those less than 27), 2) ANDS users would have a history of traditional tobacco use, and 3) higher use of all tobacco products amongst participants that report psychosocial factors indicating a favorable perception of tobacco as well as increased exposure to marketing.

Methods: Data from Waves 1 - 3 of the Health Workers Cohort Study (HWCS) was used. The HWCS is an ongoing prospective cohort study that has had three major stages of measurement, which ranged from 2004-2018. A cross-sectional analysis was performed using data from the third wave of the HCWS (2016 - 2018). Participant's previous tobacco status collected during the first two waves was used to assess and compare current and previous tobacco use with knowledge of tobacco regulation, opinions regarding tobacco, and exposure to marketing.

Results: The prevalence of traditional tobacco use was 11.48% while 49.82% reported a past history. Current and former ANDS use was .69% and 5.32% respectively. All current and former ANDS users reported traditional tobacco use. Age, reported psychosocial factors and marketing have a variable relationship with tobacco use.

Conclusions: Currently, there is little known about the health impact of alternative tobacco products or the extent of its use. While Mexico has banned the sales and marketing of some ANDS products, most notably e-cigarettes, these products are still largely available to the population. In order to fully and effectively address the public health impact of tobacco, it is important to characterize the use of tobacco products and associated psychosocial factors.

Navigating Healthcare for the Homeless: Health Policy Pilot Study

Michelle Armendariz, Research Mentor: Dr. Jo Marie Reilly

Goal: Without proper housing and social supports, homeless individuals experience high rates of physical, mental, and substance use-related illness. In addition to the many barriers and morbidities faced for those in the homeless population, negative attitudes or a lack of understanding of the actual needs homeless individuals require can represent another barrier to adequate health-care and services. This pilot project seeks to assess the stated needs in the homeless population and perception of actual needs in the general population in Hollywood, LA to assess understanding of the homeless conditions, using a needs assessment survey. I hypothesized that there is a marked discrepancy between perceived and actual needs if accounting for this lack of knowledge of the homeless condition.

Methods: In partnership with the Center at Blessed Sacrament ("the Center"), a community-based homeless resource and wellness agency, this study will conduct a survey-based needs assessment with clients of the Center's homeless community as well as homeless individuals contacted during Outreach, a service to reach out to patients on the streets, to identify their unique health needs and barriers to accessing healthcare and services. Surveys will also be conducted with housed participants surveyed in Hollywood near the Center, collected in a similar manner to Outreach on the streets.

Results: Results pending. Expected results include a difference in responses between groups.

Conclusion: This data will be used to assess difference in responses, and the hope is that this can open up further discussion about negative effects of biases and lack of understanding of the homeless condition. This pilot study will also be assessed and used for further projects with the Center at Blessed Sacrament homeless services, specifically related to health policy.

Improving Patient Outcomes for Laser Tattoo Removal
Gabriella Blissett, BA, Jo Marie Reilly, MD

Background/ Purpose/ Goal/ Hypothesis: Currently, there is not a widely accepted approach among practitioners regarding standard treatment of care for tattoo removal. Factors that influence clinical judgement of laser removal of tattoos include tattoo quality, color of ink, location of tattoo, and patient's skin color. The aim of this research study is to use large scale data to inform best practices in tattoo removal.

The hypothesis of this study is that data will demonstrate how location, tattoo type, and pigment of skin influence the average number of treatments needed to successfully remove a tattoo without complications on darker skin pigments.

Methods: A retrospective cohort study was conducted. Homeboy Ya'Stuvo Tattoo Removal staff and students from Keck School of Medicine at USC entered medical histories for over 1300 individuals who came in for any number of treatments in 2016, 2017 and 2018. After all data were merged, patients receiving only one treatment were removed from the sample, leaving 988 patients with medical histories entered for analysis. Individuals with few treatments provide little information in regards to removing tattoos and were removed from analysis. The resulting sample included 580 individuals, 16% of the total number of patients with 5 or more treatments in 2016, 2017 and 2018.

Results: Demographic data of patients was collected from the sample of 580 individuals. 83% of patients are Hispanic or Latino. 44% of patients were female, 56% of patients were male. Data analyzing patients' skin color, tattoo complications, and number of treatments is still to be collected.

Summary/ Conclusion: The aim of this study is to determine how different factors and qualities of tattoos can be used to optimize laser tattoo removal and to provide clinicians with evidence based analysis to improve patient outcomes.

Interventions to Increase Breastfeeding Rates at a Federally Qualified Health Center
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Marlene Lopez, M.D. Candidate, David Geffen School of Medicine at UCLA

Background: Only 36% of six-month-old infants at Eisner Health are being exclusively breastfed which falls short of the WHO target of 50%. This quality improvement project set out to: assess the efficacy of the full-time lactation consultant, identify barriers to delivering lactation support, and develop interventions to increase the percentage of mothers maintaining exclusive breastfeeding through the first six months of their infant's life.

Methods: Nutrition information of three to six-month-old infants who had an encounter with the lactation consultant was compared with three to six month olds without an encounter. Additionally, participant observations and interviews with Eisner staff were conducted to identify areas of improvement. Lastly, we presented our observations and recommendations to the Eisner Senior Management team and incorporated their feedback throughout the report.

Results: Infants that have had more encounters with the lactation consultant were more likely to be breastfeeding at the next visit in a dose dependent manner. 43% of infants with no encounters were not breastfeeding at a subsequent visit compared to 27%, 14%, 20%, 10%,

and 0% in those that had one, two, three, four, and five encounters, respectively. Additionally, our observations and interviews evidenced that there exists a range of lactation support services across Eisner's sites however there isn't enough cross-talk between them to give mother and child the longitudinal lactation support they need. This report details the interventions we have designed to expand postnatal service delivery and increase continuity of care between the prenatal, birth, and postnatal periods.

Recommendations/Interventions:

1. Increase the number of lactation consultants.
2. Utilize a pre-signed breast pump prescription that was created and incorporated into the EHR.
3. Include referral for a one-on-one lactation consultant as a part of the hospital post-delivery order.
4. Standardize education given by the lactation consultant to provide anticipatory guidance to mothers.
5. Continue the development of a peer support group.

Assessment of Immigration Attorneys' Experience with Health Professionals in the Context of Medical Forensic Evaluations

Mark J. Phillips, MA, **Sarah Herrera**, Stephanie Navarro, Nadya Nee, Connie Paik, April Pei, Ivy Song, Lyndon Yu, Cynthia Willard, MD, MPH, Jehni Robinson, MD

Goal: Asylum applications that include a medical affidavit are three times more likely to be successful for a client obtaining asylum status. Although the value of these examination is clear, it is important to understand the obstacles immigration lawyers and their clients face when finding and utilizing these forensic medical evaluations. This study sought to identify and quantify the major challenges faced by LA-based immigration attorneys, in the context of recent immigration policy changes.

Methods: A survey targeted towards LA-based immigration attorneys, who have worked with at least one asylum-seeking client. Survey, using Qualtrics platform, contains 6 demographic questions, 23 five-point Likert scale items, 2 ranking items, 1 multi-select item, and 2 short answer questions.

Results: Analysis of 14 survey responses highlighted the following major challenges: volunteer clinicians lack forensic evaluation experience; volunteer clinicians use extraneous information during affidavit writing which contradicts previous accounts; lack of available clinicians to perform psychological exams.

Conclusions: The data gathered showed that attorneys working with asylum-seeking clients value clinicians who are experienced in performing medical forensic exams, especially those proficient in the client's language. Language of affidavit reports was noted to be especially significant to the attorney, which is an area noted for improvement when training future volunteer clinicians.

The Impact of Tattoo History on Laser Tattoo Removal Outcomes in Former Gang and Inmate Populations: A Retrospective Study

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Background: Gang and prison tattoos dramatically impact the opportunities of ex-prison inmates and ex-gang members to re-integrate into society, get meaningful employment, and live

safely after they leave gang and prison life. Laser tattoo removal is often the first step for this population to re-integrate and is a crucial aspect of their safety. Ineffective treatment and complications such as scarring and dyspigmentation pose a unique threat to this population. Visible traces of ineffective tattoo removal may implicate their safety in the community in addition to their impact on the individual's psychosocial well-being and employment. Therefore, optimization of the laser tattoo removal process may help protect and support this vulnerable population. There is a paucity in the literature describing tattoo history and its impact on the success of the removal process and subsequent complications such as scarring, keloid formation and hyper or hypopigmentation. These factors include skin color, tattoo color, type of ink, body location, and laser settings. We aim to determine the effect of tattoo history on laser tattoo removal outcomes in former gang and inmate populations.

Methods: This respective study was conducted at Homeboy Industries (HB), a non-profit organization that offers no-cost tattoo removal services in addition to other resources for employment and re-integration for former gang members and inmates. A review of 988 Homeboy's Tattoo Removal patient charts from January 2016 to December 2017 was conducted. Patient demographics, tattoo history, treatment data, and treatment complications were recorded. Tattoo history and treatment variables will be compared with tattoo removal outcomes using a two-tailed two-sample unequal variances t-test.

Results: Of the 988 patient charts reviewed, 19 were excluded due to missing demographic information. Individuals with few treatments provided little information in regard to removing tattoos, thus we excluded all patients who had fewer than five treatments. Patients who reported having prior keloids, blisters or a skin rash, and currently receiving cancer treatments were also removed from the final sample, accounting for only a small number of patients. The resulting sample included 580 individuals, 16% of the total number of patients with 5 or more treatments in 2016, 2017 and 2018. *Tattoo treatment data are currently being entered into the database.

Conclusion: Optimizing laser tattoo removal outcomes plays an important role in patient safety, well-being, and re-integration for former gang and inmate populations. Tattoo history and treatment settings may impact laser tattoo removal success rate. Skin color, tattoo color, type of ink, body location, and laser settings should be considered for effective laser tattoo removal and to reduce the risk for scarring, keloids, and dyspigmentation.

Characterization of Older Adults at a Primary Care Comprehensive Clinic

Krystle Irvine, BS; Bonnie Olsen, Ph.D., Keck School of Medicine, Department of Family Medicine

Background: The Geriatric Assessment Program (GAP) Clinic is a comprehensive primary care clinic at Keck Medical Center where patients are seen by an interprofessional team in order to maximize their health potential as they age. The GAP clinic has seen approximately 200 patients in the past 2 years, and a cursory review of the demographics of the clinic reveals that there are approximately two female patients for every one male patient. Though females in the United States have a longer life expectancy than males, the 2010 Census shows that the female to male ratio for adults aged 65+ is 1.3 to 1. The goal of the study is to characterize the variety of patients seen at the GAP clinic and to explore factors why more females are seeking comprehensive care at the clinic. We hypothesize that female patients with a diagnosis of dementia will have a higher disease burden than male patients with dementia.

Methods: A structured retrospective chart review of all patients seen between January 1, 2016 and March 31, 2018 at the GAP Clinic was conducted. Only patients who had completed all three visits—home visit, clinic visit, and family conference—were included in the patient population. Patients without a complete Cognitive Abilities Screening Instrument (CASI) score were excluded. Basic demographic data was collected from 90 patients. Other data collected

includes CASI score, total number of medications, and a list of diagnoses needed in order to calculate the patients' Charlson Comorbidity Index (CCI). Statistical analysis will be performed with methods yet to be determined.

Results Data analysis is still ongoing. Based on previous studies of older adult patient populations, we expect female patients with dementia to have a higher disease burden than male patients with dementia.

Summary: We hope that once data analysis is complete, the results will be used to provide better care for the patients seen at the clinic and to increase access to care for potential patients.

Educational course to improve sleep and well-being in students at Bravo Medical Magnet High School

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Idea: An engaging and in-depth curriculum designed to educate high school students about the importance of sleep and help them improve their sleep habits.

Rationale: It is well established that adolescents require a certain amount of sleep to promote healthy growth, development, performance, and well-being. Despite this knowledge teenagers continue to get sub-optimal amounts of sleep on a regular basis. Homework, extracurricular activities, social influences, electronics, noise, and responsibilities at home impact adolescents' ability to get adequate sleep. Additionally, adolescents' circadian rhythms, controlled by the release of melatonin, are normally shifted approximately two hours later compared to what adults and younger children experience. This unique physiology makes it difficult for teens to adapt their sleep schedule to a "normal" school or work day and still get the recommended amount of sleep. Adolescent sleep researchers highlight the importance of sleep education to help teenagers understand and develop more healthy sleep behaviors. This study investigated whether an interactive after-school course and sleep journal project would improve high school freshmen's knowledge about sleep and help them learn and practice more healthy sleep habits.

Methods: A curriculum was designed and utilized to teach high school freshmen at Bravo Medical Magnet High School about topics including sleep physiology, the impacts of sleep and sleep deprivation on health, and behavior changes to help improve sleep. Subjects were recruited with help from school administration through their Health class which all freshmen are enrolled in. Selected students attended four 1-hour long classes held in a classroom at the high school after school hours. The classes were taught by the principal investigator and consisted of interactive lectures and discussion, as well as a 4-week sleep behavior change project and journal. The lectures were supplemented by the use of Kahoot!, a popular game-based learning platform that allows students to answer instructor's questions and contribute discussion points using their smart phones or computers. Pre- and post-course surveys recorded hours of sleep, bed times, and sleep-related knowledge. Journals created by the participants also elicited helpful information including nightly sleep hours, personal goals for sleep-related behavior changes, and challenges with sticking to these goals. PHQ-9 assessments were also utilized to measure student depression. Of the 29 students who were recruited, 18 (6 boys, 12 girls) completed all parts of the course and were included in statistical analysis. T-tests were used to analyze pre- to post-test change in mean test scores and in mean hours of sleep, and linear regression was used to determine the trendline of sleep hours over the course of the behavior-change project.

Results: By the conclusion of the course, students' performance on the post-survey demonstrated an overall improvement in their sleep knowledge ($p=0.003$). Total number of sleep hours trended upward over the course of the 4-week sleep behavior change project ($R^2=0.0045$). Homework was the most common barrier which prevented students from getting their desired amount of sleep, cited by 83% of students as a reason for not sleeping more. The two most common ways students were successful in getting to bed earlier were (1) by being more efficient with their homework throughout the day (37% of students), and (2) by reducing the use of technology prior to going to bed (37% of students). Both modalities were key teaching points. PHQ-9 scores trended downward over the course of the study. Subjects reported improvements in mood, tiredness, and energy, and less caffeine use.

Potential Impact: Educational intervention plus an interactive task may improve sleep and health in high school students. Getting more sleep can help students feel better and perform better at school because they will be better rested. Programs such as this will also highlight the specific barriers students face which prevent them from getting the sleep they need to achieve optimal health.

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The Effect of Group Lifestyle Intervention Program on Self Efficacy **Chiamaka Onwuzulike, Dr. Victoria Dunn**

Background: Feelings of self-efficacy are important to any stage of health maintenance - from prevention to chronic disease management. Successful health maintenance is often limited by patient lifestyle change. Because feelings of empowerment and self-efficacy are an important prerequisite to initiate and commit to change, this research is focused on investigating strategies that may increase patient self-efficacy. The purpose of this study is to assess whether group lifestyle intervention programs such as group exercise classes can successfully increase feelings of self-efficacy in participants and serve as an important adjunct to long term health maintenance.

Methods: Participants completed pre- and post-surveys that assessed quality of life (ability to do basic household chores, walk long distances, lift common items), comorbidity, and level of self-efficacy (how in control of their health they feel, how comfortable they feel making health related goals). Pre-survey results will be compared to post-survey results to determine the significance of class participation.

Results: Through participation in weekly exercise classes, participants will have a safe space to exercise regularly and will go home with additional information on exercises they can do on their own. Because of the dual exposure to regular practice and education, we expect that participants of the exercise classes will have an increased sense of self-efficacy after the completion of the program.

Conclusions: It is important that health care providers continue to investigate strategies that will increase patient self-efficacy in order to extend the reach of care beyond the provider setting. Considerations for future research may include longitudinal follow up to determine the long-term impact of participation on self-efficacy.

Factors associated with acute and overuse injuries in Oceanside Ironman 70.3 triathlon participants

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Goal: Triathlon is a sport with rising popularity in a variety of age groups. It has been noticed that there is a high prevalence of overuse injuries in the triathlete population, with studies finding anywhere from 37-87% of triathletes are suffering from an overuse injury. Our study will investigate the prevalence of overuse and non-overuse injuries, identify which injuries are most commonly seen, and investigate the difference in injury prevalence associated with various risk factors, all within the Oceanside Ironman 70.3 triathlete population.

Methods: We will be conducting a cross-sectional survey study at the race the weekend of April 5-7, 2019. When analyzing data, we will use our data set to characterize (1) the prevalence of different types of injuries in this triathlete population and (2) which risk factors are most highly associated with injury prevalence in this population.

Results: We predict that overuse injuries will be the most prevalent form of injury in this triathlete population, with 50% or more of our study population suffering from at least 1 overuse injury. We also predict that factors such as increased training volume, increased years of triathlon experience, history of previous injury, and inadequate warm-up/warm-down will have an association with injury prevalence. Because little or no research has been done on the association of nutrition, treatment methods, and life stressors with triathlete injury rates, we will provide insight on a relationship between these potential risk factors.

Conclusions: This study will not only help to advise physicians and the triathlete population in ways to reduce injury, but also help to prevent complications from long-term injury such as chronic pain, disability, and time required away from their sport.

Patterns of Use at a Community-Based Laser Tattoo Removal Clinic

Bing April Pei, Samantha Huang, Gabrielle Blissett, Nina Balac, Jessica Bogner, Jo Marie Reilly

Background/Purpose: Even as tattoo removal has become one of the top non-surgical cosmetic procedures performed in the United States, there remains limited understanding of who has a need for the service and for what reasons. Due to significant socioeconomic barriers to treatment, the few existing surveys on tattoo removal patients are not able to fully capture the depth and scope of community need for the procedure. This study will examine patient data

from the Ya’Stuvo tattoo removal clinic at Homeboy Industries, including demographic information, motivations for tattoo removal, and factors that influence adherence.

Methods: Demographic, medical, and treatment data from patients who received treatments in 2016-2018 were entered into an online database. Patients missing demographic data or receiving less than five treatments were excluded from the initial analysis.

Results: Of the 580 patients included in the final sample, the average age was 30, 56% were male, and the majority identified as Hispanic/Latino (83%) or Black (6%). 21% were on probation or parole, 7% lived in a recovery home, and 45% relied on public transportation or rides from others to travel to the clinic. The most common motivations given for tattoo removal were employment (64%), maturity (47%), readiness to change life (45%), and family (42%). Future analyses will compare patients who received at least 5 treatments to those who received less than 5 in order to identify potential barriers to adherence.

Summary: Data from this study differs significantly from existing surveys of tattoo removal patients. Patients at Y’Stuvo were more likely to be racial/ethnic minorities, have gang-related tattoos, and to report employment as a motivation for removal. There is also a relatively high rate of former incarceration and substance abuse. These findings suggest that individuals for whom tattoo removal is especially valuable – e.g. those for whom tattoos impede employment opportunities, put at risk for violence, and/or evoke psychological trauma – are also more likely to face barriers to access.

**Assessment of barriers immigration attorneys face
when pursuing medical forensic evaluations for asylum-seeking minors**
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Department of Family Medicine, KSOM

Background/Goal: Qualitative and quantitative assessments of challenges immigration attorneys face when seeking medical forensic examinations for asylum-seeking clients have indicated that there is a paucity of clinicians who are skilled to perform these examinations and that issues with the content and composition of the medical forensic reports mitigate their impact. Little is known about similar barriers that immigration attorneys face when seeking such evaluations for their child and adolescent asylum-seeking clients. This study seeks to investigate these barriers.

Methods: Study participants will be assessed via a modified Qualtrics survey originally used in a November 2018 KHRC pilot study. The study population includes Los Angeles-based immigration attorneys who have sought medical forensic evaluations for asylum-seeking minors, and who did not complete the November 2018 version of the survey. The survey comprises demographics questions, 27 5-point Likert-scale elements, 3 single-/multi-select elements, and 2 short-answer elements. Survey distribution will occur via the Los Angeles Legal Aid Foundation Asylum Collaborative email list.

Results: No survey responses have been recorded yet. Given the results of previous studies and observations in the field, we predict that >50% of survey respondents will either “strongly agree” or “somewhat agree” with the following: 1) there is a shortage of clinicians skilled in providing medical forensic evaluations for asylum-seeking minors; 2) asylum-seeking minors experience a greater frequency of detention without proof of age; and 3) there is a greater demand for psychological forensic evaluations and that this evaluation type is the most difficulty to acquire.

Conclusion: We predict that the data will indicate a relatively greater need for pediatric clinicians in the provision of medical forensic evaluations, that detention of asylum seekers

makes completion of such evaluations more difficult than for community-based asylum seekers, and that psychological trauma will predominate among asylum-seeking minors.

Implementation Evaluation of the new EDC Elder Mistreatment Screening and Response (EM-SAR) Tool

Tanksley B, Sivers-Teixeira T, Mosqueda L, Olsen B.

INTRODUCTION: The purpose of the study is to examine the feasibility of implementing proposed care model tools in the hospital emergency department to facilitate the identification and referral of older adults at risk of, or experiencing, elder mistreatment. Specifically, to understand how emergency departments might implement a prototype screening and response protocol designed specially for emergency departments.

OBJECTIVES: Elder mistreatment is a prevalent public health problem in the US that often is not recognized or addressed. Due in part to the lack of evidence-based screening and response protocols on elder mistreatment for emergency departments, most providers and staff rely on intuition and vague action plans.

METHODS: The "Elder Mistreatment Screening and Response tool" (EM-SAR), as part of a larger proposed elder mistreatment protocol, is planned to be universally administered in emergency departments to older adults. Three focus groups were held with eleven providers in the fields of emergency medicine, hospital administration, geriatric medicine, and public health, to determine support and feasibility of the protocol as it prepares to move into pilot phase in select emergency departments. At the completion of the focus group, online surveys were sent to the providers and forwarded to front-line staff, with quantitative and qualitative portions.

RESULTS: Responses from focus groups and surveys indicate a strong support for the EM-SAR tool in general, with particularly strong support for the short prescreen section, scoring 4.18 out of 5 (95% CI, 3.88-4.48). The areas with lowest confidence were those sections of the tool that required providers to make clinical judgements (Sections C, D, E), with the lowest scoring 3.06 out of 5 (95% CI, 2.49-3.63). All providers expressed qualitative concerns about the ability of Adult Protective Services (APS) to respond to an increased number of mistreatment reports, though also a strong desire and willingness to increase cross-training and cooperation. There was an apparent lack of clarity about the proposed staff training and which staff members would be administering the EM-SAR tool. Importantly, there was universal feedback that the tool would need to be integrated into the electronic medical records systems in order for any major implementation to be successful.

CONCLUSION: The EM-SAR tool received a strongly positive response, with feedback that will be incorporated to improve future staff training, with particular emphasis on the clinical judgement portions and staff education. In-person training on the tool likely outweighs the ease of electronic dissemination when introducing the protocol to emergency departments. Changes to the EM-SAR tool have been proposed as well, to expand response options. Involvement of local adult protective services (APS) in the training and implementation phases of the pilot sites would lead to a higher likelihood of success, and emergency departments are strongly supportive of creating integrative programs with APS.

Medication adherence among older adults living with HIV: motivations, barriers and strategies

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Background: 47% of Americans living with HIV are ages 50 and older (CDC). Because HIV therapy is a lifelong process, there is a need to study the various factors that influence medication adherence, and consequently, the maintenance of viral load suppression, a status linked to better health outcomes and decreased disease transmission.

Methods: 23 men ages 50+ living with HIV were recruited from a community based setting to participate in semi-structured 1-on-1 interviews. Afterwards, two independent researchers analyzed the verbatim interview transcripts via content coding and thematic analyses.

Results: Participants reported a range of reasons for maintaining their medication adherence, with the vast majority citing the avoidance of disease progression as a primary motivator. Other motivators included the desires of preserving a healthy appearance and maintaining family relationships. Common barriers to adherence included the adverse side effects of medications, forgetfulness, and decreased resilience. A few also reported alcohol use as an interference with their drug regimen. To facilitate adherence, a vast majority relied on the proper storage of their medications, as well as strategic timing of their dosages (e.g. during mornings or meal-times). Assistance from other persons, daily reminders, and the implementation of a daily routine were also common strategies.

Conclusions: By understanding the factors surrounding medication adherence, clinicians can support their patients in realizing their life goals, as well as enabling them to maximize the potential of their medical therapies. When initiating treatments, clinicians may use this knowledge to advise about the common barriers to adherence (e.g. adverse side effects) and provide assistive strategies (e.g. reminders via technology) to enable their patients to remain motivated and proactive within their own HIV care.

The Effectiveness of Community Nutrition and Diabetes Mellitus Education Classes on Student & Patient Learning

Joseph Yoo, MSII

Background: Although there are documented cases of peer-to-peer and medical professional education, there is little known in regards to medical students as teachers. Using pre-clinical students to educate patients about nutrition, exercise, and medication adherence may be an overlooked method to deliver patient education and simultaneously provide service learning for early student learners.

A recommendation for medical students to receive 25 hours of nutrition training by the end of their 4-year education was met by less than 40% of the U.S. medical schools in 2004. Utilizing a community-centered nutrition curriculum delivers much needed experience in both nutrition and patient education while simultaneously providing a community with knowledge to better self-manage chronic disease.

Methods: This study was conducted at the LAC-USC Wellness Center Kitchen, a space providing free 1.5 to 2 hour nutrition courses and cooking demonstrations to the community alongside a bilingual chef. Trained first year medical students (n = 20-24) with family physician faculty, taught 10 courses¹ per academic semester, culminating in a "Diabetes Day". Students were assigned bilingual lessons on diabetes mellitus, nutrition, and exercise to class participants (n= 25-40 per class).

Students and community participants are given a post-session survey to determine the effectiveness of the lessons for both student and participant learning. Students to see their self-

perceived ability to lead a course and knowledge about nutrition, and patients for self-perceived nutrition knowledge and anticipated behavior changes.

This retrospective study analyzes 3 years of qualitative student and participant data to assess patients' nutrition knowledge change and medical student skills in delivering culturally appropriate nutritional education to patients.

Results: Pending

Conclusion: Based on preliminary analyses students and participants deemed the lessons valuable.

1 Courses are as follows: "My Plate", "Protein", "Fats", "Carbohydrates", "Fruits & Vegetables", "Sugary Beverages", "Portions", "Healthy Snacks", Food Labels", "Hemoglobin A1c and Cholesterol", "Diabetes Day".

Patient Preference for Physician Racial Subgroup Concordance **Courtney Wills, Jo Marie Reilly, Dept. of Family Medicine, KSOM**

Background: Numerous studies in the literature have examined preferences for physician and patient racial group concordance. Fewer studies have examined preferences for physician-patient subracial group concordance, particularly among Black physicians and patients. In the United States, the Black population comes from all parts of the African diaspora. Generally, the major Black subgroups in the United States of America can be categorized ancestrally as African-American, Afro-Latino, African, and Afro-Caribbean. This study investigates the association between Black patients' self-described subgroup and their preference for a physician of a certain race or racial subgroup.

Methods: A 9-item survey was administered at a family healthcare clinic in the greater Los Angeles area. Respondees were asked to identify their own race and racial subgroup and then to respond with their preference for a physician to be of a certain race. If the respondees self-identified as Black or noted preference for a Black physician, they were asked to answer a more specific question about racial subgroup.

Results: The majority of the patients surveyed had no preference for the race or racial subgroup of their physician. However, 25% of the patient that self-identified as Black preferred a physician whose racial/ethnic subgroup matched their own self-described racial subgroup.

Summary/Conclusion: These findings are consistent with the original research hypothesis.

HEALTH, TECHNOLOGY & ENGINEERING

Opportunities for Reduction of Plastics Waste in Healthcare Facilities

John Hartzheim

Background: Plastic waste is a public health concern. As a major producer of plastic waste, healthcare facilities should be on the forefront of interventions to reduce plastic waste. Because disposable plastic products in healthcare have significantly improved infection control and reduced costs, these products are likely to be a permanent fixture in healthcare. However, previous studies have suggested significant volumes of unused disposable plastics are discarded. Furthermore, many uncontaminated recyclable plastics are not diverted to a recyclable waste stream and are instead incinerated or discarded in a landfill. Our goal is to map out the lifecycle of disposable plastics at a healthcare facility. We will identify opportunities to engineer solutions for meaningful reduction of plastic product consumption or increased diversion of recyclable plastics.

Methods: A schema of the lifecycle of disposable plastics at a healthcare / medical research facility will be constructed based on conversations with buyers, facility waste management directors, contracted waste management companies, and evaluation of available literature and data regarding volumes of plastic waste production by healthcare facilities. Working with waste management departments, metrics will be identified to evaluate sources of plastic waste within a facility. Finally, changes that could decrease use of disposable plastics or increase diversion to recyclable waste streams will be identified, focusing on improvements that can be aligned with concerns of key stakeholders.

Results: This study will identify several points in the lifecycle of disposable healthcare plastics at which a process change or innovation could reduce disposable plastic waste while aligning with values of administrative stakeholders.

Conclusion:

The data gathered by this study will serve as a foundation for development and implementation of a process or product to reduce disposable plastic waste produced by healthcare facilities.

Altering the skin microbiome: Reducing the foot ulcer risk in diabetic patients

Kevin Johansen, George Tolomiczenko, Terry Sanger

Background and goal: Diabetic foot ulcers and their sequelae directly result in a decrease in quality of life for patients, increase in their mortality, and cost healthcare systems around the world billions of dollars annually. The diabetic skin microbiome is significantly less diverse than the non-diabetic skin microbiome and diabetic ulcers contain little diversity with high levels of known pathogenic organisms. I aim to create product that will increase skin microbiome diversity.

Methods: I am working, in conjunction with experts in the field, on creating an easy to apply skin care product that will augment diverse bacterial growth. I am pursuing three potential product lines; a cream with bacterial growth factors, a cream with bacterial cultures and growth factors, and a cream with mainly bacterial cultures.

Results: I am still conducting a thorough literature review and meeting with experts in the field.

Summary: I am aiming to create a product that will increase diversity of the diabetic skin microbiome. It is my hope that this product can be used prophylactically on diabetic patients in order to reduce diabetic ulcers.

Improving Antireflux Surgery

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Background: Approximately 63 million adults in the United States exhibit gastroesophageal reflux disease (GERD) symptoms. Fundoplication is a surgery to treat GERD that involves altering the lower esophageal sphincter to prevent reflux of stomach acid into the esophagus. Based on research from multiple sources, alternating use of solid bougies and nasogastric tubes is standard operating procedure for most surgeons. This current method of operation is not only inefficient but adds additional risks for esophageal perforation and other complications. Fundoplication post-operative outcomes have remained consistent throughout the years; in particular, length of stay is 2.4 days on average, overall complication rate is 7.0%, and the mortality rate is approximately 0.13%.

Identified Need: Decrease both complication rate and operating time for patients receiving fundoplication surgery.

Methods: Our team first completed a patent search for previous inventions intended to solve our identified need. After reviewing several patents in the similar technology space, we saw the potential to design a novel device that would provide increased functionality. We designed a new medical device using computer aided design (CAD) software. An extensive literature review was completed to determine the US market for such a device. Though we determined there was a sufficient market, demand for fundoplication surgery is decreasing due to alternative treatment using proton pump inhibitors (PPIs).

Results: We are currently working with lawyers at USC Stevens Center for Innovation to file a provisional patent. After our intellectual property is protected, we may build a prototype or alternatively attempt to sell our design to licensing companies and/or medical device manufacturers.

Conclusion: Our device is best categorized as an incremental innovation, improving and expanding upon previous technology and methods. For right now we intend on marketing the device for the fundoplication market. Future outlook involves expanding our device for other surgeries, such as a gastric sleeve procedure.

Speech Therapy App for Children with Surgically Repaired Cleft Lip and Palates

Patrick Sammons, Eric Nagengast, George Tolomiczenko, William Magee III

Background: Every 3 minutes a child is born with a cleft lip or palate. This structural anomaly of the face results in a gap in the roof of the mouth or the upper lip and/or teeth. These malformations can range in severity and, if left surgically untreated, can severely impair the child's ability eat, drink and integrate socially.

Ideally, children with cleft are surgically treated before age 2, and subsequently receive the necessary speech therapy. In the developing world however, surgical intervention is often locally unattainable, and even if the child is able to have their cleft surgically repaired, there is a severe shortage of trained speech language pathologists. So although these children will grow up with a structurally normal face, their ability to speak and communicate can be severely impaired, leading to poor life outcomes.

We posit that this gap in care can be bridged with a mobile app that will make high quality speech therapy available to anyone with a supporting device.

Methods: Through our partnership with Operation Smile we have standardized our speech collection protocol and collected a range of speech samples. These samples are then fed into a machine learning algorithm created by our partners at Microsoft. After the generation of this central functional component of the app is fit into an intuitive interface, we will begin testing the design with cohorts of users. Upon validation of the tool, we will deploy it in select Operation Smile mission sites.

Conclusion: Though we are still in the early stages of development and testing, our key partnerships with Microsoft and the large network of speech pathologists associated with Operation Smile have incited early optimism in this project.

INTERNAL MEDICINE

Characterization of the CDK12 knockdown phenotype in prostate cancer

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Background: Recent genomic sequencing studies of metastatic prostate cancer have revealed an enrichment for mutations in CDK12, a cyclin-dependent kinase involved in the homologous recombination pathway of double-strand DNA break repair. Cancers with other defects in homologous recombination, such as BRCA1/2 mutations, show increased sensitivity to treatment with a class of drugs known as poly (ADP-ribose) polymerase (PARP) inhibitors and platinum-based chemotherapy. Additionally, other groups have reported that CDK12 mutations in ovarian cancer cells are associated with sensitivity to PARP inhibitors. The purpose of this study was to characterize the effects of CDK12 knockdown in prostate cancer cell lines in order to identify potential targeted therapies for CDK12-mutant prostate cancer.

Methods: Human prostate cancer cell lines (22Rv1, PC3, DU145, LNCaP) were stably transfected with lentiviral vectors designed to knock down CDK12 or a control construct. CDK12 expression was assessed by RT-PCR and Western blot. The effects of CDK12 knockdown on carboplatin sensitivity and olaparib sensitivity were assessed with an MTS growth assay and colony formation assay, respectively. Cell cycle analysis was performed on olaparib-treated cells using flow cytometry.

Results: Compared to control cells, CDK12 knockdown cells showed decreased survival upon treatment with carboplatin and decreased colony formation with olaparib. Cell cycle analysis studies are ongoing.

Conclusions: These results demonstrate increased sensitivity to olaparib and carboplatin in prostate cancer cell lines expressing lower levels of CDK12. These results suggest that CDK12 mutations in prostate cancer could be utilized as a marker for responsiveness to treatment with PARP inhibitors and platinum-based chemotherapy.

Nifty After Fifty

Brian Chung, Dr. Gabe Waterman, Dr. Michael Hochman, Gehr Family Center for Health System Science, KSOM

Background: CareMore Medical Group (CMG) is an integrated health plan and care delivery system specializing in frail elderly populations. Nifty After Fifty (NAF) offers CMG enrollees an innovative general fitness program with customized workout programs which cater to each patient's health and chronic conditions. In addition, NAF provides access to social events, group fitness classes, prescribed fitness programs for chronic diseases, computer-based exercises directed towards improving memory and cognition, and nutritional programs. This study seeks to compare changes in depression and loneliness scores between NAF patients and contemporaneous CMG patients who did not participate in NAF.

Methods: We used a quasi-experimental cohort approach to compare outcomes between CMG enrollees who chose to participate in NAF and CMG who did not. Patients eligible for study inclusion were a) mature adults (≥ 55 years old), b) insured by Medicaid, and c) capable of performing resistance training exercises. Patients were prescreened for inclusion criteria using data from the electronic medical record. In order to reduce selection bias, we utilized the Coarsened Exact Matching (CEM) model, basing our matches around patient Hierarchical Condition Category (HCC) scores. A difference-in-differences analysis was implemented to compare changes in depression (measured via PHQ-9) and loneliness scores between the experimental and control group.

Results: We hypothesize that there will be a larger increase in depression and loneliness scores for NAF patients when compared to contemporaneous CMG patients who did not participate in NAF. We expect this to be a dose-dependent response in which attending more NAF sessions produces a larger increase in scores.

Conclusion: Implementation of a therapeutic resistance-training program in the senior population can provide marked improvement in both physical and mental fitness. This improved state of functionality will result in significant healthcare cost savings from reduced hospital utilization by frail senior patients.

Empowering RN Care Managers in Complex Care: Best Practices from Successful Programs

Javier de la Rosa, Barbara Rubino, MD

Background: Complex Care Management (CCM) describes programs that seek to assist high-risk patients in adhering to treatment plans, coordinating medical and social services, and reducing the need for invasive and high-cost medical interventions. Typically headed by an RN Care Manager, such CCM programs vary in their scope, outcomes, and the actions required of the Care Manager. Currently, primary care clinics at LAC+USC Medical Center utilize a CCM program to care for such high-risk patients, however, the effectiveness of these practices have not been evaluated relative to exemplary medical centers. We hypothesize that diverse models and best practices around CCM in primary care settings exist both in the literature and in practice, and may be applicable to the LAC+USC Primary Care Clinics.

Methods: Through interviews and academic literature investigations, this research project will investigate practices that have evidence of success, with a focus on those that have been implemented by medical sites that produce exemplary patient outcomes. These practices will be compiled into a recommendation for best practices and submitted for consideration for implementation at LAC+USC primary care clinics.

Results: Data collection and analysis is still ongoing. However, preliminary findings suggest that successful programs included 1) standardized risk-stratification with use of scaled questionnaires (e.g. PMQ9, HEDIS, SPMSQ), 2) focusing on patients that are not too sick to benefit from intervention as measured by the above, 3) comprehensive initial evaluation and periodic reassessments, 4) timely notification of care setting transitions, and 5) patient coaching employing behavior-change techniques, among others.

Conclusion: Evaluation is ongoing but findings so far suggest that numerous opportunities exist for optimizing practices within LAC+USC primary care clinics CCM program through modeling successful practices at other medical centers.

State-of-the-Art Digital Biomarkers for Clinical Research Recruitment, Measures and Endpoints

Anjali Doshi, Leslie Saxon, M.D., Department of Medicine, KSOM

Introduction: For the first time, digital technology is being used in clinical trial research to recruit subjects, collect data, and establish new clinical endpoints. Digital clinical trials are uncharted territory, but offer the promise of accelerated and more diverse subject recruitment, continuous data collection, and earlier identification of new trial endpoints at reduced costs.

From a regulatory perspective, clinical trial conduct and data collection standards are immature for digital biomarkers.

Methods: We propose a research methodology where we will canvass, collate, and categorize the digital health ecosystem and identify issues related specifically to how the use of digital tools for clinical research differs from traditional research methods. This will include issues related to trial awareness, recruitment and consent, digital data collection and integrity, digital contract research organizations (CRO), regulatory and intellectual property (IP) considerations, and endpoint validation.

Results: Based on our qualitative analysis, we expect to identify areas in need of standard development for digital clinical trial recruitment, data collection, and endpoint validation.

Conclusions: Research involving digital biomarkers will require a comprehensive creation of validated methods of research conduct to realize the potential of more clinical trials, improved enrollment, and new discovery. With defined standards, patients, hospitals, traditional and non-traditional research organizations, and clinical scientists will embrace the opportunity.

Visualizing the Natural Killer and T Cell Response in the Multiple Myeloma Tumor Microenvironment with Imaging Mass Cytometry

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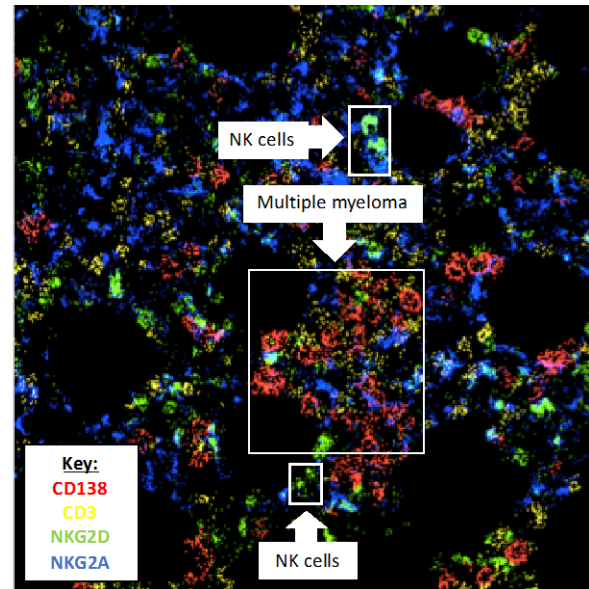
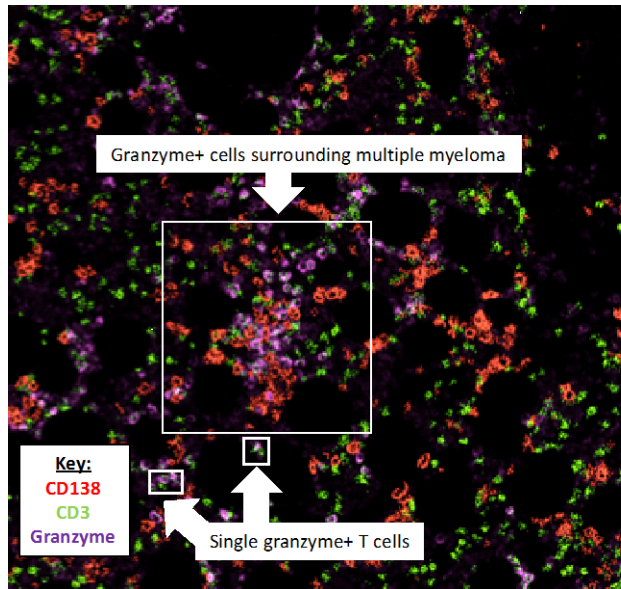
Goal: Multiple myeloma is an incurable cancer of uncontrolled plasma cell proliferation in the bone marrow. Reolysin, an oncolytic virus, has recently been used with bortezomib to induce natural killer (NK) and T cell activation in multiple myeloma patients. We are studying the activation and recruitment of NK and T cells in multiple myeloma bone marrow biopsies after Reolysin treatment using imaging mass cytometry (IMC), which allows for multiplexed immunophenotyping of up to 40 markers at a subcellular resolution in formalin-fixed paraffin-embedded (FFPE) tissue.

Methods: We selected a panel of 32 BSA-free antibodies to bind to multiple myeloma, T cells, NK cells, Reolysin, and other immune cells. After these antibodies were confirmed to bind to their targets on immunohistochemistry, we conjugated them to rare earth metals. The conjugated antibodies were then pooled together and used to stain FFPE tissues from patients enrolled in Reolysin clinical trials at LA County Hospital and Keck Hospital. The tissues were ionized on the Fluidigm Hyperion imaging mass cytometer, and the staining patterns was visualized with MCD Viewer. We plan to stain a total of 18 samples, with 8 paired samples before and after Reolysin treatment.

Results: Of the 32 antibodies that we selected, 25 of the antibodies exhibited positive staining on IMC, which we will analyze further. Our panel also allowed us to visualize various subsets of NK cells (activated and inhibited) and T cells (cytotoxic, helper, and regulatory), surrounding the multiple myeloma cells.

Conclusions: We visualized the tumor microenvironment in bone marrow using imaging mass cytometry for the first time. By thoroughly understanding the tumor immune environment, we can better understand the mechanism of diseases and treatments and eventually tailor patient treatment regimens based on their immune profiles and responses.

Images:



Demographic and Psychosocial Risk Factors Predictive of Recidivism Post Liver Transplant

Karousatos C, Wang Y, Frankel M, Willoughby A, Fong T-L

Background: Alcoholic liver disease (ALD) is one of the most common indications for orthotopic liver transplant (OLT) in the United States and Europe. Outcomes for patients with ALD who undergo OLT are excellent. However, patients with alcohol recidivism have significantly lower survival rates compared to patients who remain abstinent after OLT. Historically, most liver transplant programs require that patients abstain from alcohol for six months prior to transplant. This “six-month rule” has proved controversial, as there are no consistent studies showing length of abstinence to be associated with abstinence after OLT. Recently, several studies have reported the benefits of early OLT for patients with severe acute alcoholic hepatitis (AAH) who did not respond to corticosteroids. However, the disease acuity means that the six-month abstinence period cannot be fulfilled. The Keck Liver Transplant Program has also waived the six-month rule for some patients with AAH who do not respond to corticosteroids, though there are currently no consistent identified risk factors for recidivism.

Goal: To identify demographic and psychosocial variables predictive of alcoholic recidivism.

Methods: Five hundred twenty-five (525) patients underwent OLT from July 2012 through December 2017 at Keck Hospital. We conducted a retrospective chart review and identified 250 patients with alcoholic cirrhosis, AAH, or a history of drinking in quantities that exceed those defined as low risk for developing alcohol use disorder by the National Institute of Alcohol Abuse and Alcoholism.

Investigators were blinded to transplanted patients’ drinking habits (alcohol abstinence or recidivism) after OLT. Using electronic medical records, we identified a number of pre-transplant demographic, psycho-social, and clinical variables for examination. Post-transplant alcohol use was determined by patient interview and random testing for alcohol metabolites in clinic follow-up.

Results: Data analysis is ongoing.

Major Tissue Loss in Critical Limb Ischemia is Associated With Left Ventricular Systolic Dysfunction and Left Atrial Enlargement

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Division of Cardiovascular Medicine, University of Southern California, Los Angeles, CA

Abstract

This study explored the impact of left ventricular dysfunction in patients with Critical Limb Ischemia (CLI) and how understanding this relationship can improve perioperative care in CLI patients undergoing vascular surgery. Detailed evaluation of left ventricular function and outcomes of patients undergoing vascular surgery has not been previously described. What this study found was that left ventricular systolic and diastolic dysfunction is associated with major tissue loss (Rutherford class 6) and a larger atrial size compared to minor tissue loss and rest pain. These findings may be helping in reducing perioperative complications and future studies should look confirm these findings and assess clinical impact.

Exploring the relationship between sleep and insulin sensitivity in children born to mothers with gestational diabetes

Elioenai Morales, Eustace Chaofung Hsu PhD, Ana Marcela Romero, Kathleen Page MD

Purpose: The goal is to investigate the relationship between sleep and insulin sensitivity in children born to mothers with gestational diabetes mellitus (GDM), a group at high risk for type 2 diabetes (T2D). We hypothesize that shorter main sleep duration (MSD) in children is associated with lower insulin sensitivity, which augments risk for T2D. This work may lead to new strategies to help prevent the development of T2D in high-risk children.

Methods: Children ages 7 to 11 born to mothers with GDM or without GDM (control group) were included. Anthropometrics were measured and 3-hour oral glucose tolerance tests, in which blood samples were collected fasting and at 8 time points after oral glucose (1.75 g/kg body weight), were performed. Measures of plasma glucose and insulin were used to estimate insulin sensitivity using the Matsuda insulin sensitivity index (ISI). Children wore wrist accelerometers (ActiGraph model GT3x-BT) for 7 days to capture activity patterns in 60 second epochs, and parents filled out sleep logs. ActiGraph and sleep log data were analyzed to determine MSD. Two-sample t test and linear regression statistical analyses were performed.

Results: 29 children (18 boys; 11 girls; 14 GDM exposed; 15 controls) completed the study. Mean MSD was 486 minutes in the GDM-exposed group and 471.7 minutes in the control group ($t(43) = -1.173$, $p=0.25$). For the entire cohort, the correlation between MSD and Matsuda ISI was 0.31 ($p=0.10$). Linear regression showed a positive relationship between MSD and Matsuda ISI ($B(SE)=1.9(1.1)$, $p=0.10$), and this relationship remained after adjusting for child's sex, age, BMI, and waist:hip ratio ($B(SE) = 2.7(1.5)$, $p=0.10$).

Conclusion: These data indicate that more sleep may be associated with increased insulin sensitivity in children. Continued work on this project will yield a higher number of participants which will lead to testing the hypothesis specifically for the GDM- group.

Preoperative Functional Status and Risk of Adverse Outcomes Following Endovascular Repair for Abdominal Aortic Aneurysm.
Pradeep Nadeswaran

Endovascular aneurysm repair (EVAR) has been an important advancement in the procedural treatment of abdominal aortic aneurysms (AAA). The use of EVAR for AAA repair grew from 5% to 74% between 2000-2010. When compared to open repair of AAA, EVAR is associated with lower perioperative mortality, with 30-day mortality of 1.6% compared to 4.8% of open repair. The mortality benefit of EVAR is most pronounced for those deemed to be high-risk surgical candidates (4.7% mortality compared to 19.2% for open repair). It has been shown that preoperative functional status is a strong determinant of perioperative surgical complications and mortality. Thus, EVAR is the preferred, lower-risk procedure for patients with poorer preoperative functional status when compared to open repair. Although EVAR is a safer option for patients with poor functional status, the full impact of their poor functional status on outcomes is not fully understood. The Vascular Quality Initiative (VQI) database has characterized the pre-operative functional status for all recorded patients undergoing EVAR according to the Eastern Cooperative Oncology Group's (ECOG) definitions of performance status (full, light work, self-care, assisted care, and bed bound). The VQI Database is a large, well-characterized national registry and we seek to determine the association between ECOG-defined preoperative functional status and risk of adverse inpatient surgical outcomes, including mortality for patients undergoing EVAR for AAA. If an association is observed, then we will also determine how the presence of important individual comorbidities, such as cardiovascular disease, may mediate this relationship.

What Drives Healthcare Organizations to Address Social Determinants of Health?
Sneha Panganamamula, Sonali Saluja, Rishi Manchanda, Diana Rios, Michael Hochman, Lauren Taylor

Background/Goal: There has been a growing trend in healthcare to shift the focus from point of service care delivery to addressing more upstream causes of adverse health outcomes. These upstream factors are collectively termed social determinants of health (SDH) and entail the contexts in which people grow up, live, eat, work, and live their lives. Little is known about elements that are driving healthcare organizations to address social needs. The goal of this study was to determine the key forces that are motivating organizations to prioritize specific SDH.

Methods: We conducted qualitative phone interviews, using a standardized interview guide, with three representatives each from four diverse healthcare organizations in California (health insurer, health care system, hospital association, and health care foundation). We generated a codebook using both inductive and deductive codes. We coded the transcripts using a software called Dedoose. The frequency and pattern of codes were analyzed to elicit themes around organizational drivers.

Results: We found internal and external drivers that encouraged healthcare organizations to select SDH priorities. External drivers include financial incentives, political and cultural environment, patient demographics, and results from community health needs assessments (CHNA) while internal drivers comprise organization mission and values as well as leadership. Of these factors, financial incentives and CHNA results were both the most frequently mentioned drivers as well as the drivers mentioned by the greatest number of organizations.

Conclusion/Discussion: This data suggests that certain factors carry more weight in incentivizing healthcare organizations to implement SDH programs. On a broader scale, this implies that policies may be more effective in promoting social needs initiatives within organizations when they involve key drivers like financial incentives and CHNA.

Examining Medical Students' Interest, Attitudes, and Knowledge in Health Systems Before and After a New Curriculum

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1. Keck School of Medicine at USC and Gehr Family Center of Health Systems Science

Introduction: Many medical students have limited exposure to health systems science (HSS) – a subject that includes topics like health policy and population health. Few studies have examined the impact of a specific HSS curriculum. Our research sought to determine changes in interest, attitudes, and knowledge towards HSS among students at Keck School of Medicine before and after a new curriculum.

Methods: Using a quasi-experimental design, we surveyed first-year students (MS1s) both before (N=116) and after (N=64) exposure to a faculty-designed HSS curriculum - and compared them to a control group of third-year students (MS3s) (N=153) who did not receive prior HSS curriculum. We developed survey questions to assess knowledge based on the curriculum and included questions on interest and attitudes towards HSS topics. We compared changes in the scores on questions related to interest, attitudes, and knowledge between the three groups using two-sample t-tests and chi-squared tests. Lastly, we examined the association between scoring high on HSS knowledge and demonstrating a high interest in HSS or strong attitudes towards health policies.

Results: MS1s demonstrated a 16.0% increase in HSS knowledge after implementation of the curriculum (P<0.001). Self-reported interest in HSS was high (90.0%) in MS1s before the curriculum and remained high (87.5%) afterwards. However, significantly fewer (71.9%) MS3s were interested in HSS subjects compared to MS1s pre-curriculum (P<0.001). Students that scored higher on the HSS knowledge questions were more likely to be interested in HSS subjects (OR: 13.0, 95% CI: 1.7-97.1) and were more likely to have strong attitudes (OR: 7.7, 95% CI: 1.8-33.0) towards HSS policies.

Discussion: The implementation of a longitudinal curriculum increased HSS knowledge of medical students. We also found a strong positive correlation between knowledge levels and interest and attitudes regarding health systems.

Comparison of Basic Natriuretic Peptide and Pulmonary Artery Pressures in Patients with Congestive Heart Failure

Catherine Song, Jeffrey Tran, David Shavelle

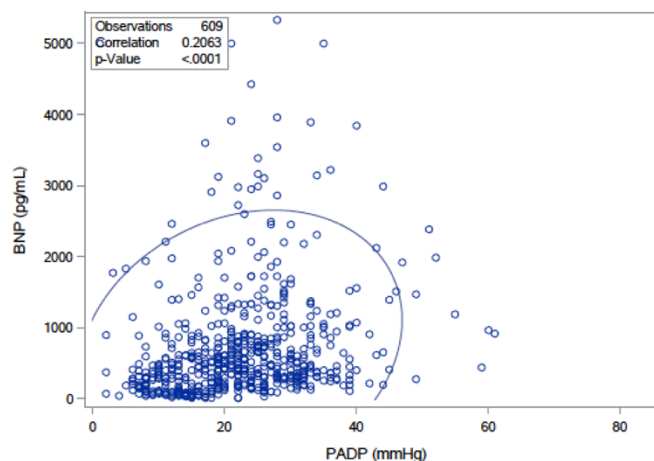
Background: Basic Natriuretic Peptide (BNP) is an established biomarker used in the management of patients with heart failure (HF). Remote hemodynamic monitoring of pulmonary artery pressure offers a continuous, non-invasive method to monitor HF patients and has been shown to reduce future HF hospitalization rates. The goal of this study was to compare these 2 methods of monitoring volume status in patients with advanced HF.

Methods: This was a single-center, retrospective cohort study of 121 NYHA class III patients implanted with the CardioMEMS™ HF system for clinical indications. BNP measurements were compared to pulmonary diastolic artery pressure (PADP), with both measures obtained within 24 hours of each other. Patients with less than 3 paired measurements and measurements taken while patients were receiving sacubitril/valsartan were excluded, yielding 49 patients with 609 paired PADP and BNP measurements. BNP value > 200 pg/mL and PADP > 20 mm Hg were considered elevated. Pearson correlation coefficient and fixed effects regression were applied for statistical analysis.

Results: Mean age was 64±16 years, 38 (78%) were male and 38 (78%) had HF with reduced ejection fraction. One hundred fifty-three (25%) paired measures fell into the category of elevated BNP and low PADP and 41 (6.7%) fell into the category of low BNP and elevated PADP. Pearson correlation analysis showed a statistically significant correlation between BNP and PADP (PCC: 0.21, 95% CI: (0.13, 0.28), p<0.0001). Fixed effects regression analysis showed a statistically significant, positive association between BNP and PAP (β :19.2, 95% CI: (4.8, 33.5), p=0.01).

Conclusions: Basic natriuretic peptide and pulmonary artery diastolic pressures appear to be associated in patients with advanced heart failure.

Figure 1. Scatter plot with 95% prediction ellipse showing correlation between BNP vs. PADP for the entire cohort.



Pathological characterization of lupus nephritis in a predominately Mexican population in Western US

Gregory Stone, Nina Petrosyan, Hui Yi Shan, Department of Nephrology, KSOM

Background: About 50% of those with systemic lupus erythematosus develop lupus nephritis (LN), of whom ~10% progress to end stage renal disease despite treatment. Geographic and ethnic differences exist in the prevalence and severity of LN. Environmental and genetic factors are thought to contribute to this variation. To better understand the heterozygosity of LN, and to identify those requiring early screening, it is imperative to describe LN in various populations. This study serves to characterize the pathology of LN in a primarily Mexican population in Los Angeles, California.

Methods: A retrospective review of all native kidney biopsies from patients >18 years of age at LAC+USC Medical Center from 2008-2018 was performed. Demographic information, serologic information at biopsy, class of LN, and the extent of tubular atrophy and interstitial fibrosis were collected for those with LN.

Results: We identified 127 patients with LN. 40 (31.5%) were Hispanic, 47 (37.0%) White, 15 (11.8%) Asian/Asian American, 14 (11.0%) Black/African American, and 11 (8.66%) non-reporting. The most common country of birth was Mexico (38.6%), followed by South/Central America (19.7%) and the US (10.2%), but 24.4% did not report. The median age at biopsy was 37 years (standard deviation (SD) = 11.3 years). The median serum creatinine (Cr) was 0.95 mg/dL (SD = 5.15), BUN was 25.0 mg/dL (SD = 22.2), and urine protein:Cr ratio was 3.80 (SD = 3.83). The most common LN class was Class IV (40.2%), followed by Class V (16.5%) and Class III + V (15.0%). Biopsy most often revealed mild tubular atrophy and interstitial fibrosis (47.2%), and no severe findings were reported.

Conclusions: This group has a more severe involvement of LN presenting at a median age of 37 years. The Cr at biopsy is lower than expected. The tubular atrophy and interstitial fibrosis are mild, but a wide range of classes of LN were noted. The group demonstrated hematuria and heavy proteinuria at biopsy. Early screening is advised in this high-risk group.

Association between *APOL1* genotype and end-stage renal disease risk in patients without diabetes: does age matter?

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Feng Lin, MS

Vito Campese, MD

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Elaine Ku, MD MAS

Background: Presence of high-risk apolipoprotein L1 (*APOL1*) genotype has been shown to increase the risk of end stage renal disease (ESRD) among individuals of African ancestry. However, few studies have evaluated how age may modify the association between *APOL1* genotype and ESRD risk. Our objective was to determine if and when the effect of *APOL1* high-risk genotype on ESRD risk may attenuate with aging. We hypothesized that the strength of the association between *APOL1* high-risk genotype and ESRD risk would wane in a graded fashion with aging.

Methods: We performed a retrospective analysis of 682 participants with chronic kidney disease and *APOL1* genotyping available (157 with high-risk genotype) from the African American Study of Kidney Disease and Hypertension study. Follow-up for ESRD events was performed through linkage to the United States Renal Data System through June 2012. We tested for the presence of effect modification between *APOL1* genotype with age (as a time-dependent covariate), categorizing age as above or below 50 years (the cohort's median age) and then varying age by 5-year increments or decrements and repeating tests for interaction in separate Cox models.

Results: We found a statistically significant interaction ($p < 0.05$) between high-risk *APOL1* genotype and ESRD up to 55 years of age. After age 55, there was no statistically significant interaction between age and *APOL1* genotype on ESRD risk, suggesting that presence of *APOL1* genotype may be less important as a determinant of ESRD risk in individuals older than 55 years.

Conclusion: Our findings support our original hypothesis. These results may inform the continued debate surrounding *APOL1* screening and the importance of high-risk *APOL1* genotype on ESRD risk across the lifespan.

MEDICAL EDUCATION

The Bridge to Residency – A Pilot Flexible Elective for Fourth-Year Medical Students

Jeremy Aung, Julie Nyquist, PhD, Anne Vo, PhD, Department of Medical Education, Keck School of Medicine

Background: The shift from the fourth year of medical school to residency is a difficult transition in the course of becoming a physician. We posit that offering an elective course to fourth-year medical students that focuses on development of non-clinical skills that are essential for leadership, professionalism, and resilience while also offering students flexibility in their schedules to accommodate residency interviews will ease the challenges of this transition.

Methods: A sequential, mixed methods study was conducted involving data gathered from fourth-year medical students (n=26) who participated in the pilot course. Qualitative, thematic analysis was performed on stories students wrote about their efforts to apply course concepts. Stories were coded for its framing, event type(s) mentioned, and general theme using the constant comparison method. Descriptive, quantitative analysis was performed on scales used to measure students' mindfulness, growth, grit, and self-compassion.

Preliminary Results: Most stories reflected students' efforts to problem-solve a variety of challenging situations (see Figure 1) and the course concepts that were most useful in their attempts to maintain a positive attitude or treat the challenges as learning experiences (see Figure 2). Results of quantitative analyses are pending.

Conclusions: The preliminary data show promise that the flexible elective is able to help fourth-year medical students strengthen their essential non-clinical skills and better prepare them for the challenges of residency.

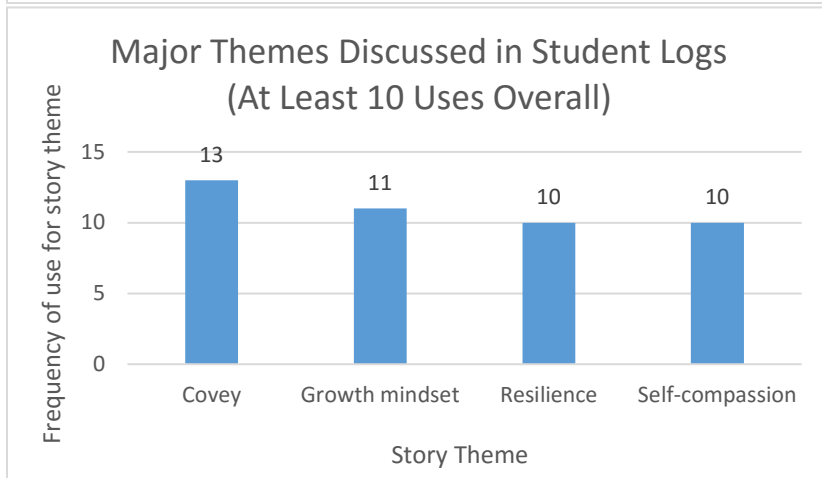
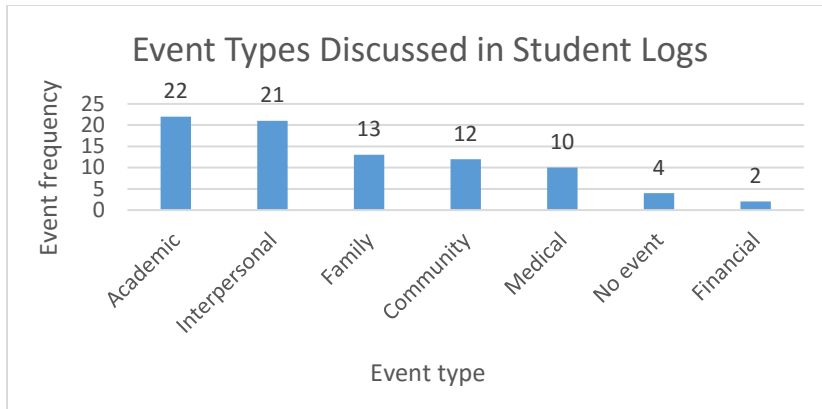


Figure 1. Types of challenges reflected in students’ stories.

Figure 2. Course concepts most frequently applied by students to overcome stated challenges.

Menstrual Hygiene Practices and Reproductive Tract Infections in Rural Southwestern Uganda

Karen Opara, M.S., William Cherniak, M.D., M.P.H., Iman Ahmad, Aaron Nepal

Background: Reproductive tract infections pose a significant threat to the health of populations in low income countries. There is a relative lack of research on the impact that menstrual hygiene practices (MHP) may have on RTIs. This study aims to identify common MHPs used among women in a rural community in southwestern Uganda, and investigate whether there is an association between menstrual hygiene and reproductive tract infections.

Methods: Phase 1 is a meta-analysis of current literature, conducted from January 2019 to April 2019. Phase 2 will be a prospective cohort study set for summer of 2020 in Kabale, Uganda. Women ages 18-49 will be recruited during a rural health outreach program, where communities will be selected through a population to size calculation. Participants will be engaged through a structured survey inquiring about their MHPs, among other socioeconomic and clinical indicators. These will be later analyzed to observe differences in rates of infection. Initial cohort will be followed for a 1-year period and tested every four months to assess for recurrent and new RTIs. This will later be analyzed to determine the subset of women most at risk for RTI as well as determination of the incidence and prevalence of RTIs in the region.

Results: Meta-analysis is in progress, however preliminary review of our literature suggests that there may be a positive association between unhygienic MHPs and infections of the reproductive tract. Hygienic MHPs include use of menstrual cups, tampons, and locally prepared napkins. Unhygienic MHPs include use of cloth, makeshift items such as leaves, or nothing at all.

Conclusions: We anticipate that in a low resource setting such as Kabale, there will be a higher frequency of use of unhygienic menstrual hygiene practices, and that these practices confer a higher risk of reproductive tract infections in the region.

NEUROLOGY

Post-Endovascular Criteria for Acute Ischemic Stroke Patients to Designated Stroke Center Hospitals

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Goal: “Variability in Criteria for Emergency Medical Services Routing of Acute Stroke Patients to Designated Stroke Center Hospitals” (Dimitrov et. Al.) characterized the stroke routing protocol of all the counties of California. The study looked at EMS agencies’ method for stroke identification and the criteria for transport to a stroke center. We obtained protocol and policy data from local emergency medical services agencies (LEMSA) and characterized change in routing protocol following the publishing of the AHA guidelines for stroke routing in 2015.

Methods: California LEMSAs policies and protocols were reviewed for stroke routing protocol, criteria for transport, stroke identification methods, and tiered routing.

Results: Since 2015, LEMSAs with stroke routing protocols increased from fifteen (45%) to twenty-four (73%). Coverage of the state’s population by stroke routing protocols increased from 68% to 90%. LEMSAs with protocols covered counties with higher population densities (1,600 vs 180 persons per square mile) which is unchanged from protocol coverage in 2015 (1,500 vs. 140 persons per square mile). Six (25%) of the twenty-four routing protocols included protocol for two-tiered routing to a primary stroke center or a comprehensive stroke center. The two-tier routing LEMSAs all used different large vessel occlusion screening tools (RACE, or county-specific protocol). All LEMSAs had a prehospital stroke identification method compared to 97% of LEMSAs in 2015. LEMSAs used Cincinnati Prehospital Stroke Screen/Face Arm Speech Time (57%), Los Angeles Prehospital Stroke Screen (15%), B.E.F.A.S.T. (12%), or county-specific protocol (15%).

Conclusion: California EMS prehospital acute stroke routing protocols now cover 90% of California’s population compared to 68% in 2015. The variation in parameters that determine stroke routing however, continue to demonstrate the differences in resources among the counties.

Investigating Exercise-induced Neuroplasticity and its Mechanisms in Parkinson’s Disease

Elbert Pu, Giselle Petzinger, MD

Goal: Prior studies have suggested that exercise intensity and fitness levels have been associated with improved cognitive function. However, relatively little is known about the role of fitness on cognition in individuals with Parkinson’s Disease (PD). The study aims to determine whether there is an association between exercise intensity with cognitive function and functional network connectivity in PD patients.

Methods: An 18 month long observational study will be performed, with assessments at 0, 9 and 18 month timepoints. Baseline fMRI scanning and assessment of patient cognitive performance, cardiovascular fitness, motor skill fitness, and balance will be performed at 0 months. Accelerometers, exercise log, sleep/mood logs will track activity in between visits. At the 9-month mark, cardiovascular fitness and balance will be re-assessed, and their exercise/sleep/mood logs reviewed. The 18-month timepoint will be identical to the 0-month timepoint.

Results: We are currently still enrolling patients and collecting data for the initial timepoint. We would expect that an association exists between exercise intensity, fitness, and level of cognitive performance in PD Patients.

Conclusions: While a conclusion cannot currently be made, elucidating the association between exercise, fitness and cognitive function in PD patients would suggest the possibility of using these factors as clinical indexes for better assessing risk of cognitive impairment in PD.

Film as a health communication tool in Hispanics to understand perceptions and attitudes in Multiple Sclerosis

**Kevyn Ramos-Laguna¹, Andrea Martinez, MPH ¹, Laura Gonzalez¹, Lilyana Amezcua, MD,MS¹
Department of Neurology¹, University of Southern California (USC) – Keck School of Medicine**

Goal: Low-income Hispanics with Multiple Sclerosis (MS) have a lack of adequate education available about treatment and resources for MS. Whether this reflects socioeconomic status or cultural barriers is unknown. By utilizing culturally tailored messaging that reflect relevant concerns and diverse beliefs we aim to effectively transmit important MS information.

Methods: Participants diagnosed with MS in the last 2 years will be randomly assigned to view a short film intervention. Those with greater disease duration will follow standard of care (verbal teaching of MS). The Brief Illness Perception Questionnaire (B-IPQ) and MS self-efficacy questionnaire (MSSE) are administered before viewing the film at month 0, immediately after viewing the film, and again at month 1 and 3 for those with short disease duration. For those with longer disease duration, questionnaires are administered at every time point (month 0, 1, and 3) before viewing the film during a focus group. Characteristics such as age, gender, onset, socioeconomic status, acculturation using the short acculturation Hispanic scale (SASH), Expanded Disability Status Scale (EDSS) and disease modifying therapies (DMT) will also be collected.

Results: Participants in our intervention group have shorter disease duration ($p=0.03$), are younger ($p<0.01$) and have a lower EDSS score ($p=0.05$). There are significant differences between groups in MSSE ($p<0.01$), where those with longer disease duration have less function and less control. There are no differences between groups in baseline B-IPQ scores or SASH. However, there are significant changes in mean B-IPQ scores across time ($p=0.02$); that of which is a composite of 8 domains (cognitive, emotional, understanding). We will explore each domain's trajectory.

Conclusions: The use of short film may promote self-care and condition perceptions about disease in those of Hispanic background. Our long-term goal is to eventually disseminate the film to MS centers across the US and develop new interventions addressing other important social and behavioral topics in this community.

NEUROSCIENCE & PHYSIOLOGY

Biodistribution of CAR-NK-92 MI cells in NOD scid IL-2R gamma^{null} (NSG) mice bearing CD19+ Raji tumors: a dose-escalation study using simultaneous PET/MRI imaging

Daniel Cohrs, Naomi S. Sta Maria, Leslie A. Khawli, Sharon W. Lin, Vyshnavi Pachipulusu, Long Zheng, Alan L. Epstein, and Russell E. Jacobs

Goal: Previous studies have demonstrated hepatic accumulation of adoptively transferred CAR-NK-92MI cells. Therefore, in the present dose-escalation biodistribution study, we set out to determine the relationship between injected dose and relative accumulation of immune cells in the liver vs. tumor and other organs. Ultimately, we hope our results will translate to improved immunotherapy dosing regimens.

Methods: We tracked [⁸⁹Zr]-oxinate₄ labeled CD19 CAR-NK- 92MI cells — injected at a dose of either 1e6 to 2e6 (N=4), 5.3e6 (N=1), or 17e6 (N=3) total cells — in NSG mice bearing CD19+ Raji tumors using simultaneous PET and MRI. Imaging was conducted with an MR Solutions 7 Tesla MRI scanner with PET insert at the USC Functional Biological Imaging Core. Subsequent to imaging, tumors and organs of interest were also dissected and their activity (expressed as % injected 1e⁶ cells per gram of tissue) was measured using the 2480 Wizard2® Automatic Gamma Counter at the USC Molecular Imaging Center.

Results: A lower injected dose led to less hepatic accumulation—quantified as a percentage of the injected dose per gram of tissue— at each time point, and an increasing proportion of the injected dose in tumor over the course of 5 days. Conversely, a higher cell dose resulted in initially (within the first 24 hours) greater tumoral and hepatic accumulation relative to other organs, but yielded a decreasing proportion of the injected dose in tumor over time, and an increased percentage of the injected dose per gram in liver at each time point.

Conclusion: This study demonstrates a clear dose-dependence concerning hepatic accumulation of adoptively transferred CAR-NK-92MI cells. However, a higher injected dose led to greater tumoral accumulation within the first 24 hours. We hope that both this study, and related subsequent studies by our team, will eventually contribute to the design of treatment regimens using adoptive cell therapies.

NEUROSURGERY

Predictors of endocrinological outcomes following endoscopic transsphenoidal surgery in patients with acromegaly: a single-surgeon series
Tyler Cardinal

Introduction: This study examined long-term endocrinological outcomes in 53 patients with acromegaly who underwent endoscopic endonasal transsphenoidal resection of a growth hormone secreting pituitary adenoma. The goal was to determine clinical and surgical predictors of endocrinological outcomes in this patient population.

Methods: A retrospectively collected single-surgeon database of patients operated on at LAC+USC Medical Center and Keck Hospital of USC was analyzed in this study. Endocrinological remission was defined as postoperative IGF-1 levels at or below the age- and sex-normalized value.

Results: The 53 patients had a mean clinical follow-up time of 9.5 ± 20.5 months and the majority (63%) achieved hormonal remission after endoscopic transsphenoidal resection alone. 43 (82%) of the tumors were macroadenomas and 10 (18%) were microadenomas. 31 (58%) were invasive tumors, with 22 (42%) exhibiting cavernous sinus invasion. Invasive tumors were significantly larger and gross total resection of the tumor was significantly less likely to be achieved. Extent of resection was found to be strongly predictive of hormonal remission, with 89% of patients who underwent GTR and 60% of patients who underwent STR exhibiting normalized IGF-1 levels. Preoperative IGF-1 levels negatively correlated with hormonal remission.

Conclusion: This study indicates that endoscopic transsphenoidal resection of growth hormone secreting pituitary adenomas is a safe and highly effective management for acromegaly. When combined with postoperative medical therapy, we observed endocrinological remission rates of 77% based on normalized IGF-1 levels. Smaller and less invasive tumors were significantly more likely to be fully resected, and patients with lower preoperative IGF-1 were significantly more likely to undergo postoperative biochemical remission.

Superior Sagittal Sinus Injury Simulation Model
Stephanie Chang

Introduction: Dural sinus injuries are potentially serious complications associated with acute blood loss during a craniotomy. It is imperative that neurosurgery trainees are able to recognize and manage this challenging scenario. We aim to assess the feasibility of a novel perfusion-based cadaveric simulation model to provide fundamentals of dural sinus repair to neurosurgical trainees.

Methods: Ten perfusion-based human cadaveric models are prepared to simulate a realistic operative experience deliberately complicated by a superior sagittal sinus (SSS) laceration. A craniotomy was performed to expose both sides of the SSS prior to intentional sinus injury in the context of perfusion at physiological blood pressure and flow. Residents were instructed to repair the injury utilizing a dural flap technique and standard packing material. A training video demonstrating the dural flap technique will be viewed at the conclusion of the first trial. The participant will subsequently repeat the trial, and answer pre and post demonstration confidence survey.

Results: The high-pressure extravasation of the perfusion-based cadaveric model mimicked similar conditions and challenges encountered during acute SSS injury. Residents developed the psychomotor skill set and decision-making abilities required to manage the laceration. Hemostasis was achieved in all cases utilizing suction, cotton compression devices, thrombotic material, and suturing of a dural flap across the SSS laceration. We are currently still recruiting for the study, and will complete a statistical analysis after 10 trials have been completed.

Conclusion: A perfusion-based human cadaveric model accurately simulates acute sinus injury and realistic human anatomy, affording neurosurgical trainees the opportunity to hone management skills in a simulated and realistic environment. As such, strategies for obtaining hemostasis can be practiced in an easily reproducible and reliable format.

Increased Complication and Mortality Among Non-Index Hospital Readmissions after Brain Tumor Resection is Driven by Hospital Volume

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Objective: Fragmentation of care following craniotomy for tumor is increasingly common with the regionalization of neurosurgery. Hospital readmission to a different hospital (non-index) from which patients received their original care (index) has been associated with increases in morbidity and mortality for cancer patients. We determined rates of non-index readmission following craniotomy for tumor, and evaluated outcomes following index and non-index readmission.

Methods: Retrospective analyses of patients who received surgical resection of a primary brain tumor were conducted using data from the Nationwide Readmissions Database (NRD) between 2010-2014. Multivariate logistic regression was used to evaluate the association of non-index vs. index hospital readmission with mortality and major complications during readmission. Effects of readmission hospital procedure volume on mortality and morbidity were evaluated in *post hoc* sensitivity analysis.

Results: Of 17,459 total unplanned readmissions, 84.4% patients were readmitted to index hospitals and 15.6% to non-index hospitals. Readmission to a non-index facility was associated with a 28% increase in major complication and 21% increase in mortality in initial analysis. Following sensitivity analysis, low procedure volume of readmitting facility was significantly associated with non-index readmission. Readmission to a lower procedure volume facility was associated with a 46%-75% increase in mortality and 21%-35% increase in major complications. Following adjustment for volume at readmitting facility, admission to non-index facility was no longer associated with mortality and major complication.

Conclusion: 15.6% of patient readmissions following brain tumor resection occur at a non-index facility. Low procedure volume is a confounder for non-index analysis, and is associated with an increased likelihood of major complications and mortality, as compared to readmission to high procedure volume hospitals.

Experimental Chronic Cerebral Hypoperfusion Results in Increased Blood-Brain Barrier Permeability

Krista Lamorie-Foote, Michelle Connor, Kristina Shkirkova, Arati Patel, Qinghai Liu, William J. Mack

Introduction: Chronic cerebral hypoperfusion (CCH) can lead to neuronal and small vessel white matter ischemic injury, resulting in neurocognitive decline. It is important to understand the processes that mediate this injury and the effects of hypoxia on the angioarchitecture of the brain. Our lab demonstrated blood-brain barrier (BBB) dysfunction and a decline in pericyte coverage in the corpus callosum of mice following CCH using histological analysis. The aim of

the present study is to further characterize BBB integrity using dynamic contrast enhanced (DCE)-MRI following murine experimental CCH secondary to bilateral carotid artery stenosis (BCAS).

Methods: Mice underwent either BCAS (n=6) or sham surgery (n=6). At days 1, 3, 7, 30 post-operatively, mice were scanned and DCE-MRI data was collected. DCE processing software was used for post-processing and the K_{trans} was calculated to measure BBB permeability.

Results: BBB permeability, measured by K_{trans} , in the corpus callosum was increased on postoperative days 1, 3, and 7, with a peak occurring on day 3 and recovery by day 30 in BCAS mice [day 3: 0.0013 min^{-1} , day 30: 0.0007 min^{-1}] compared to sham mice [day 3: 0.0006 min^{-1} , day 30: 0.0005 min^{-1}]. Similar trends were noted in the cortex, with increased BBB permeability on postoperative days 1, 3, and 7, with a peak on day 3 and recovery by day 30 in BCAS mice [day 3: 0.0013 min^{-1} , day 30: 0.0006 min^{-1}] compared to sham mice [day 3: 0.0005 min^{-1} , day 30: 0.0005 min^{-1}].

Conclusions: CCH secondary to BCAS temporally increases BBB permeability in the corpus callosum and cortex, with the greatest increase on postoperative day 3 and gradual recovery by day 30, corresponding to pericyte changes previously demonstrated. BBB dysfunction may contribute to the pathogenesis of neuronal and white matter injury in the setting of CCH.

Mapping of primary somatosensory cortex of the hand area using a high-density, small area electrocorticography grid for closed-loop brain computer interface

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Background: The ideal modality for generating percepts of sensation for use in a sensorimotor brain computer interfaces (BCI) has not been determined. Here we report the feasibility of using a high-density “mini”-electrocorticography (mECoG) grid in a somatosensory BCI system.

Methods: Thirteen subjects with intractable epilepsy (age 19 to 62) underwent implantation of subdural electrodes for the purpose of seizure localization and cortical mapping. In addition to standard clinical electrodes, a high-density, mECoG grid was also placed (Ad-tech, 8x8 2-mm contacts, 1.2-mm exposed, 3-mm center-to-center spacing) over the hand area of primary somatosensory cortex (S1). Following implantation, cortical mapping was performed with stimulation parameters of frequency: 50 Hz, pulse-width: 250micro-s, pulse duration: 4s, polarity: alternating, and current that ranged from 0.5mA to 15mA at the discretion of the epileptologist. Sensory percepts from electrical stimulation were recorded for location along with

a description of the sensation. The dermatomal regions of the hand were partitioned into 48 anatomically distinct boxes. A box was included if sensation was felt anywhere within the box.

Results: Mean percentage of the hand covered was 63.9% (SD 34.4%). Redundancy, measured as electrode pairs stimulating the same box, was 1.98 electrodes per box (SD 2.16); and resolution, measured as boxes per electrode pair was 11.44 (SD 13.67) with 8.08 boxes in the digits and 3.35 in the palm. Functional utility of the system was assessed by quantifying usable percepts. Under the strictest classification, non-overlapping percepts, an average of 2.2 usable percepts were found per grid. The least strict classification, “unique percepts”, found an average of 5.5 usable percepts per grid. No seizures were induced from stimulation in S1 and no adverse events occurred.

Conclusion: In comparison to the small area of coverage and redundancy of a microelectrode system, or the poor resolution of a standard ECoG grid, a mECoG is likely the best modality for a somatosensory BCI system with good coverage of the hand and minimal redundancy.

Characterization of lncRNAs Contributing to Temozolomide Resistance in Glioblastoma Multiforme

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Background: Glioblastoma multiforme (GBM) is the most common and deadly brain tumor. Despite intervention, GBM patients can expect to survive on average 15 months post-diagnosis, often attributed to the tumor developing resistance to chemotherapy. Long noncoding RNAs (lncRNAs) have recently been implicated in regulating a variety of cellular mechanisms. We sought to determine if a novel lncRNA, *Linc02454*, is implicated in GBM resistance to the first line chemotherapeutic temozolomide (TMZ).

Methods: For this study, GBM cell lines U87MG and U251MG were used. Stable knockdown of *Linc02454* was achieved using lentiviral transduction of a dCas9-BFP fused to a KRAB transcriptional repressor. Three unique gRNA constructs were generated for targeting the promoter region of *Linc02454*. Knockdown efficacy was measured using qRT-PCR. Cell viability and proliferation following treatment with TMZ was determined using MTT assay.

Results: Treatment with 250uM TMZ for 72 hours caused *Linc02454* to be upregulated by 8x in U87MG and 6x in U251MG compared to control. 90% knockdown of *Linc02454* was achieved with no significant change in proliferation rate or cell morphology. Cell viability studies however did not demonstrate a marked change in the susceptibility of *Linc02454* deficient cells to TMZ at varying concentrations and time.

Conclusion: We have demonstrated that TMZ treatment of GBM cells significantly induces the expression of *Linc02454* but was unable to sensitize the cells to TMZ following repression. It may be possible that we have not achieved a high enough degree of repression in order to elicit a phenotype, or that U87MG and U251MG have become sensitized to TMZ through an alternative pathway, thereby hiding any effect. Given that TMZ induces expression of *Linc02454*, we plan to expand the study in order to cover the variance between different GBM cell lines.

Comparison of Intraoperative 3D Fluoroscopy with Standard CT for Stereotactic Frame Registration

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Background: 3D fluoroscopy via the O-arm (Medtronic, Minneapolis, Minnesota) has been validated for intraoperative confirmation of successful lead placement in stereotactic electrode implantation. However, its role in registration and targeting has not yet been studied. After frame placement, many stereotactic neurosurgeons obtain a CT scan and merge it with a preoperative MRI scan to generate planning coordinates; potential disadvantages of this practice include increased procedure time and limited scanner availability. This study seeks to evaluate whether the second-generation O-arm (O2) can be used in lieu of a traditional CT scan to obtain accurate frame registration scans.

Methods: In seven patients, a post-frame placement CT scan was merged with preoperative MRI and used to generate lead implantation coordinates. After implantation, the fiducial box was again placed on the patient to obtain an O2 confirmation scan. Absolute value, signed, and Euclidean differences between analogous X, Y, and Z coordinates from fused O2/MRI and CT/MRI scans were calculated for 33 electrodes.

Results: Single sample, two-tailed t-tests revealed mean vector differences ($X=0.146\pm 0.086\text{mm}$, $p=.002$; $Y=0.306\pm 0.116\text{mm}$, $p<.001$; $Z=-0.340\pm 0.288\text{mm}$, $p=.03$), scalar differences ($X=0.236\pm 0.057\text{mm}$, $p<.001$; $Y=0.361\pm 0.095\text{mm}$, $p<.001$; $Z=0.727\pm 0.182\text{mm}$, $p<.001$), and Euclidean difference ($0.921\pm 0.172\text{mm}$, $p<.001$) that remained well below the clinical threshold of 2mm. These results indicate the O2 can generate planning coordinates with the necessary accuracy for stereotactic electrode implantation.

Conclusion: This study demonstrates the O2 is a viable alternative to the traditional CT scanner for generating planning coordinates. Adopting the O2 as a perioperative tool offers reduced transport risks, decreased anesthesia time, and greater surgical efficiency.

Endoscopic Endonasal Approach for the Surgical Management of Rathke's Cleft Cysts

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Introduction: Rathke's cleft cysts (RCCs) are benign epithelial lesions of the sellar region. There is limited evidence to guide patient selection for operative treatment, and little literature describing contributing factors for cyst recurrence and outcome status.

Methods: A retrospective review of all patients who underwent endoscopic endonasal approaches (EEA) for RCC from 2012-18 at our tertiary care center was performed. Data on RCC characteristics, clinical presentations, postoperative course and long-term follow-up was collected and analyzed.

Results: A total of 35 patients with pathologically verified RCC were identified and included. Mean patient age was 46 years (range 22-81). Twenty-seven (79%) patients were female. Preoperative symptoms included headache (82%), vision loss (56%), and hypopituitarism (56%). Mean RCC diameter was 16.9mm (range 9-30mm). Extended approaches were utilized in 14% of cases. Headache improvement was noted in 26 of 28 patients (93%), and vision improved in 18 of 19 patients (95%) with preoperative vision loss. Of 19 patients with

preoperative hypopituitarism, 7 (20%) showed improvement in at least one hormonal axis. Postoperative complications included: CSF rhinorrhea (9%), meningitis (3%), sinusitis (3%), and carotid artery injury without neurological sequelae in a patient with an inflammatory and refractory RCC. The mean follow-up time was 16.5 months. There were two new cases of panhypopituitarism (6%) and 9 cases of postoperative transient DI (26%), with no new cases of permanent DI (0%). There were 3 recurrences (9%) within the follow-up period (average time to recurrence 24 months), confirmed by MRI, one of which was symptomatic and required reoperation.

Conclusion: Our series comprises one of the largest series reporting outcomes following purely endoscopic treatment of RCC. Patients who underwent an EEA benefited from rapid and sustained improvements in vision and headache, with some experiencing improved endocrine function.

Predicative model for pituitary adenoma recurrence or progression using machine-based learning system **Ivy Song**

Introduction: Prognostication in the management of pituitary adenoma is based on a complex set of neuroendocrine, visual, and pathologic features that have rarely been studied in concert. Using a large dataset of patients treated for functional (FA) and nonfunctional adenoma (NFA), a predictive model for patient outcomes was developed.

Methods: Data were retrospectively collected from a cohort of 581 patients with pituitary adenoma. Predictor variables included 35 features comprised of patient characteristics, clinical presentation, tumor characteristics, neuroendocrine status, and histopathological subtypes. Outcomes were binarized as 'good' or 'bad', with bad outcome defined as tumor progression, recurrence, or hormonal non-remission. Predictors with univariate association p-values ≤ 0.15 were included in a multivariate model. The prediction model was developed using Lasso logistic regression, and candidate models were compared using AUC criterion. Prediction performance was evaluated by AUC on the validation dataset.

Results: Our patient cohort had a mean age of 52 years (range 13-92 years) and was 46% male. There were 434 (75%) NFAs, 66 (11%) GH-secreting, 31 (5%) ACTH-secreting, and 50 (9%) prolactinomas. Mean follow-up was 70 months for patients with bad outcomes, and 50 months for patients with good outcomes. The rates of non-remission, recurrence and progression of 5.9%, 6.3%, 7.8%, respectively. A model with the following predictive variables for bad outcome was selected via lasso logistic regression: Vision loss, headaches, prior treatment, cavernous sinus invasion, ventricular extension, and immunostaining with prolactin or ACTH. Increased age at surgery predicted lower risk of a bad outcome. The risk of bad outcome was lowest for NFAs, with increased risk for GH-secreting, prolactinoma, and ACTH-secreting. Time dependent AUC remained 0.72 to 0.78 for up to 10 years of follow up.

Conclusion: Our model offers a unique means of predicting patient outcome based on a robust dataset. Patients with pituitary adenoma can be risk-stratified based on these preoperative and pathologic criteria with relatively high accuracy.

Nonindex Hospital Readmission After Ruptured Cerebral Aneurysm Treatment is Associated With Higher Morbidity and Repeat Readmission

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BACKGROUND: Aneurysmal subarachnoid hemorrhage (aSAH) is a devastating disease with high morbidity requiring multidisciplinary care. Following initial treatment (index hospital), readmission to a different hospital (nonindex) can compromise care delivered in aSAH management. No prior reports have investigated factors associated with nonindex readmissions (NRs) and the impact on subsequent outcomes for patients with aSAH.

OBJECTIVES: To characterize predictors of nonindex readmissions, and the impact on outcomes in ruptured aneurysm patients.

METHODS: Readmissions after aSAH treatment were identified from the 2010-2014 Nationwide Readmissions Databases. 90-day readmissions to a hospital different from the first treatment site were nonindex readmissions. Multivariable logistic regression was used to identify factors independently associated with NR. Multivariable models quantified increased morbidity or risk of further readmission after NR.

RESULTS: 9,254 patients that underwent treatment of their ruptured aneurysms were identified. Of these patients, 1,985 were readmitted, with 355 (17.9%) of readmissions to nonindex hospitals. Patients receiving care at privately owned hospitals (OR=1.70, p=0.02) or discharged to a facility (OR=1.70, p=0.0004) had a higher likelihood of NR. Having private insurance was associated with index readmission (OR=0.65, p=0.014). Compared to index readmissions, NR patients had higher rates of a major complications (OR=1.71, p=0.005) and second readmission (OR=1.51, p=0.002).

CONCLUSION: Following treatment of a ruptured cerebral aneurysm, 17.9% of readmissions occurred at a nonindex hospital, and were at increased risk for major complications or subsequent readmissions. This may be due to care fragmentation, and further investigations in interventions aimed at improving continuity of care may help reduce the higher morbidity associated with nonindex readmission.

Stereotactic Radiosurgery in Nonfunctioning Pituitary Adenomas: A Comparison of Gamma Knife and CyberKnife Approaches

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Purpose: Nonfunctioning pituitary adenoma (NFPAs) is a common intracranial tumor that often presents with endocrinopathies and neurological deficits. NFPAs are often initially treated with transphenoidal surgical removal. For residual or recurrent NFPAs, a treatment approach is stereotactic radiosurgery (SRS). Single-fraction Gamma Knife radiosurgery (GKRS) and fractionated CyberKnife radiosurgery (CKRS) are the two different forms of SRS treatment for NFPAs. To our knowledge, no direct comparison of these modalities for treating NFPAs has been performed. A comparison of the effectiveness and complication rates could aid clinical decision-making when planning the treatment of NFPAs.

Methods: A retrospective, IRB-approved chart review of 90 patients with NFPAs treated with GKRS or CKRS and greater than 3 months follow-up at the Keck Hospital of USC from January 1995 to February 2017 was conducted. The decision to treat with GKRS or CKRS was determined at multidisciplinary conference review.

Results: Out of the 90 patients, 68 patients underwent single-fraction GKRS and 22 patients underwent fractionated CKRS. The mean follow-up period was 6.53 years. The median

prescribed GKRS treatment was 12.5 Gy in a single fraction (prescribed to the 50% isodose line), and for CKRS it was 20 Gy over 5 fractions. There was no statistically significant difference in 5-year progression free survival (88.9% vs 89.5%, $p=0.77$). Furthermore, there was no significant difference in incidence of vision loss (11.8% vs 9.1%, $p=0.73$), or post-surgical hypopituitarism (4.4% vs 9.1%, $p=0.40$).

Conclusions: To our knowledge, this is the first single-site comparison of long-term outcomes in patients with NFPA who were treated with GKRS or CKRS. Despite the differences in each modality, patients have comparable outcomes in terms of survival and complications. This study aids in the validation of both treatment modalities for NFPAs.

Effects of particulate matter on neural stem cell-mediated response to hypoperfusion-induced injury

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Background: Exposure to air pollution has been linked to various diseases and neurologic pathologies. It has been shown that nanoparticulate matter (nPM) is one of the components most significantly associated with disease processes. Rodent models exposed to nPM induces genetic changes that parallel brain tumor formation and further exacerbates both hypoperfusion and stroke damage. In the mammalian brain, neural stem cells (NSCs) can be found in the subventricular zone (SVZ), representing a population of cells that can potentially respond to injury. We hypothesize that mice with hypoperfusion-induced injury exposed to nPM will show a decreased self-renewal of SVZ NSCs when compared to injury in mice exposed to controlled air.

Methods: Bilateral carotid arterial stenosis (BCAS) was performed to induce cerebral hypoperfusion on 4.5-month-old male mice. A total of 21 mice were divided into four cohorts: filter +/- BCAS ($n=4/8$) and nPM +/- BCAS ($n=3/6$). Animals were exposed to nPM air for 9 weeks. On post-stenosis day 30, all mice were euthanized. The brains were paraffin-embedded and sectioned into 5 μ m sections using a microtome. Immunohistochemistry was performed to analyze the stem cell population (Sox2/GFAP/Ki67).

Results: The immunohistochemistry data showed a significant decrease in the Sox2-positive SVZ cell population between the filter and the filter+BCAS group as well as between the filter+BCAS and the nPM group. Furthermore, BCAS also decreased the population of proliferating (Ki67+) stem cells in the SVZ.

Conclusion: Our data suggests that even though BCAS leads to a depletion of the SVZ stem cell population, nPM does not seem to negatively affect this particular population in the SVZ. Current and future studies in the lab include investigating other potential nPM-mediated injury mechanisms, including its effects on the oligodendrocytic lineage (PDGFR- α /Olig2), the microglia/macrophage population (Iba1), and the blood-brain barrier (s100B/IB4).

OBSTETRICS & GYNECOLOGY

Immediate Postpartum Contraceptive Uptake after C-section at a Large Tertiary Care Center

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Background/Goal: The use of immediate postpartum long acting, reversible contraception (LARC) is safe and encouraged by organizations such as the American College of Obstetrics and Gynecology. Effective contraceptive methods such as immediate post-placental intrauterine devices (IUDs), are recommended for patients who deliver via cesarean section (C-section). Research shows that pregnancy less than six months after a C-section can increase the patient's risk of complications such as preterm delivery or uterine rupture. Widespread provision of immediate postpartum LARC however, is still limited. The goal of this study is to determine how often women elect for long-acting contraception in the immediate postpartum period (prior to discharge from the hospital after delivery) after cesarean section at an institution where all methods of contraception, including LARC, are readily available and free to patients in the immediate and interval postpartum periods.

Methods: This is a retrospective, IRB approved, chart-review of reproductive aged women who had cesarean-section deliveries at a tertiary care center from June-December 2015, and received contraceptive counseling in the antenatal and immediate postpartum periods on all contraceptive methods.

Results: Of 500 women studies, 181 women had C-section deliveries. Of these 181, 14 did not receive any method and 19 delayed selection until follow up, 22 underwent bilateral tubal ligation, 6 underwent hysterectomy. Of the 53 selecting immediate reversible methods prior to discharge, 26 chose condoms, 20 chose pills, 7 depot-medroxyprogesterone acetate. 70 chose immediate postpartum LARC (37 IUD, 33 implant) and 2 used fertility awareness methods.

Conclusion: Women who deliver by C-section are willing to use contraceptives prior to being discharged from the hospital, often selecting LARC options if available. Providers should discuss all contraceptive options with patients in the antenatal period to encourage postpartum contraceptive uptake.

STI Rates, Retesting, and Recurrence among LA County Hospitals

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Background: The rates of sexually transmitted infections (STIs), including chlamydia (CT), gonorrhea (GC), and trichomonas, have been on the rise in LA county. One possible explanation for the increase in STI rates is lack of treatment, especially in sexual partners. If the sexual partner(s) of a patient diagnosed with a STI do not receive treatment, they could potentially re-infect the patient or spread the infection to other people. Expedited partner therapy (EPT) is a method of treating the patient's partners without a separate health provider visit. The goal of EPT is to decrease the rates of STI reinfections, and it has been approved for the treatment of chlamydia, gonorrhea, and trichomonas. The purpose of this study is to determine the prevalence of CT, GC, and trichomonas in the LA county and what factors (including EPT) might play a role in the increased rates of infection.

Methods: Electronical medical records from LA County hospitals were used to identify patients with positive CT/GC and trichomonas lab results from January 1, 2015 to July 1, 2017. Patient charts were reviewed and various factors (including patient demographics, whether the patient was given partner counseling, and whether the patient was offered EPT) were recorded. Simple descriptive statistics were used to identify correlations between the recorded variables and the rates of infection.

Results: For patients who tested positive for trichomonas, the average age was 34. 100% of diagnosed patients were female. 45% of patients did not receive any form of partner counseling, and only 14% of patients were offered EPT. African American patients were disproportionately affected and were less likely to receive EPT. We expect a higher proportion of patients who testing positive for CT/GC to have received partner counseling and EPT.

Conclusion: These data show that the majority of patients diagnosed with trichomonas were not offered EPT, suggesting that untreated sexual partners may be playing a role in the high rates of STIs in LA County.

The Effect of a Diagnosis of Interstitial Cystitis/ Bladder Pain Syndrome: A Qualitative Approach

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Introduction: Interstitial cystitis/ bladder pain syndrome (IC/BPS) is an underdiagnosed chronic pain syndrome that often causes profound detrimental effects on quality of life. We sought to investigate whether obtaining a diagnosis of IC/BPS makes a significant impact on patients' symptom course and coping.

Methods: Participants with self-reported IC/BPS completed publicly available online surveys from October 2017-January 2018. Surveys included demographic information, validated questionnaires and free-text response on the utility of obtaining a diagnosis. Researchers coded and analyzed the comments using Dedoose Version 7.0.23 and Grounded Theory methodology.

Results: 1052 participants completed the survey and 673 answered the free-text response. The median age was 53 (interquartile range [IQR] 41, 64) with an average of 7 years (IQR 3, 14) since IC/BPS diagnosis. Two categories were identified in the participants' responses: 1) effects of the diagnosis on daily life and 2) effects of the diagnosis on medical care. Within each category, both positive and negative experiences were noted. Effects on daily life included emotional response to diagnosis (hope vs. desperation) and impacts on everyday activities (social support vs. financial burden of treatment). Effects on medical care included IC/BPS-specific treatment (appropriate referrals vs. no improvement despite different treatments) and changes to provider interactions (validation vs. stigmatization). The majority of participants noted emotional benefit and improved treatment with diagnosis. However, some participants reported detrimental effects.

Conclusion/Implications: IC/BPS diagnosis has a significant physical and emotional effect on patients' experience of their symptoms. Validating patients' experiences may help to minimize possible negative effects of diagnosis.

Men's Sexual and Reproductive Health Services in California

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Background: While sexual and reproductive health (SRH) are relevant to men and women, services are traditionally targeted towards women, under the assumption that men would not utilize SRH services. However, gender-based disparities in the uptake of SRH services may be related to the lack of SRH services and coverage offered to men, rather than their willingness to seek or use them. For instance, vasectomy is safer and more effective than female sterilization methods; however female sterilization is performed five times more often than vasectomy. Federal funding programs (e.g., Title IX) offer coverage of preventative SRH services for women, including female sterilization; however, such coverage of vasectomy and other SRH services for men vary between states. In California, the Family Planning, Access, Care and

Treatment (FPACT) program is unique for its coverage of SRH services for both men and women, and specifically unique for its coverage of vasectomy. To develop a list of providers to whom we could refer men for SRH services, we surveyed family planning clinics throughout California to determine the range of services provided for men, with attention to differences between state (FPACT) and federally funded programs (Planned Parenthood, PP).

Methods: Surveys were conducted over telephone calls with FPACT family planning clinics (n=77) and PP clinics (n=62) in California. Survey items queried the availability of 20 different SRH services for men, including vasectomy, STI testing, sexual health counseling, and more.

Results: The top two services offered for men across all FPACT and PP clinics together (n=139) were gonorrhea/chlamydia screening (97.8%) and HIV/syphilis screening (95.7%). The two least common services offered for men were vasectomy procedure (5.04%) and emergency contraception (42.4%). FPACT and PP clinics differed significantly with respect to available SRH services for men. PP clinics were more likely than FPACT clinics to offer HIV/syphilis testing, HPV vaccinations, condom demonstration, intimate partner violence screening, emergency contraception, and initial infertility testing.

Conclusions: PP clinics may be more likely than FPACT clinics in California to offer comprehensive SRH services for men. Further, while vasectomy is covered by FPACT and PP clinics advertise vasectomy as an available service, vasectomy access is scarce in these clinics.

OPHTHALMOLOGY

Visual Function Assessment in Subjects Receiving a Human Embryonic Stem Cell-Derived Retinal Pigment Epithelium Implant for Advanced, Dry Age-Related Macular Degeneration

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Background: Non-neovascular, or dry, AMD (NNAMD) is characterized by progressive dysfunction of the retinal pigment epithelium (RPE) with loss of overlying photoreceptors. While there are no effective treatments for NNAMD, replacement of the RPE using human embryonic stem cells may delay disease progression in subjects with severe vision loss. Assessment of visual function in these patients is challenging since baseline vision is very poor. Therefore, non-traditional methods of visual function assessment such as visual fixation may be useful.

Purpose: To develop methods of assessing visual function using visual fixation in subjects with NNAMD who have undergone an IRB approved clinical trial for a stem cell-derived RPE transplantation.

Methods: Retrospective review of 5 implanted subjects with NNAMD and vision <20/200 was conducted. Visual fixation was assessed at baseline and at 3 months post-op using a microperimetry device (Nidek MP1S). Fixation stability was analyzed using two methods: (1) bivariate contour ellipse area (BCEA) and (2) 2/4 degree method. BCEA is the minimum area of an ellipse encompassing 1SD (68%) or 2 SD (95%) of all fixation points. The 2/4 degree method calculates the percentage of fixation points falling within a 2° or 4° diameter. Paired t-tests were used for statistical analysis.

Results: The mean BCEA (68%) at baseline was 4.89 ± 7.32 and 5.95 ± 5.98 at follow-up ($p=0.732$). The mean BCEA (95%) at baseline was 13.17 ± 19.70 and 16.06 ± 16.08 at follow-up ($p=0.727$). The mean percentage of fixation points within a 2° diameter at baseline was 45.20 ± 45.38 and 55.63 ± 40.73 at follow-up ($p=0.065$). The mean percentage of fixation points within a 4° diameter at baseline was 60.9 ± 41.67 and 73.13 ± 31.93 at follow-up ($p=0.103$).

Conclusion: The 2/4 degree method indicated improved fixation at follow-up, while BCEA indicated worse fixation. Although neither metric reached statistical significance, two subjects did have a ceiling effect (100% fixation points) with the 2/4 degree method. In these subjects with stable fixation, BCEA may be better at quantifying changes in fixation. It remains to be determined which method is more useful for assessment of visual function in low vision patients. Differences between these methods will be the focus of a longer term study.

Optical coherence tomography angiography reveals distinguishing vascular features of choroidal tumors

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Background: Early detection is an important approach for improving management of choroidal melanoma.¹ Imaging modalities² have been used to stratify benign nevi from malignant melanoma, with the recent use of optical coherence tomography angiography (OCTA) to detect changes in parafoveal microvasculature.³⁻⁶ The goal of this study is to quantitatively measure retinal microvascular changes in choroidal nevi and melanoma using OCTA to reveal microvascular signatures that correlate with malignant transformation.

Methods: This retrospective study included patients evaluated for choroidal tumors, but without other retinal pathologies, at the USC Roski Eye Institute from January 2015 to October 2018. Foveal centered 3x3 mm OCTA images were obtained using a PlexElite device (Carl Zeiss Meditec Dublin, CA). A semi-automated algorithm was used to assess for vessel diameter index

(VDI) and vessel skeleton density (VSD).^{7,8} Clinical high-risk tumor features^{1,9} were used to stratify microvascular changes detected by OCTA. Statistical analysis was performed using generalized estimating equations controlling for age and gender with SAS (version 9.4).

Results: 29 affected eyes (17 low-risk nevi, 4 high-risk nevi, 8 untreated melanomas) with 29 contralateral control eyes were identified for this study. The mean age was 57±15(SD) with range 24-75, made up of 11 males and 18 females. In low-risk nevi eyes, OCTA demonstrated decreased VSD ($p = 0.0421$) compared to healthy controls. Decreased VSD ($p = 0.0373$) and increased VDI ($p = 0.0031$) was demonstrated between high-risk nevi and controls. Analysis of parameters in melanoma eyes revealed no significant findings. A trend of increasing VDI and decreasing VSD was consistently seen as the number of clinical risk factors increased.

Conclusions: By identifying quantifiable OCTA parameters that may be associated with high-risk clinical features, we hope to add to the current body of literature for methods of earlier detection of choroidal melanoma and high-risk choroidal nevi.

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An Intraocular Pressure Predictive of High-Risk Histopathologic Features in Group E Retinoblastoma Eyes

Mary Kim

Background/Aims: To determine the intraocular pressure (IOP), with or without neovascularization of the iris (NVI), that most accurately predicts the presence of high-risk histopathologic features, including post-laminar optic nerve invasion, massive choroidal invasion, and extra-scleral invasion.

Methods: A retrospective chart review was done on 118 enucleated Group E eyes with numerical IOP recorded at diagnosis and documentation of the presence or absence of high-risk histopathologic features.

Results: The mean IOP at diagnosis for eyes with high-risk pathology (31.8 mm Hg) was significantly higher than the mean IOP at diagnosis for eyes without high-risk pathology (24.5 mm Hg) ($p = 0.0031$). An IOP cutoff value of 34 mm Hg optimizes specificity (82.4%) in predicting the presence of high-risk histopathologic features, as eyes with an IOP ≥ 34 mm Hg at diagnosis were 5.91 times more likely to have high-risk histopathologic features than those with an IOP < 34 mm Hg at diagnosis. Furthermore, having an IOP ≥ 34 mm Hg at diagnosis was more predictive of high-risk histopathology than either the presence or absence of NVI.

Conclusion: Whether or not NVI occurs, Group E eyes with an IOP ≥ 34 mm Hg at diagnosis are 5.91 times more likely to have high-risk histopathologic features than eyes with an IOP below this value. Thus, any attempts at salvage or unnecessary delay in enucleation for these eyes may predispose the child to unnecessary metastatic risk.

Ocular Factors Associated with Peripapillary Vessel Density in Healthy African Americans

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Purpose: Decreased vessel density (VD) in the radial peripapillary capillaries (RPC) plexus has been shown to be a good diagnostic marker of glaucoma. However, little is currently known regarding the ocular variables which may influence peripapillary VD. This study seeks to evaluate the ocular determinants of RPC VD in healthy African Americans (AA) using optical coherence tomography angiography (OCTA).

Methods: The African American Eye Disease Study (AFEDS) is a population-based, cross-sectional OCTA study on AA 40 years and older in Inglewood, California. From participants without a history of ocular diseases, we analyzed the following factors: age, signal strength, axial length, intraocular pressure, central corneal thickness, mean retinal nerve fiber layer (RNFL) thickness, and visual field mean deviation. RPC VD was quantified by processing 6x6mm spectral domain-OCTA scans of the optic nerve with custom software. We then evaluated each factor's relative contributions to VD reduction using a multivariate linear regression with a significance level set at 0.05.

Results: After excluding images with signal strength < 7 or poor image quality according to a standardized quality grading algorithm, we analyzed 1042 eyes from 1042 subjects. The final multivariate model found that thinner mean RNFL thickness ($\beta=0.0023$, per micron, $p<0.0001$, SRC=0.565) and longer axial length ($\beta=-0.0050$, per mm, $p<0.0001$, SRC=-0.105) were

significantly associated with reduced RPC VD, controlling for age and signal strength. The model R^2 was 0.68.

Conclusions: Using data from the largest cross-sectional population-based OCTA study to our knowledge, we evaluated the ocular determinants of peripapillary VD in healthy AA eyes. Our results suggest that eyes with a longer axial length (i.e. myopia) and thinner RNFL thickness may contribute to reduced perfusion to the peripapillary vessels, and thus may have an increased risk for developing glaucoma.

Posterior Vitreous Detachment and the Associated Risk of Retinal Toxicity with Intravitreal Melphalan Treatment for Retinoblastoma

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Purpose: Intravitreal melphalan (IVM) has been introduced as a safe and effective treatment modality for vitreous seeding, but studies have demonstrated this modality has dose-dependent toxicity on retinal pigment epithelial cells. It has been hypothesized that the presence of a posterior vitreous detachment (PVD) may play a role in the development of retinal toxicity. We evaluated the incidence of PVDs in retinoblastoma eyes and correlated the presence of PVD with risk of developing retinal toxicity secondary to IVM for vitreous seeding.

Methods: We reviewed 112 eyes of 81 retinoblastoma patients with B-scan images available for review from 2010 to 2017. A cohort with vitreous seeding treated with IVM was compared to a cohort that did not undergo injection. Primary outcome measure was the presence of PVD at diagnosis and after treatment. Secondary measures included IVM-associated retinal toxicity and other ocular complications.

Results: The incidence of PVD was 20% at diagnosis, and in eyes with B-scans available both at diagnosis and after treatment 18% of eyes developed a PVD over the course of therapy, more frequently after IVM ($p=0.05$). Of 34 eyes receiving IVM treatment, the incidences of posterior segment toxicity and globe salvage were similar between eyes with and without PVD ($p = 0.4015$ and 0.52 , respectively).

Conclusion: In this patient cohort, there appears to be no association with the presence of PVD during IVM and the development of retinal toxicity. More research is required to better understand the risk factors for the development of posterior toxicity post IVM injection.

Fundus Autofluorescence and Vascular Attenuation in Inherited Retinal Degeneration **Jacob Rosenbloom**, Dr. Aditi Jani, Dr. Hossein Ameri, Department of Ophthalmology, KSOM

Goal: Inherited retinal degenerations (IRD), such as retinitis pigmentosa (RP), are characterized by a general loss of the outer retina resulting in vision loss. The most common presentations of RP include night blindness and peripheral vision loss as a result of progressive degeneration of the rods and cones in the retina. Our objective is to determine if there is a correlation between phenotypic presentations of IRD, including RP, and genotypic profiles of affected patients.

Methods: We will be using patient data provided from the EyeGene database, which includes a wide variety of patient demographics including race, age, and gender. Our two arm study includes analyzing fundus autofluorescence (FAF) images of patient eyes affected by various

IRDs and studying the correlation of retinal vascular diameter, measured from color and red free fundus images, with varying genotypes in RP. 1) FAF images will be sorted based on genotype and reviewed by multiple investigators to determine the phenotypic pattern of each genotype compared to others. Depending on findings, quantitative measurement may be performed. 2) Color and red free fundus images will be sorted based on genotype. Four major arteries and four major veins in each eye will be selected and their diameter will be measured between half and one disc diameter from the optic disc margin using integrative vessel analysis (IVAN) software. The average diameter of arteries and veins will be compared between groups.

Results: We hope to find discrete correlations between genotype and phenotype for our two study arms. The results of this study will enhance our understanding of clinical features of IRD and may assist in clinical diagnosis.

Electric Field Directed Growth of Retinal Ganglion Cells **Aparna Tatineni, Kim Gokoffski (PI), Daniel Shvarts**

Goal: Restoring vision requires regenerating the optic nerve. Advances in stem cell biology allow for high volume production of retinal ganglion cells (RGCs), the cells that make up the optic nerve. The goal of this project is to explore a novel approach of using electrical fields (EF) to regenerate the optic nerve. The Rho Kinase signaling pathway is implicated in converting EFs into directional cues in other neural systems, and includes signaling molecules such as RhoA, Cdc42, and Rac1. Here, we focus on the involvement of Rac1 in EF-directed axonal growth.

Methods: The following two experiments were conducted to explore the role of Rac1 in directing axonal growth in the presence of an electric field. (1) Full thickness murine retinal explants (pups day 0-5) were excised. Rac1 inhibitor was applied for 2 hours, and immediately thereafter, an electric field of 100 mV/mm was applied for 4 hours. Axonal growth was monitored by a Zeiss microscope. (2) RGCs were purified from excised retina using a Mac column, and an electric field was applied over the following time points in minutes (0, 3, 60, 150, 240). Cells were lysed and Rac1 levels were measured at these time points using GLISA.

Results: (1) Under the influence of an EF alone, axonal growth is typically directed from the anode to the cathode. Rac1 inhibitor neutralized cathode directed axonal growth in full thickness retina with a $p < .0216$, indicating Rac1 is vital for EF-directed axonal growth. (2) EF exposure leads to an increase in Rac1 in purified RGCs. These levels decline to baseline once ceasing EF exposure, again suggesting that Rac1 plays a role in EF-directed axonal growth.

Conclusions: Rac1 is vital for EF-directed axonal growth in RGCs. We continue to work with different strengths of EFs and inhibitor doses to better elucidate the role of Rac1 in directing axonal growth.

Utility of intraoperative OCT in the transplantation of hESC-derived RPE for treatment of dry age-related macular degeneration

Jeremy Uang, Amir H. Kashani

Purpose: hESC-derived RPE transplantations are being developed for the treatment of non-neovascular age-related macular degeneration (NNAMD) and geographic atrophy (GA). Intraoperative OCT (iOCT) has been shown to augment surgical decision-making, but such studies are often based on postoperative feedback rather than quantitative analysis of the surgeries. This study seeks to assess the feasibility of quantifying how iOCT can facilitate

certain retinal procedures, such as RPE transplantation, through surgical video recording analysis.

Methods: Retrospective review of subjects who had undergone subretinal implantation of hESC-derived RPE under an IRB approved protocol was performed. Nine subjects were identified with adequate surgical videos for evaluation. Inclusion criteria for analysis were *i*OCT imaging of the entire surgery and good quality video of key portions of the procedure. Subjects with incomplete videos or poor video quality were excluded. Videos were reviewed to identify key surgical steps and define criteria for their duration. Step durations were calculated from video timepoints using iMovie with perioperative notes supplementing the video analysis.

Results: Videos were successfully segmented. Durations of the entire procedure and key surgical steps were defined including durations of subretinal dissection and implant repositioning. Mean surgical time for cases performed with *i*OCT was 148.11±31.16 minutes. Mean durations of subretinal dissection and implant repositioning were 53.78±22.73 and 9.60±10.28 minutes, respectively. *i*OCT enabled detailed analysis of subretinal pathology including subjective extent of subretinal dissection, presence of subretinal adhesions, and final transplant placement.

Conclusions: Results suggest that video analysis with *i*OCT is a feasible method of quantifying how *i*OCT can facilitate certain retinal procedures and assessing the duration and effectiveness of key surgical steps.

Enhanced Preservation of Donor Corneas Using WNT3A

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Goal: Vision loss due to corneal endothelial dysfunction is a common indication for endothelial keratoplasty (EK), resulting in approximately 20,000 EKs per year. Currently, it is possible to store donor corneas for up to 14 days post-procurement; however, endothelial cell viability declines while in storage. WNT10B is an endogenously expressed protein that induces cell proliferation without fibrosis via the canonical β -catenin pathway by selectively activating different aspects of mesenchymal transition in the corneal endothelium. Similarly, WNT3A, a more potent activator of the canonical pathway, has been shown to induce endothelial cell proliferation without inducing fibrosis. The goal of this project is to determine if WNT3A could enhance endothelial cell viability during storage of donor corneas.

Methods: Human corneas will be obtained from One Legacy eye bank (Los Angeles, CA). Human corneas *ex vivo* will be stored in Optisol GS at 4°C for 14 days in the presence of either WNT3A or vehicle control. Following 14-day storage, the corneas will be maintained in organ culture for another 14 days. The endothelium will be isolated from the corneas and RT-PCR will be used to determine the expression of the following genes: *SNAI1*, *ZEB1*, *Fibronectin*, *Vimentin*, *CDK2*, *CCNE1*, *COL1A1*, and *COL1A2*. *SNAI1*, *ZEB1*, *Fibronectin*, and *Vimentin* are mesenchymal transition markers. *CDK2* and *CCNE1* are cell proliferation markers, and *COL1A1* and *COL1A2* are markers of fibrosis.

Results: Currently, RT-PCR is being performed using human corneal endothelial cells *in vitro* stimulated with WNT3A, prior to performing the experiment in human corneas *ex vivo*. Thus far, *COL8A2*, a corneal endothelial cell marker has been amplified from RNA purified from control and WNT3A-treated human corneal endothelial cells *in vitro*.

Conclusions: The human corneal endothelial cells *in vitro* maintained their endothelial cell phenotype during culture.

Prevalence of Keratoconus in Children and Adolescents in the Greater Los Angeles Area

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Background: Keratoconus is a non-inflammatory thinning disease of the corneal stroma that assumes a conical shape as a result, leading to impaired quality of vision. The reported prevalence of keratoconus is about 1/2000, however it can vary widely depending upon the geographic location, diagnostic technique, and cohort of patients selected. We hypothesize that the prevalence of keratoconus is much higher than current estimates and is particularly underreported in the pediatric population. The aim of this study is to determine the prevalence of keratoconus in the pediatric population in the Greater Los Angeles area.

Methods: This will be a prospective, observational, cross-sectional, single-center study. Data was collected from patients between ages 4 to 21 years, of all ethnicities, seen during an emergency visit to Children's Hospital Los Angeles. Subjects were imaged using a non-contact, high-resolution rotating Scheimpflug camera system that measures anterior and posterior corneal topography. Two masked ophthalmologists will classify each subject as normal, suspect or as having keratoconus.

Results: 162 eyes from 81 patients were collected thus far. The average was age 13.37 ± 4.32 . We cannot provide any significant estimates of keratoconus prevalence due to the low number of subjects to date. From our current data, the auto-generated Keratoconus Severity Score (KSS) indicated that 92.59% of subjects have normal topography and 2.47% have atypical topography inconsistent with keratoconus. No subjects were suspicious for keratoconus development.

Conclusions: Preliminary data indicates that the prevalence of keratoconus is less than 1/81. We expect the prevalence to be greater than 1/2000 however more patient data will need to be collected to verify this hypothesis.

The Effect of Electrical Fields and Rho GTPase on Retinal Ganglion Cell Axon Growth

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Goal: Recent evidence suggest that electrical fields (EFs) exert a galvanotropic effect on retinal ganglion cell (RGC) axonal growth. In light of these findings, we undertook this study to further characterize how RGCs respond to electrical fields as well as determine if Rho GTPase plays a role in translating electrical cues to directional cues for RCG axonal growth.

Methods: Full thickness, early post-natal mouse retina was cultured in electrotaxis chambers and exposed to EFs of varying strengths (50-200 mV/mm). The percentage of axons that grew within 60 degrees of the cathode vs anode vs perpendicular to the EFs was quantified using time lapsed videos. The rate of axon growth and responsiveness to changes in EF polarity were also determined. Finally, the effects of ToxinB, a non-specific inhibitor of Rho GTPase signaling, was determined.

Results: In the absence of an EF, RGC axons demonstrated indiscriminate directional growth from the explant edge. Retinal cultures exposed to an EF of 200 mV/mm showed marked

asymmetric growth, with 81.2% of axons oriented towards the cathode ($p < 0.001$). RGC axons responded to acute changes in EF polarity by changing their direction of growth. This galvanotropic effect was partially neutralized by 1 ng/ml and 10 ng/ml ToxinB added at one hour before EF exposure.

Conclusions: RGC axons exhibit directional growth towards the cathode in the presence of an EF. Moreover, this effect is mediated, in part, by the Rho GTPase signaling cascade.

ORTHOPAEDIC SURGERY

Can Serum Alkaline Phosphatase levels predict bone related complications after spinal fusion surgery

Ranvir Singh Bajwa, Blake Formanek BA, Jeffrey C. Wang MD, Zorica Buser PhD

Background: Spinal fusion surgery is a common procedure used to ameliorate various spinal pathologies. Alkaline phosphatase (ALP) is an enzyme that inactivates pyrophosphate, which promotes calcium deposition, mineralization, and ectopic bone production. Serum ALP is widely used as a marker of bone metabolism and formation. Our study will look at preoperative levels of serum alkaline phosphatase in patients who have subsequently undergone spinal fusion surgery to determine whether differing levels of ALP are correlated with postoperative bone related complications. We hypothesize patients who develop nonunion or require revision surgery will have decreased serum ALP, patients who develop heterotopic ossification will have above normal preoperative levels of serum ALP

Methods: This study is a retrospective database analysis using PearlDiver database (Humana) to examine patients within the last 10 years who have undergone cervical/lumbar fusion and had preoperative ALP measurements. We will analyze what type of postoperative bone related complications dividing patients into groups based upon the type of complication, with 1 control group of patients who did not develop any postoperative complications. We will compare preoperative ALP levels between these groups and run a statistical analysis (TBD) to determine the correlation between ALP levels and the type of postoperative bone related complication that developed.

Results: 37 patients who had undergone cervical fusion surgery had preoperative ALP measurements, while 62 patients who had undergone lumbar fusion surgery had preoperative ALP measurements.

Conclusions: This patient count is not enough to investigate the relationship between ALP levels and spinal fusion complications. Currently, we are in the process of redesigning this study.

Biomechanical Characterization of Pig Articular Joints Using Automated Indentation and Thickness Mapping

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Purpose: Automated indentation and thickness mapping is a powerful novel tool for biomechanical characterization of articular cartilage in healthy and diseased states. Using the Mach1 bio-indenter (Biomomentum, Canada), an entire articular joint can be analyzed in very high resolution, providing thickness and mechanical force values for discrete points throughout the surface. The purpose of this study was to evaluate the Mach1 as a novel analytical tool offering biomechanical metrics about cartilage defects in a pig joint surface injury model.

Methods: Full thickness 6-mm diameter defects were generated in knee articular cartilage of Yucatan minipigs. Pluripotent stem cell-derived chondrocytes (PSCDC) were transplanted either as chondrosphere cell aggregates, or on a cell-seeded collagen I/III membrane. Control groups received either fibrin glue only or cell-less collagen I/III membrane. Biomechanical analysis was carried out one month after transplantation using Mach-1 bio-indenter with 1mm spherical indenter tool. At least ten points were analyzed within each defect, and heat maps representing instantaneous modulus and thickness were generated.

Results: One month after transplantation biomechanical assessment of operated and non-operated knees was performed using Mach-1 bio-indenter. Differences between treatment groups were noted, including cartilage gross appearance, measured instantaneous modulus

and measured thickness. Lowest instantaneous modulus was measured in control groups, while cell-loaded membrane treated groups had greatest instantaneous modulus.

Discussion: Instantaneous modulus reflects tissue elasticity and structural integrity, which are critical for normal cartilage function. In conjunction with immunohistochemistry, flow cytometry, PCR, and histology, automated indentation and thickness mapping allows for more robust evaluation of healing in a joint injury model.

Post-Operative Urinary Tract Infection in patients who have undergone Lumbar Spine Surgery

Ahsan Butt, Ian Buchanan MD, Jeffrey C. Wang MD, Zorica Buser PhD

Background: Postoperative urinary tract infection is an important complication of lumbar surgery. There are various types of urinary tract infection, including asymptomatic bacteriuria, cystitis, prostatitis, and pyelonephritis. Possible complications of UTI are dangerous, and can include renal abscess, perirenal abscess, sepsis syndrome, papillary necrosis, emphysematous pyelonephritis, recurrent UTI, and chronic renal failure. Using information from databases can provide insight into the incidence and potential risk factors of urinary tract infections in patients undergoing different types of lumbar surgery.

Methods: We will be using the PearlDiver patient database from Humana to analyze patient information in regard to incidence and risk factors of post-operative UTI in patients undergoing lumbar spine surgery. More specifically, we will be looking at patients who underwent lumbar spine surgery in the period of 2007-Q42016 and were diagnosed with UTI within one month of the surgery. Through the use of this database, we will be able to find statistically significant risk factors that predispose patients to postoperative urinary tract infection after different types of lumbar surgery.

Results: We expect to find varied rates of post-operative urinary tract infection in lumbar spine surgery patients, based on their risk factors.

Summary: We have not yet collected and analyzed our data for this study. We hope that our paper will improve healthcare outcomes by providing insight to surgeons when they quantify the risk of UTI in patients undergoing lumbar surgery.

C5 Palsy and Neurological Complications after Cervical Spine Surgery

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Background: C5 palsy, monoplegia, paraplegia, and quadriplegia are potential neurological complications of cervical spine surgery that have little literature supporting their incidence or associated risk factors. The objective of this study was to identify the incidence and risk factors for postoperative cervical spine iatrogenic neurological complications after cervical spine surgery using a nationwide patient database.

Methods: ICD-9, ICD-10, and CPT codes were used to evaluate patients from 2007 to 2016 in the Humana database who experienced neurological complications over a 14-day postoperative period following posterior fusion surgery, anterior fusion surgery, laminectomy/laminotomy, and artificial disc replacement. Complication incidences and relative risk ratios were calculated via Chi-squared testing with respect to type of cervical spine surgery, Charlson Comorbidity Index (CCI), patient age, and patient sex.

Results: 732 of 45,373 (1.61%) patients experienced a neurological complication within 14 days after cervical spine surgery. C5 palsy had an incidence of 0.06% (29 of 45,373 patients). A CCI >3 had a 5.44 times relative risk for any neurological complication (RR: 5.44; 95% CI: 4.70 – 6.30; $p < 0.001$) and a 2.85 times relative risk of C5 palsy complications (RR: 2.85; 95% CI: 1.37 - 5.92; $p < 0.05$). The incidence of neurological complications varied by surgery: posterior fusion [4.56%], anterior fusion [1.10%], laminotomy [1.84%] and artificial disc replacement [1.08%]. Compared to female patients, male patients had a 1.43 times relative risk of neurological complications (RR: 1.43; 95% CI: 1.23-1.65; $p < 0.001$), but not C5 palsy (RR: 1.23, 95% CI: 0.59-2.56, $p = 0.57314$). The age group 65-69 had the most surgeries and complications (8,568 surgeries; 159 complications), yet patients 90 and over had the highest incidence of neurological complications (10.26%).

Conclusions: Patients who had a CCI >3 or were male had an increased relative risk for neurological complications.

Perioperative Invasive Vascular Catheterization Associated With Increased Risk of Postoperative Infection in Lumbar Spine Surgery

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Background: Infection is a risk inherent to lumbar spine surgery, with overall postoperative infection rates of 0.86%–8.5%. Patients experiencing postoperative infection have higher rates of mortality, revision surgeries, pseudarthrosis, and worsening pain and disability. This study's objective was to determine if perioperative invasive vascular catheter (IVC) placement, independent of comorbid conditions, modified the risk of postoperative infection in lumbar spine surgery.

Methods: Data was collected for patients undergoing lumbar spine surgery between January 2007 and October 2015 with records in the nationwide Humana private insurance database. Patients receiving fusion, laminectomy, and discectomy were followed for 3 months from the date of surgery for surgical site infection (SSI), 6 months for subsequent incision and drainage (I&D), and 1 year for vertebral osteomyelitis (VO). Risk factors investigated included central venous catheter and arterial-line placement.

Results: Analysis of 114,259 patient records showed an SSI rate of 3.2% within 1 month and 4.5% within 3 months, VO rate of 0.82%–0.83% within 1 year, and I&D rate of 2.8% within 6 months. Patients receiving a first-time invasive vascular catheter on the day of surgery were more likely to experience SSI within 1 month [risk ratios (RR), 2.5, 95% confidence interval (CI): 2.3–2.7], SSI within 3 months (RR, 2.4; 95% CI: 2.3–2.7), VO within 1 year (RR, 4.2–4.3; 95% CI: 3.7–4.5), and undergo an I&D within 6 months (RR, 1.9; 95% CI: 1.8–2.0). These trends were consistent by procedure type and independent of the patient's Charlson Comorbidity Index.

Conclusions: Perioperative IVC placement was significantly associated with an increased risk of postoperative infection in lumbar spine surgery, independent of a patient's concomitant comorbidities. Thus, in patients with an indication for invasive catheterization, surgeons should consider risks and benefits of surgery carefully.

Extensor Carpi Ulnaris Tendon Lengthening and Tenotomy: Alternative Surgical Treatments for Refractory ECU Tendinopathy

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Hypothesis: Extensor carpi ulnaris (ECU) tendinopathy is a cause of ulnar-sided wrist pain for which treatment options are variable and operative interventions have not been extensively studied. The most commonly utilized surgical procedures for cases refractory to immobilization and corticosteroid injection involve reconstruction of the 6th dorsal compartment. However, reconstruction is technically challenging and necessitates post-operative immobilization and physical therapy. With this study, we sought to determine the feasibility of 2 similar, underreported treatments for ECU tendinopathy. We hypothesize that the ECU can be lengthened or cut as an expedient alternative to 6th dorsal compartment reconstruction.

Methods: We retrospectively reviewed electronic patient health records from patients who underwent ECU lengthening or tenotomy to identify demographics, cause of injury, symptoms, conservative treatments given prior to surgery, functional testing prior to and following surgery, postoperative recovery protocols, and related complications.

Results: We identified 10 cases performed between 2009 and 2017. 5 surgeons contributed case material. Average age of the patients included was 45, with 6 males and 4 females. Acute injury occurred in 4 cases with the remaining 6 occurring insidiously. Surgeons frequently attempted splinting and cortisone injections. Preoperative ECU subluxation was seen in 3/10 patients with 2 resolved following surgery and 1 unrecorded. Of the 10 patients included, 7 were treated with ECU lengthening and 3 with tenotomy. Post-operative protocols involved restricted weightbearing in 1/10 patients and restricted ROM in 4/10 patients. 8 patients were pain free 11 weeks following the operation. All patients had full range of motion on final follow up (mean 14 weeks).

Summary Points:

- Reconstruction of the 6th dorsal compartment, the most utilized surgical treatment for refractory ECU tendonitis, requires extensive immobilization and rehabilitation postoperatively.
- In contrast, ECU tendon lengthening and tenotomy require minimal immobilization, and strength training and physical therapy can be initiated soon after the procedure.
- Lengthening and tenotomy likely render the ECU incompetent, implying that this tendon is likely expendable in some patients. Further prospective studies will be necessary to define the indications for these procedures.

The Incidence of Myocardial Infarction after Lumbar Spine Surgery

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Introduction: As the population continues to age, the number of lumbar spine surgeries continues to increase. While there are many complications associated with lumbar surgeries, a myocardial infarction (MI) is a particularly devastating one. This complication is of considerable importance with mortality rates of postoperative MI documented between 26.5-70%. This study aimed to determine the relationship between lumbar surgeries, preoperative diagnoses (risk factors) and myocardial infarction.

Methods: Data from the Humana database (PearlDiver) was analyzed from 2007 - 2016. Patients undergoing lumbar spine surgeries were identified and stratified based on procedural approach, patient demographics, and preoperative risk factors. Each group was analyzed to determine incidence and relative risk. Chi square analysis was used to determine significance.

Results: A total of 105,505 patients who fit inclusion criteria were identified in the PearlDiver database between 2007-2016. A total of 644 patients (0.63%) experienced a postoperative myocardial infarction within 30 days of surgery. Patients undergoing fusion and non-fusion procedures showed significantly different rates of postoperative myocardial infarction (0.08% vs. 0.05%, $p < 0.01$). Male patients, older patients and patients with a Charlson Comorbidity Index > 3 showed a considerable increase in incidence ($p < 0.01$). Furthermore, patients with preoperative risk factors (high cholesterol, obesity, depression, congestive heart failure, tachycardia, hypertension, hypotension) exhibited risk ratios from 1.35 - 6.54 ($p < 0.01$).

Discussion: Preoperative risk factors, patient demographics, and procedure type had a significant effect on the on the incidence of postoperative myocardial infarction. With procedural, social, and medical stratification, this study may serve as a guidance for physicians in their consideration of surgical technique in conjunction with patient comorbidities.

Relationship Between Tumor Resection Margins and Recurrence-Free Survival in Soft Tissue Sarcomas

Andrew Homere, Sherry Quinteros, Alexander Fedenko MD, Lawrence Menendez MD

Background: Soft tissue sarcomas are a rare type of cancer that can affect muscle, fat, blood vessels, nerves, tendons, and lining of joints. These cancers are typically treated by surgical resection, and recurrence rates are around 5-50%. Previous studies have looked at resection margins and recurrence/outcomes, with mixed results. This includes the prognostic factors on time to local recurrence and metastasis survival. These studies have generally shown that

inadequate resection margins are associated with local recurrence and local recurrence is associated with metastasis, but the direct association between resection margins and metastasis is unclear. Our study looks at both of these endpoints and will attempt to more clearly define their relationship with resection margins.

Hypothesis: We hypothesize that there will be an association between negative margin status and lower recurrence, and negative margin status and long survival after soft tissue sarcoma.

Methods: This study is a retrospective analysis of LAC-USC patients diagnosed with soft tissue sarcomas. Pathology reports and patient charts will be reviewed for recurrence and survival outcomes, and prognostic factors will be identified. We hypothesize that there will be an association between negative margin status and lower recurrence, and negative margin status and long survival after soft tissue sarcoma.

Results: The results of the project are not yet available, but potential results include finding a positive association, no association, or a negative association between negative resection margins and recurrence/metastasis.

Summary: This project will attempt to more clearly define the relationship between surgical resection margins and recurrence/metastasis, potentially guiding the future surgical planning and approach to soft tissue sarcomas.

Return to driving after Rotator Cuff Surgery

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Purpose of study: We aim to prospectively measure the length of time that it takes for patients to return to pre-operative driving ability by measuring turning response to visual stimulus after surgical rotator cuff repair.

We also aim to identify risk factors for delay in returning to baseline driving ability following rotator cuff repair.

Methods: Licensed, adult drivers undergoing rotator cuff surgery at Keck Hospital of USC used a driving simulator to perform a series of random turning and braking tasks in response to a visual stimulus. We recorded patient characteristics (i.e. age, gender, hand dominance, preferred driving hand, surgical procedure, and driving record), disability of the shoulder and hand (DASH), 100-point visual analogue scale (VAS), brake (BRT), and turn reaction times (TRT). Preoperative measurements were compared to 2-week, 4-6-week, and 12-week post-operative measurements.

Results: 2 week, 4-6 week and 12 week results of 18 patients (age 56.4±7.9 years) are shown in Table 1. We anticipate to also include 10 healthy age matched controls to quantify the learning effect of using the simulator for repeated sessions. All patients in the cohort maintained reaction times within proposed national guidelines (between 750 – 1500ms) at follow-up visits. All patient reaction times had returned to pre-operative baseline after 2 weeks. A significant portion of the cohort had modified driving (73% at 2 weeks post-op, 40% at 4-6 weeks post-op, and 0% at 12 weeks post-op) and required narcotic pain control (43% at 2 weeks and 10% at 4-6 weeks).

Conclusions: Driving reaction times returned to baseline pre-operative values by 2-weeks postoperatively. Learning effect will need to be quantified to quantify effect on TRT with a cohort of 10 control patients. There were still potential factors that could impact safe driving at 2- and 4-6-week follow-ups. Many of the patients had modified driving, pain, narcotic use, and

shoulder disability that could potentially impact driving performance. While patient reaction times may be adequate for safe driving, physicians should continue to counsel patients on the risks of driving with limited arm function, and while taking opioids.

THE INCIDENCE OF DVT IN ORTHOPEDIC TRAUMA

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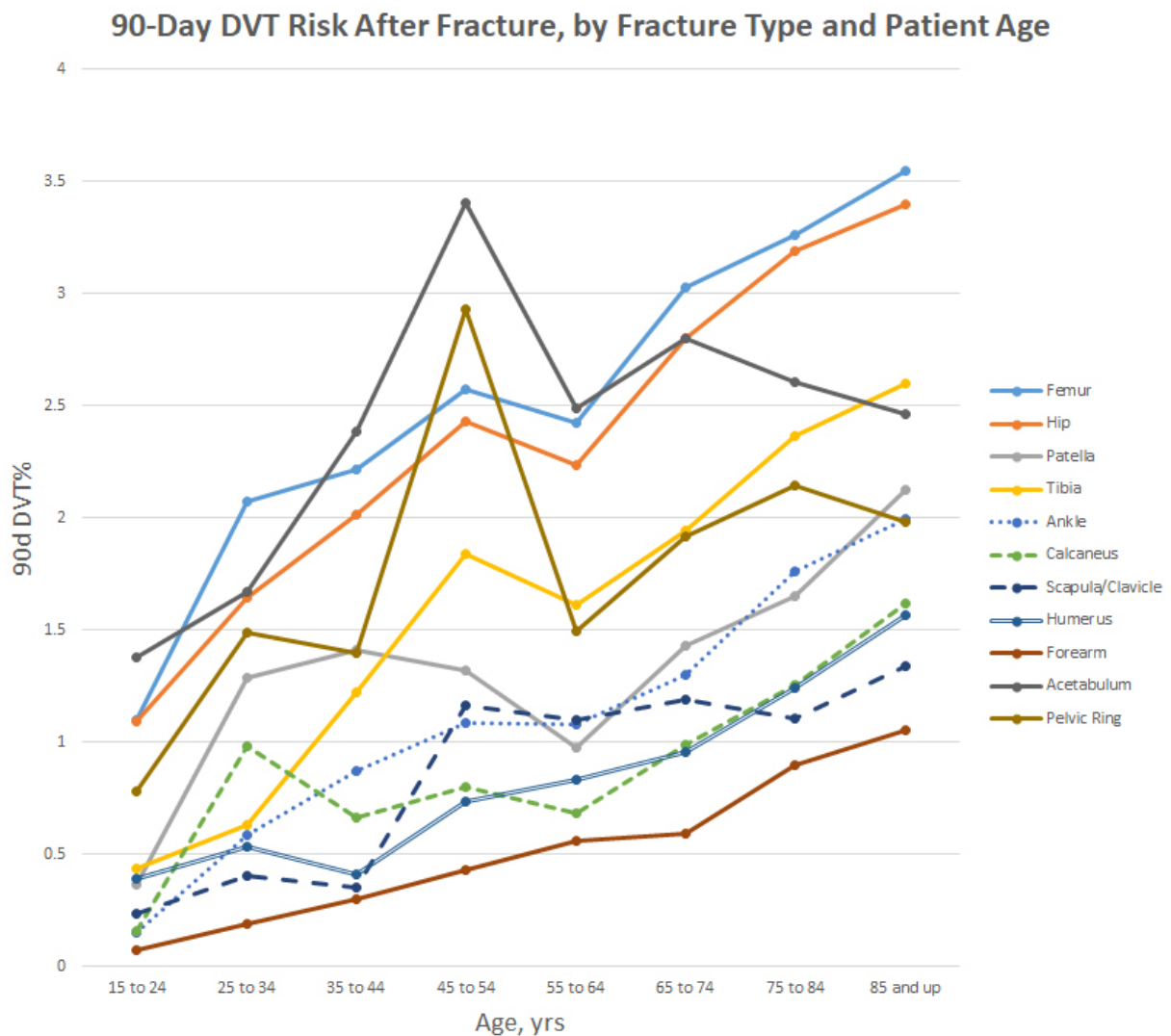
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INTRODUCTION: Deep vein thrombosis (DVT) is a significant complication associated with trauma. Though some studies have examined DVT rates for specific fractures, general rate of DVT after orthopedic trauma has not been well-characterized. The study purpose was to examine the 30- and 90-day incidence of DVTs by fracture type and age in a large representative sample within the US.

METHODS: A nationwide private insurance database was evaluated from 2007 through 2016. Fractures and lower-extremity DVTs were identified using relevant ICD-9 and ICD-10 diagnosis codes, regardless of treatment. Patients were grouped in 10-year age brackets for analysis, and patients under age 15 were excluded to focus primarily on skeletally mature individuals.

RESULTS: A large sample of fractures were captured. The incidence of DVT in orthopedic trauma patients is relatively low, ranging from 0.34% to 1.94% at 30 days post-injury, and 0.64% to 3.13% at 90 days. Predictably, pelvic and lower extremity fractures were at highest risk for DVTs, with the highest incidence seen in femur fractures. The lowest rate was seen in forearm fractures. While the general trend is a gradual increase in DVT rate with advancing age, in virtually all pelvic and lower-extremity fractures, there is a sharp increase in the 45-54yr age group.

DISCUSSION AND CONCLUSION: The rate of DVT among US orthopedic trauma patients across all fractures and ages is low. The incidence of DVT continues to rise beyond 30 days from surgery. The 45-54yr age group with pelvis and lower extremity fractures appears to be a population whose DVT risk is higher and may represent an opportunity to decrease DVT rate through more aggressive thromboprophylaxis strategies.



Complications of Cervical Disc Replacement

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Background: Cervical Disc Replacement (CDR) was developed as an alternative to anterior cervical discectomy and fusion (ACDF) to treat symptomatic radiculopathy and/or myelopathy. It was designed to preserve the natural segmental range of motion, which is lost with ACDF and may lead to post-surgical complications. Studies have shown that CDR seems to be both safe and efficacious with good outcomes that are non-inferior and potentially superior to ACDF. We hypothesized that the outcomes of CDR would be similar or within the range of those found in the literature.

Methods: A retrospective database study was performed within the Humana portion of the PearlDiver Record Database. Complications were grouped into 7 categories: pain, mechanical/bone-related, nerve injury, dysphagia/dysphonia, infections, adverse reactions, and revision/re-operation procedures.

Results: 293 total patients received single or multi-level CDR from 2009 to 2015. Less than 3.7% of patients (<11) had new-onset pain within year after CDR, but 74.4% (218) patients reported continued pain. 12.3% of patients (36) reported a mechanical and/or bone-related complication within 1 year. Less than 3.7% (<11) presented with dysphagia and/or dysphonia within 6 months, infection within 3 months, or a revision and/or re-operation within 1 year. 0 patients indicated a new nerve injury within 6 months of follow-up.

Conclusions: Previously reported rates of complications within 1 year of CDR have ranged from 0-10% in other large studies. Our study reported the mechanical/bone-related complication rate to be slightly higher than other studies, but the dysphagia/dysphonia and revision/re-operation rates were shown to be consistent. Limitations to our study include a limited number of procedures, a lack of specific data on individual patients, and the nature of performing a retrospective database study. However, we feel that this study allows us to examine the short-term outcomes of CDR and add to the previously existing data on complication rates from prior studies.

Socioeconomic and Ethnic Disparities in Pain Following Total Shoulder Arthroplasty
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INTRODUCTION: Ethnic and socioeconomic disparities have been demonstrated in the morbidity of chronic diseases such as heart disease and diabetes, as well as recovery following acute fracture care. It remains unclear if similar disparities exist in recovery following joint arthroplasty. The purpose of this study is to retrospectively evaluate the correlations between socioeconomic status, ethnicity and patient-reported pain following total shoulder arthroplasty (TSA).

METHODS: All patients who underwent anatomic or reverse TSA with one of four surgeons at our institution between January 2013 and April 2017 were retrospectively analyzed. Patient demographics and pain scores were collected from electronic medical record. Socioeconomic data was collected by phone interview. Multiple linear regression was used to assess the effects of race, ethnicity, education level, occupational category, household income, zip code, age, sex and smoking status on patient-reported pain.

RESULTS: 136 patients who underwent TSA (95 reverse, 41 anatomic) were identified. There was no significant difference in preoperative pain. At three months postoperatively, Latino and Asian patients reported significantly greater VAS pain scores compared to White patients ($p=0.048$; $p=0.016$), while Black patients reported lower scores ($p=0.043$). Median household income in the upper two quintiles were associated with significantly lower postoperative pain scores compared to the lowest quintile ($p=0.031$). With respect to education level, patients that completed some college had higher pain scores than those with a graduate degree ($p=0.028$). Smoking status was found to be the strongest predictor of VAS pain scores, showing a positive correlation ($R=3.09$; $p=0.027$).

CONCLUSION: This study suggests that socioeconomic disparities, ethnicity and culture influence a patient's perception of pain following shoulder arthroplasty. More research is warranted to better understand the complex cultural and socioeconomic factors responsible for this disparity.

Opioid Prescription and Dependence Following Elective Spine Surgery: National Trends and Associated Factors

Adam Shonubi, Aidin Abedi, Blake Formanek, Jeffrey C. Wang, Zorica Buser

Background Context: Chronic opioid use is a major public health concern with significant socioeconomic burden. Evidence has emerged on an association of opioid use with adverse outcomes following spine surgery, and it has been suggested that lumbar fusion often fails to discontinue opioid prescription.

Purpose: To evaluate the patterns of opioid prescription and rate of dependence in patients undergoing elective spine surgery, and to identify associated demographic, psychological and surgical factors.

Methods: Patients who had undergone elective spine surgery between 2008-2016 were identified using the Humana database. Opioid prescription was assessed one month after surgery. Opioids were classified based on duration of action, abuse deterrence formulation and dependence potential according to Drug Enforcement Administration categories. Bivariate logistic regression was used to identify factors associated with post-operative opioid prescription and dependence.

Results: Majority of the 99,792 included lumbar surgery patients were prescribed short-acting opioids (70.22%) from DEA category II (66.87%). Patients with the following factors were more likely to receive opioid prescription in early post-operative period: gender (female), smoking, pre-operative diagnosis of opioid dependence/chronic use, mental health disorders, alcoholism, lateral fusion and grafted surgery. The following sub-groups had the largest odds of opioid dependence: patients receiving long-acting opioids, those undergoing spinal fusion, and patients with a history of mental illnesses.

Conclusions: This study sets a benchmark for assessment of practice changes in prescription patterns. Although some of the identified factors are non-modifiable, they can be used for screening of high-risk patients who may benefit from multi-modal pain management strategies.

Playing Surface Effects Anterior Cruciate Ligament Injury In NCAA Soccer

Samantha Solaru, Hyunwoo "Paco" Kang, Mark Howard, George F. "Rick" Hatch II, James Tibone, Seth Gamradt, Alexander E. Weber

Introduction: Previous orthopedic literature has examined the effect of synthetic playing surfaces on the risk of anterior cruciate ligament (ACL) injury. The work has largely been done in football and has led to varying and inconclusive results. The objective of this study was to examine the role of playing surface on the incidence and risk of ACL injury in collegiate soccer athletes.

Methods: The NCAA Injury Surveillance Program database was queried for ACL injuries for Division I-III male and female soccer players for the 2004-05 through 2013-14 seasons. The number of athlete exposures (AEs) were recorded for grass and synthetic playing surfaces. Reported injuries and exposures provided were weighted to represent the entire NCAA collegiate soccer population. Normalized ACL incidence rates were calculated and used to determine rate ratios as a means of comparison.

Results: Overall, matches produced a 7.86-fold increase of injury incidence compared to practice. ACL injuries were more common on grass surfaces (1.16 per 10,000 AEs) than artificial turf (0.92 per 10,000 AEs). The injury incidence during practice on natural grass (0.52 per 10,000 AEs) was 8.67 times more likely than that during practice on artificial turf (0.06 per 10,000 AEs). However, there was no significant difference in injury incidence during matches on natural grass (3.40 per 10,000 AEs) and matches on artificial surfaces (3.66 per 10,000 AEs).

Conclusion: Between 2004 and 2014, NCAA soccer players experienced a high rate of ACL tears with matches producing a greater number of ACL injuries compared to practice. There was no significant difference in match ACL injury rate based on playing surface. However, when examining practice playing surface, athletes were nearly 9 times more likely to suffer an ACL injury on grass than artificial turf. These results suggest that collegiate soccer athletes may be safer practicing on artificial turf fields.

Hypoalbuminemia and Elevated CRP as Predictors for Lumbar Spinal Surgery Complications

Brandon Yoshida, Ailene Nguyen, Blake Formanek, Milad Alam, Jeffrey C. Wang, Zorica Buser

Introduction: Pre-operative malnutrition and inflammatory markers effect post-operative outcomes and complications. Albumin, a marker for malnutrition and inflammation, and CRP, also a marker for inflammation, are predictors of post-operative complications after total joint arthroplasty. This retrospective database study aims to determine if pre-operative albumin and CRP levels can predict post-operative complications in patients undergoing lumbar surgeries.

Methods: From the Humana Database, patients who underwent an anterior lumbar interbody fusion (ALIF), posterior interbody fusion (PLIF), or lumbar discectomy were divided based on their Charlson Comorbidity Index (CCI) scores (≤ 3 and > 3). Post-operative complications included superficial, deep, and urinary tract infections within 3 months and revisions within 1 year of the surgery. Chi-squared analyses were used to calculate *P*-values for all odds ratios and statistically significant *P*-values were defined as $P < 0.05$.

Results: 74,280 patients were included in this study. Pre-operative hypoalbuminemia and elevated CRP were risk factors for deep infection, UTI, and/or revision, depending on the type of surgery. Patients with low albumin had a two to five times higher chance of developing UTI ($P < 0.001$). Furthermore, patients with hypoalbuminemia who underwent a PLIF procedure had a three to eight times higher chance of post-operative deep infection ($P < 0.0001$). In patients with elevated CRP, complication rates were not significantly different from patients with normal CRP values. The only exception was UTI in patients with a CCI ≤ 3 who underwent PLIF (OR 2, CI 1.31-3.05, $p < 0.017$).

Conclusion: Hypoalbuminemia was a risk factor for multiple post-operative complications, especially UTI, for all included procedures. For all procedures except for PLIF, CRP was not a strong predictor of post-operative complications. Future work should investigate albumin and CRPs ability to predict other post-operative complications.

OTOLARYNGOLOGY

Neurologic Disorders in Aerodigestive Clinic Patients

Yvonne Adigwu, Beth Osterbauer MPH, Manvi Bansal MD, Vrinda Bhardwaj MD,
Christian Hochstim MD PhD

Goal: Pediatric patients with complex airway, digestive and respiratory problems can be referred to the CHLA aerodigestive clinic to receive evaluation and care from multiple specialties. In some patients, it has been found that neurological disorders underlie their aerodigestive signs and symptoms. For these patients, early suspicion of a neurological diagnosis would play a significant role in their management. We studied the presenting signs and symptoms of patients who were later found to have an underlying neurological disorder and compared the prevalence to those of other aerodigestive patients who did not have an underlying neurological disorder.

Methods: We conducted a retrospective review of children (0 through 17 years of age) who were referred to the CHLA aerodigestive clinic between June 2016 and August 2018. Children who were referred without a known neurological diagnosis but later were diagnosed with a neurological disorder at the aerodigestive clinic (n = 3) were compared to children who were referred to the clinic and were not found to have any neurological disease (n = 107). Data extracted from the medical records include gender, race, age, referral diagnoses and comorbidities.

Results: 38 (35%) of the 110 patients who met inclusion criteria were females. Of the patients who had an underlying neurological disorder, 3 (100%) had vomiting and reflux as comorbidities. In comparison, out of the 107 patients without any underlying neurological disorder, 35 (29%) presented with vomiting as a comorbidity and 25 (23%) presented with reflux as a comorbidity. Future planned analyses include a more detailed look at co-morbidities and presenting signs and symptoms as well as a statistical assessment of correlations.

Conclusion: Neurological disorders may be the cause for some pediatric patients who present with aerodigestive signs and symptoms. Recognizing which comorbidities have an increased prevalence in association with an underlying neurological disorder will be useful in providing a correct diagnosis in a timely manner. This could lead to better outcomes for these patients.

Sung vowel comprehension and melodic contour identification in cochlear implant users **Roger W. Boles**, Shaikat Hossain, and Raymond L. Goldsworthy

Background: Lingering deficiencies in cochlear implant (CI) technology include pitch and timbre discrimination and overall music appraisal. Sung speech is unique because it combines elements of speech, timbre, and pitch into a single stimulus, making it ideal for testing. However, little research has been done to examine sung speech comprehension (SSC) in CI users, as well as pitch/timbre discrimination in the context of sung speech. Finally, the effects of training on SSC and pitch/timbre discrimination in the context of sung speech have not been investigated.

Goal: My study aims to:

1. Examine SSC and pitch/timbre discrimination in the context of sung speech in CI users
2. Determine if SSC and pitch/timbre discrimination in the context of sung speech can be improved by training

Hypothesis: I hypothesize that:

1. SSC and pitch/timbre discrimination are poor in CI users

2. Both SSC and pitch/timbre discrimination will improve with training. Furthermore, sung speech training will improve performance in melodic contour identification (MCI) more than MCI training improves SSC.

Methods: This will be a crossover cohort study. Test stimuli consist of melodic contours comprising synthetic sung vowels. Subjects will complete two, one-hour blocks of testing and training on Matlab. The tests that will be used to assess performance are MCI and SSC. All subjects will train in either MCI or SSC, then crossover. Performance will be assessed both pre- and post-training for each training session.

Results: Early piloting data show that:

1. CI users have poor SSC
2. MCI performance improved with vowel training
3. MCI performance did not significantly improve with MCI training

Summary: Early piloting data supports my hypotheses, but data is very limited. By better understanding sung speech comprehension and pitch/timbre discrimination in CI users, this study aims to contribute towards improving music appraisal and quality-of-life in CI users.

Risk factors associated with plate extrusion following mandibular reconstruction

Ka Ho Cheung, BS, Jonathan D. West, MA, Somdipto Das, MDS, Tamara Chambers, MD, Niels C. Kokot, MD

Background: Plate extrusion is a common late complication following mandibulectomy and free flap reconstruction that imparts significant morbidity for patients leading to frequent surgical intervention. The factors that increase extrusion risk have not yet been worked out in the literature. This study aims to determine the relationship between various potential risk factors, in particular the profile of the mandibular plate, and the rate of plate extrusion. Establishing this relationship could prospectively inform the choice and approach to plate reconstruction in a way that might reduce or avoid this complication.

Methods: This study involves a retrospective chart review of patients who underwent plate reconstruction of segmental mandibulectomy defects following neoplasm ablation or trauma from January 2010 – December 2017 at either Los Angeles County Medical Center or Keck Hospital of USC. Patients with a minimum of 1 year follow up will be included. The primary outcome is plate extrusion rate. The independent variables include plate profile, defined as high (>2.4mm) and low (<= 2.4mm), mandibular defect class, involvement of soft tissue resection, and radiation treatment.

Results: We expect to see that higher plate profile, anterior mandible defect class, involvement of soft tissue resection, and radiation therapy will all be associated with plate extrusion following mandibular reconstruction for segmental mandibulectomy defect.

Conclusion: An improved understanding of the presented risk factors for mandibular plate extrusion could help guide clinical decision making for head and neck surgeons moving forward.

Flexible Endoscopic Examination of Swallowing in Children

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Introduction: Flexible endoscopic evaluation of swallowing (FEES) has important advantages over conventional methods such as modified barium swallow study (MBSS) in the evaluation of dysphagia and swallowing safety in children, including the lack of radiation exposure from fluoroscopy, direct structural visualization, and the ability to assess breastfeeding. Our objectives were to describe the experience of FEES in children at an urban children's hospital, including the completion rate, whether a clear diagnosis or feeding plan was made, and the incidence of adverse events.

Methods: A retrospective review of children (term infants through 17 years of age) who underwent a FEES examination between December 2015 and August 2018 at an urban children's hospital was conducted. Patients who had FEES outside of the hospital were excluded. Data extracted from the medical record included age, gender, race, comorbidities, and outcomes of FEES.

Results: Of the 121 patients enrolled, 41 (34%) were female with a mean age of 4.5 years (SD 4.8). 106 (88%) patients fully cooperated and obtained a result, while 15 (12%) of patients did not cooperate and no result was obtained. There was no significant difference in comorbidities, age, or race between those who cooperated and those who did not. Patients who cooperated had a higher average age (4.8 years) than those who did not (2.5 years) but this was not statistically significant in our cohort. No significant adverse events were reported, with the most common adverse event, excessive crying (31 subjects, 25.6%), not affecting cooperation rates.

Conclusion: Children who undergo FEES have a favorable completion rate and no serious adverse events. FEES should not be restricted to patients based on comorbidities, age, or race due to concerns of noncompliance as none of these factors was predictive of poorer compliance than the overall group. There was a non-statistically significant trend suggesting that younger patients may be more likely to be non-compliant with FEES which merits further investigation. Further studies may also help to identify strategies to improve compliance with pediatric FEES.

Level 1b lymphadenopathy in P16+ Oropharyngeal Squamous Cell Cancer

William Hines, BS; Margaret Nurimba BA; Mark Swanson, MD; Alfred Lee, BS; Elias Fanous, BS; Niels Kokot, MD

Objectives: To determine the incidence of level 1b neck disease in the elective and therapeutic neck dissection for OPSCC when stratified by HPV-status and determine the impact of level 1b nodal dissection on regional recurrence risk.

Study Design: Retrospective cohort study

Setting: A tertiary care academic center

Subjects and Methods: Patients who underwent resection of oropharyngeal squamous cell cancer (OPSCC) with ipsilateral neck dissection of level 1b-IV were compared to level II-IV between 2009-2017. The primary outcome was incidence of level 1b pathologic lymphadenopathy in the context of clinically N0 and N+ disease. Secondary outcomes were regional and overall recurrence risk.

Results: 93 patients were included, of whom 61.3% underwent level 1b-IV dissection and 38.7% underwent level II-IV dissection. 88.2% had p16+ tumors and 11.8% had p16- tumors. The incidence of pathologic level 1 lymphadenopathy was 5.2% overall, with an occult level 1b neck disease rate of 2.6% (2.4% for p16+ vs 20.0% for p16-). There were no observed differences in

regional (HR 0.896, 95% CI 0.219 – 3.661) or overall recurrence risk (HR 1.591, 95% CI 0.507 – 4.999) if level 1b was dissected, regardless of p16 status.

Conclusion: The risk of occult level 1b nodal disease in HPV+ OPSCC is low even in the context of a clinically N+ neck. Given the increased risk of facial nerve injury and salivary fistula with transoral resections of the primary tumor, it is recommended to only dissect level 1b when there is clinically evident level 1 nodal disease.

Idiopathic Ulcerative Laryngitis: A Survey of Laryngologists and Review of the Literature **Celeste Kim, Ido Badash, Michael M. Johns, III, MD**

Background: Idiopathic Ulcerative Laryngitis (IUL) is characterized by cough, persistent dysphonia, and ulcers in the membranous portion of vocal folds. The etiology and disease course of IUL are poorly understood. The diagnostic criteria and appropriate therapeutic interventions have not yet been standardized, leading to discrepancies in the management of this condition between laryngologists. These variations in the management of patients with IUL may be contributing to differences in their health outcomes. We aim to discover how practicing laryngologists diagnose and treat patients with IUL. We also aim to review the literature to investigate common treatment modalities and patient outcomes for this condition.

Methods: We will be creating an online survey that will ask general questions on laryngologists' clinical encounters with patients diagnosed with Idiopathic Ulcerative Laryngitis. The survey will be distributed to about 600 practicing laryngologists across the United States. The identities of the laryngologists responding to the survey will be kept anonymous, and their responses will be analyzed using Microsoft Excel. A review of the existing literature on IUL will also be performed, summarized, and compared with the results of the online survey.

Results: After we send out our survey and the data has been analyzed, we expect to find commonalities in the ways that laryngologists approach the diagnosis and treatment of Idiopathic Ulcerative Laryngitis.

Conclusion: We are currently in the process of designing our survey. We expect that there will be similarities in what laryngologists believe to be the etiology and natural history of Idiopathic Ulcerative Laryngitis. Furthermore, this study may help develop guidelines for the diagnosis and therapeutic intervention of IUL, which could contribute to improving the health outcomes of patients with this disorder.

Evaluating 30-day readmissions following HNCA pedicled or free flap surgery **Michelle Pei, Dr. Mark Swanson, Keck School of Medicine**

OBJECTIVE: 30-day readmissions have significant impacts on healthcare costs, patient outcomes, and are increasingly being used as a measure of quality of care. Studies evaluating surgical HNCA patients on a nationwide scale have been sparse. Our goal is to describe risk factors, causes, and co-morbidities of 30-day readmissions in patients with HNCA following pedicled or free flap reconstruction surgery.

METHODS: A retrospective cohort study, using the Nationwide Readmissions Database (2014), of HNCA patients who were readmitted within 30 days after pedicled or free flap reconstruction surgery. The main outcome was 30-day readmission. Secondary outcomes include risk factors, cause of readmission, and various co-morbidities.

RESULTS: Within 30 days, 1591 (16.09%) of 9886 patients were readmitted. 30% of readmissions were wound-related (infection, wound dehiscence, fistula, and other graft complications). Patients from lower household income zip codes were generally more likely to be readmitted (OR 1.30, 95% CI 1.11-1.51), and they were more likely to be readmitted due to wound-related complications (OR 1.36, 95% CI 1.00-1.85). Medicaid patients were more likely to be readmitted (OR 1.39, 95% CI 1.19-1.62) than Medicare, private insurance, and self-pay patients. Medicaid readmissions were also more likely to be due to wound-related complications (OR 1.42, 95% CI 1.06-1.91). Co-morbidities correlated to significantly higher risks of readmission include: congestive heart failure (OR 1.57, 95% CI 1.24-1.98), chronic pulmonary disease (OR 1.41, 95% CI 1.24-1.60), complicated diabetes mellitus (OR 1.70, 95% CI 1.20-2.42), and liver disease (OR 1.71, 95% CI 1.19-2.46).

CONCLUSION: Consistent with a similar study done using the 2013 NRD¹, 30-day readmissions after HNCA surgery remained at 16% in 2014 and are commonly due to wound-related complications. Lower SES (socioeconomic status) patients were generally at higher risk of readmission and of developing wound-related complications.

¹Chen, M. Predictors of readmissions after head and neck cancer surgery: A national perspective. 2017. Oral Oncology; 71:106-112.

Safety and Efficacy of Platelet-Rich Plasma Injection for Age-Related Vocal Fold Atrophy

Sarah Tillman, Dr. Michael Johns, Dr. William Gao, Dr. Karla O'Dell, Dr. Amit Kochhar

Background/Purpose/Goal/Hypothesis: Vocal fold atrophy and resulting dysphonia is a condition affecting millions of aging Americans, up to 35% of those 65 or older [1]. Currently used treatment methods include voice therapy, injections of inert fillers, and laryngeal framework surgery [1]. These modalities are imperfect with voice therapy requiring considerable time commitment, filler injections generally temporary in benefit, and surgery with increased risks. Thus, there is a need for biologically active alternatives to restore vocal function more safely and effectively.-We hypothesize that serial PRP injections will significantly improve vocal fold volume, morphology, and dysphonia in these patients with no adverse side effects.

Methods: We intend to conduct a single-arm study to assess the safety and efficacy of autologous platelet-rich plasma (PRP) injection for age-related vocal fold atrophy. PRP is a substance purified from the patient's own blood that consists of platelets, growth factors, and other regenerative molecules that have been shown to promote rejuvenation in a variety of tissue types. Twenty patients with vocal fold atrophy identified in the USC Voice Center will be offered participation in a study to receive serial PRP injections in one vocal fold.

Results: Outcome measures evaluated pre- and post-injection and over follow-up visits will include various patient reported quality of life indices, objective clinical assessments of voice, and laryngeal video stroboscopy examinations.

Summary/Conclusion: We hope that PRP injections may be used to stimulate targeted healing and more permanent volume restoration in atrophied vocal folds to improve dysphonia with minimal invasiveness and risk and lower cost to patients.

1. Bradley, J. & Johns, M. (2014). Chapter 49: The Aging Voice. Sataloff's Comprehensive Textbook of Otolaryngology: Head & Neck Surgery: Head and Neck Surgery 1st Edition (pp. 635-640). New Delhi, India: Jaypee Brothers Medical Publishers.

Outcomes Using the Supraclavicular Artery Island Flap in Mucosal Versus Cutaneous Head and Neck Reconstruction

Jonathan D. West, BS, James H. Kim, BS, Zhipeng Zhang, MD, MPH, Niels C. Kokot, MD

Background: The supraclavicular artery island (SAI) flap is a fasciocutaneous rotational flap used for head and neck reconstruction. It may provide a better option than conventional flaps in select situations because it is thin and pliable, reliable, easy to harvest and provides superior color match. However, to better understand where to use SAI flaps, it is important to know whether complication rates vary depending on reconstruction site. Our goal was to address this question by determining whether SAI flap complication rates differ between mucosal and cutaneous reconstruction sites. We hypothesized that the SAI flap would be associated with a higher complication rate at mucosal reconstruction sites.

METHODS USED: We reviewed 107 consecutive SAI flaps performed by the senior author from 2010-2018. We recorded the site of reconstruction (mucosal vs. cutaneous) and any post-operative complications. Complications were categorized as total (100%) or partial (<100%) flap necrosis, fistula, and flap dehiscence at recipient site. We further categorized each complication as major (defined as total flap necrosis or any complication requiring a second surgery) or minor (all other complications). We used Chi-square test for all analyses. We determined statistical significance at $p < 0.05$.

RESULTS: SAI flaps were used to reconstruct cutaneous and mucosal defects at a similar rate (56% vs. 44%, $p=0.09$). Compared with cutaneous reconstruction site, SAI flaps for mucosal sites had higher rates of total complications (54% vs. 34%, $p=0.04$), flap dehiscence at the recipient site (32% vs. 14%, $p=0.03$), and major complications (21% vs. 5%, $p=0.02$). Complication rates for total flap necrosis, partial flap necrosis and minor complications were similar for mucosal and cutaneous sites.

CONCLUSION: The SAI flap is more appropriate for use in cutaneous reconstruction of the face, neck, and parotid/temporal bone regions than mucosal reconstruction.

PATHOLOGY

Antimicrobial effects of varying UMF-graded Manuka honeys on bacterial organisms

Alodia Girma, Wonjae Seo, Rosemary She MD

Goal: Historically, honey has been used as a remedy for skin and soft tissue infections. Manuka honey is thought to work uniquely by utilizing an antibacterial compound, methylglyoxal (MGO), to induce selective toxicity against bacterial organisms. A grading system, termed Unique Manuka Factor (UMF), has been developed that measures levels of MGO in Manuka honey. We suspected that Manuka honey with higher UMF values would exhibit higher toxicity against various bacterial organisms.

Methods: This was an experimental laboratory study that tested Manuka honeys of varying UMF values against a spectrum of bacterial organisms that were prepared via a broth microdilution method outlined by the Clinical and Laboratory Standards Institute. Minimum inhibitory concentrations (MICs), in % w/v, were measured and compared for UMF 5, 10, and 15 filtered Manuka honeys against 124 bacterial isolates. MIC results at the 50th (MIC₅₀) and the 90th (MIC₉₀) percentile were analyzed for each group. Statistical comparisons of MIC values of the different UMF honeys were conducted by the paired t-test.

Results: MIC₅₀ for UMF5, UMF10, and UMF15 honey against staphylococci (n=74) was 6%, 7%, and 15%, and for *Enterobacteriaceae* (n=28) was 21%, 21%, and 27%, respectively. For *P. aeruginosa* (n=22), MIC₅₀ was 21% for all UMFs and MIC₉₀ did not differ significantly. Lower MIC values were observed for both staphylococci and *P. aeruginosa* with UMF5 compared to UMF10 honey (p<0.01) and UMF10 compared to UMF15 (p<0.01). For enteric bacilli, MIC values were significantly lower for UMF5 than UMF15 (p<0.01) and UMF10 than UMF15 honey (p<0.01).

Conclusion: Our data supported the theory that Manuka honey does exhibit antimicrobial activity against a spectrum of organisms, including those with multi-drug resistance. Paradoxically, Manuka honey with a lower UMF value demonstrated increased antimicrobial activity, raising the question of the antibacterial activity of MGO and other substances selected for in higher UMF grade Manuka honey.

Transcriptomics Analyses of HIV-infected T-Cells Reveal Novel Canonical Pathways Involved in Multiple *Non-AIDS* Diseases

Joseph St. Pierre, Nathan Vo, Suraiya Rasheed, Department of Pathology, KSOM

Background: While the use of multiple combinations of antiretroviral therapies has **decreased** the incidence of AIDS globally, the frequency of cardiovascular, neurovascular and other ***non-AIDS diseases*** have increased significantly ***in both treated and un-treated*** HIV-infected individuals. To understand molecular pathways triggered during chronic HIV replication, we examined the dynamics of genome-wide transcriptome of chronically HIV-infected CD4+ T-cells and identified differentially expressed genes and pathways in comparison with transcripts present in un-infected controls.

Methods: The output data of transcriptomic analysis via the Illumina Hi-Seq platform for HIV-infected vs control transcriptomes of a single clone of the CD4+ T-cell line (RH9) were filtered to a range of (≥ -1.5 , $1.5 \geq$) for fold difference in their expression. The differentially expressed protein-coding genes were then analyzed using Qiagen Ingenuity Pathway Analyzer to identify canonical pathways, disease functions, upstream regulators as well as predictions for gene activation and inactivation. The significance of each transcript analysis was evaluated by z-score and p-value.

Results: We have identified 819 protein coding genes that were expressed differentially in HIV-infected cells compared to uninfected control cells. Bioinformatics pathway analysis demonstrated clusters of changes in the gene expression profiles, which overlapped with

multiple pathways. In particular, cholesterol biosynthesis pathways were significant and overlapped with EIF2 signaling and p53 signaling pathways.

Conclusion: The transcriptomics data analyses support our earlier proteomics findings that HIV-infection alone can enhance Fatty Acid synthesis and predisposes HIV-infected individuals to multiple Non-AIDS diseases.

Therapeutic inhibition of T-cell targeted MDSC suppression

Kevin Yu, Alison Smith, Alan Epstein, M.D. Ph.D.

Background: Myeloid-derived suppressor cell (MDSC) populations expand in cancer patients and have been correlated with patient tumor burden. Because of the MDSC's association with the tumor microenvironment and its ability to suppress T-cells, we were interested in characterizing and identifying potential therapeutic targets in this particular cell population.

Methods: T-cells were isolated and MDSC were induced from polymorphonuclear neutrophils using thapsigargin, an ER stress inducer. T-cells were cultured with MDSC and growth factors (IL-2, CD3/CD28 dynabeads) on a 96-well plate to assess the amount of MDSC suppression on T-cell proliferation. T-cell proliferation was determined by flow cytometry and was measured at 48, 52, 64, and 76 hours. Therapeutic agents, such as CSF1R inhibitors, LIGHT, OX40L, and anti-RANKL, will be used to potentially reverse the effects of MDSC suppression on T-cell proliferation.

Results: The methods of setting up the MDSC suppression assay (i.e. concentrations of thapsigargin, growth factors, and CFSE stain) were established in the experiments completed to date. Our hypothesis is that there will be some level of inhibition of MDSC suppression using therapeutic agents, which will cause an increase in T-cell proliferation indicated by flow cytometry.

Conclusions: We hope to demonstrate a reversal of MDSC suppression on T-cell proliferation, which would potentially indicate a role for experimental immune modulators in the inhibition of MDSC to augment current practices of cancer immunotherapy.

PEDIATRICS

Diabetes Mellitus as an Independent Risk Factor for Clinically Significant Retinopathy of Prematurity Severity in Neonates less than 1500g

Similolu Akintorin

BACKGROUND: Retinopathy of prematurity (ROP) is significant morbidity in the preterm babies; multiple risk factors have been studied except maternal diabetes mellitus (MDM). ROP and diabetic retinopathy are both retinal vascular diseases, in which there is leakage and/or neovascularization from damaged retinal vessels based on retinal ischemia. In intrauterine life, the human fetus is nearly completely dependent on maternal glucose passing through the placenta by facilitated diffusion. Diabetes may have both direct and indirect impact on ROP development; however, there are conflicting results on the association between maternal diabetes mellitus and ROP.

OBJECTIVE: To determine if MDM is an independent risk factor for clinically significant ROP (ROP > stage 2) in neonates weighing less than 1500g

DESIGN/METHOD: We conducted a retrospective cohort study of neonates weighing <1500g who were delivered or transferred into our institution from 2007 through 2017. The study was approved by an expedited review by our institutional review board, Study ID 18-169X. We reviewed the electronic medical records (EMR) of mother and neonates. We used a standard data collection form to extract clinical data into a database from the EMR. We used Microsoft Excel and IBM PASW for data collection and analysis.

RESULTS: Data collection and analysis is still ongoing. To date we have extracted 276 paired maternal-neonate clinical information into our database. Overall mean+/- [Standard Deviation (SD)] maternal age at admission was 27.5 (7.2) years, with mean (SD) gestational age at delivery of 28.6 (3.0) weeks and mean (SD) birth weight of 1050 (295) grams. Overall mean (SD) hospital length of stay was 69 (41) days. Of the 276 mothers, 59 (21%) had either gestational or DM (type I or II), and of these 99 neonates (35.6%) received the diagnosis of ROP. Of the 99 with ROP, 29 (29%) were classified as stage I, 52 (52%) stage II, and 18 (18%) stage III. Stratification analysis using MDM as the independent risk factor and severe ROP as a dependent factor demonstrated a Relative Risk value of 1.27 (95% Confidence Interval, 0.81, 2.00).

CONCLUSION: There appears to be a weak causal relationship between MDM and severe ROP. Additional data and ongoing analysis (risk factors, sub-group analysis, dose response) are needed to confirm causation. Prompt treatment and tight control of MDM is recommended to reduce the incidence and severity of ROP.

Stromal Exosomes in Neuroblastoma Tumor Cell Communication

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Background: Using neuroblastoma as a model, our laboratory studies the interaction between cancer cells and bone marrow derived mesenchymal stromal cells (MSC) that form the BM-niche, a physiologically normal environment that is a supportive host to disseminated tumor cells, allowing their metastasis to other organs and protecting them from therapy. Previously published research has shown that cancer cell exosomes are captured by MSCs and cause the production of pro-tumorigenic cytokines. However, it is not known if MSC exosomes are captured by neuroblastoma cells and how this capture induces pro- or anti-tumorigenic activity towards neuroblastoma cells.

Methods: Due to feasibility concerns with the quantity of primary MSCs necessary for exosome purification, we hypothesized that HS-5s, an immortalized bone marrow/stroma cell line from ATCC, could be a faster model. We characterized HS-5 cells based on standard criteria for

human MSCs, including differentiation assays and cell surface marker analysis. HS-5 exosomes were purified and characterized according to International Society for Extracellular Vesicles standards. ELISA analysis of pro-tumorigenic cytokine production in response to HS-5 exosome is underway. Demonstration of cellular uptake by confocal microscopy is upcoming.

Results: HS-5s are capable of differentiating into adipocytes and chondrocytes, and express MSC cell surface markers CD73 and CD90. According to ISEV standards, HS-5 exosomes are of appropriate size, contain exosomal tetraspanins CD9, CD63, and CD81, and contain exosomal proteins Syntenin and ALIX. The addition of HS-5 exosomes to neuroblastoma cell lines results in the production of protumorigenic cytokine IL-6, compared to cell free-exosome control.

Conclusions: These data show that HS-5s are an acceptable preliminary model for primary MSCs. Further exploration of the influence of MSC-derived exosomes on neuroblastoma activity is warranted.

Health Outcomes in Long-term Survivors of Childhood and Adolescent Cancer Saptati Bhattacharjee (USC), David Freyer, DO, MS (CHLA/USC)

Background: Over the last several years, survival rates have significantly increased for pediatric cancer patients. However, survivors of pediatric cancer suffer from a high burden of late effects. The LIFE Research Database at CHLA documents health outcomes in long-term survivors after cancer treatment. This study will use this database to study long-term health outcomes after childhood and adolescent cancer.

Methods: The project relied on generating reports using the LIFE database. The LIFE database is a web-based application that documents patient-specific demographics, congenital conditions, medical history, cancer diagnoses, cancer treatment regimens used (including chemotherapy agents and cumulative exposures), and chronic health conditions or late effects (including severity grading and relatedness to cancer treatment). The information is entered as coded data to allow for analysis and aggregative reporting.

Results: The landscape of the LIFE database reveals various characteristics regarding the patient population (n = 1465). For example, the median age at database entry for patients was 15 years and the sex distribution is nearly equal. Importantly, the majority of the patient population identifies as Hispanic or Latino. Chemotherapy and radiation exposures can also be investigated. As an example, doxorubicin was the most commonly given antitumor antibiotic, while head/brain was the most common site for radiation. Using information in the LIFE database, researchers can create cohorts and reveal trends in health conditions of survivors.

Conclusions: The project highlighted many important concepts related to database design and operation. In particular, careful definitions of queries are required to ensure the proper extraction of relevant data. In addition, database construction requires coded data; natural language fields complicate data and leave room for error. The next steps include conducting a formal internal validation study of the data quality and generating a report of the relevant data to distribute to the Center for Cancer Research at CHLA to stimulate more focused, cohort-based studies.

Developing a resource navigation mobile (mHealth) application for transition-to-home from the NICU: A user-centered design approach,

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Background: The burden of infant health and developmental outcomes and caregiver strain related to infants hospitalized in the NICU is widely recognized. Mobile health (mHealth)

solutions have demonstrated promising ways to improve self-efficacy in other areas. The most effective mHealth applications have been based on user-centered design (UCD). The objective of this study was to design a mHealth application that individualizes the patient experience, integrates the concepts of care mapping, and addresses social determinants of health.

Methods: Focus groups were conducted with English or Spanish-speaking families of infants who were in the NICU and enrolled in Medicaid at a safety-net center and with neonatal care providers. We asked participants to sketch care maps to inform our design process, and generated salient themes using modified grounded theory. Subsequently, using UCD, we created user personas and story mapping which informed our user experience (UX) and user interface (UI) design.

Results: Thirty-one participants completed the study (20 parents and 11 neonatal providers). Fifty percent of family participants were Hispanic, 25% were Black non-Hispanic, and 87% had medical complexity (defined by using the Pediatric Medical Complexity Algorithm 3.0). Providers were physicians, nurses, care coordinators, developmental pediatricians, and general pediatricians. The analysis revealed the major themes that both families and providers valued were (1) path planning (2) information needs and (3) support.

Conclusion: We designed a mHealth application targeted to help families transition to home from the NICU and demonstrated how valuable the UCD approach can be in designing mHealth products. We anticipate pilot testing the application with families, and assessing both short and long-term outcomes such as caregiver strain, satisfaction, quality of life, and care coordination.

Addressing Food Insecurity Through Pediatric Resident Training

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Background: Food insecurity is a significant social determinant of health associated with many chronic diseases, poor health outcomes, increased emergency room usage, and higher health care costs. Children who are food insecure are at risk of delayed development, diminished academic performance, and impaired social skills. We aim to increase pediatric provider awareness of food insecurity and its health consequences and to increase provider screening and referral to food resources.

Methods: Pediatric and med+peds residents of LAC+USC completed pre-intervention surveys to assess their basic knowledge of food insecurity and their screening and referral habits. Residents were then given an education presentation describing food insecurity, its negative health consequences, screening instructions, and resources available for LAC+USC patients. Residents were encouraged to screen all patients of the outpatient clinics during well-child visits. In March 2019, we will send a post-training survey, which will be compared to pre-intervention data.

Results: We collected completed surveys (n=45) from pediatric and med+peds residents of LAC+USC. 60% of all residents responded that they do not routinely ask about food insecurity during pediatric continuity visits. 64% were only aware of 1-2 resources that aid food insecure families, while 7% were aware of no resources. 40% of residents had never given their patients referrals to the Wellness Center, local food banks or drives, WIC programs, or after school meal programs.

Conclusions: Most residents of the pediatrics and med+peds program at LAC+USC do not routinely ask about food insecurity. We predict that residents will have improved food insecurity knowledge, screening, and referral practices on our post-intervention assessment. It is important that physicians improve their understanding of food insecurity and resources available for food insecure families, as we need a multidisciplinary approach to tackle this social determinant problem.

Reduction in Ototoxicity through IMRT for Patients with Medulloblastoma/PNET

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Purpose: To report the rates of ototoxicity for a cohort of children with localized brain tumors treated with craniospinal irradiation (CSI) followed by either an intensity modulated radiotherapy (IMRT) boost or a 3D conformal (3D) boost, and to model the contributions of ototoxic chemotherapy and radiation.

Methods: We retrospectively reviewed 34 patients diagnosed with medulloblastoma (MB) or primary neuroectodermal tumor (PNET) treated with radiotherapy (RT) at CHLA from 1993 to 2007. Patients underwent maximal safe resection followed by adjuvant RT of CSI with posterior fossa (PF), supratentorial (ST) and/or tumor bed boost (TB), and chemotherapy. All patients underwent computed tomography simulation and IMRT treatment planning. Mean cochlear dose data was collected from the RT planning system. Ototoxicity was assessed via review of audiogram data containing audiometric evaluations of hearing thresholds for each ear at stimulus frequencies.

Results: There was a mean of 7.8 audiograms over 97.8 months for 3D patients and 9.0 audiograms over 54.6 months for IMRT patients. Mean cochlear dose was lower in patients treated with an IMRT boost (33.8 Gy) as opposed to a 3D boost (51.3 Gy, $p < 0.0001$). Despite receiving no less cisplatin than the 3D group (396.8 mg/m² vs. 379.1 mg/m², $p = 0.827$), the IMRT group experienced less severe ototoxicity. Grade 3 and 4 ototoxicity was present in 18/28 ears (67%) in the 3D cohort at median follow-up of 115.5 months versus 9/40 ears (22.5%) in the IMRT cohort ($p = 0.001$) at a median follow-up of 54.0 months. Mean cochlear dose and cisplatin dose were both found to be contributors to clinically significant hearing loss, grade 2-4 ($p < 0.05$, $p < 0.01$).

Conclusions: Ototoxicity is a concern for pediatric brain tumor survivors and cisplatin and RT are significant factors contributing to hearing loss. We confirm that utilizing an IMRT boost allows better hearing outcomes than a 3D boost and propose cochlear dosing must be held under 35 Gy when both RT and cisplatin are involved in treatment.

Imagine HEALTH Metabolic Study

Maria Espinoza, Dr. Weigensberg MD, Jaclyn Vargas MD, Sara Ptasnik MD, Dept. of Pediatrics.

Goal: The prevalence of obesity among pediatric population is increasing. Without intervention, these patients are at an increased risk of developing diabetes, hypertension, and behavior problems. Moreover, these patients are more likely to remain obese into adulthood and accrue damage to their bodies. Because children tend to visit their health provider more frequently than older individuals, it is practical to develop obesity prevention interventions that pediatricians can incorporate in a clinic setting. The Imagine HEALTH intervention is a 12-week program providing patients and parents with shared medical appointments and lifestyle education. The overall goal of this study is: assess whether the intervention leads to improved health habits, health knowledge, and lower stress among overweight/obese children, and assess relationship between patient satisfaction and specific clinical outcomes.

Methods: The 12-week lifestyle intervention was tested using randomized trial design. Primary outcome measures: survey data (healthy habits questionnaire, perceived stress scale-4, health knowledge test) and feasibility/acceptability (program satisfaction data and anecdotal).

Secondary outcome measures: objective data (BMI, lipid profile, insulin level, fasting glucose, Hgb A1c, weight and BMI percentiles).

Results: Results are pending.

Conclusion: The high prevalence of obesity among increasingly younger patients is a significant public health issue. It is important to intervene early and develop evidence-based interventions targeted to obese children and adolescents because research shows that most adolescents with obesity will remain obese in adulthood. Data also shows that interventions that incorporate children and parents that focus on lifestyle modification and health education are especially effective. More research is needed to assess the feasibility of in-office interventions targeted at children and their parents.

Central venous catheter associated deep vein thrombosis risk in children with medical complexity

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Background: Children with medical complexity (CMC) are a defined sub-population of pediatric patients that have been recognized to have higher healthcare spending and poor healthcare outcomes. Central venous catheters (CVCs) are frequently used in complex patients, simplifying administration of medication and nutrition as well as collection of blood samples. However, use of these devices is also associated with complications including infection and obstruction of the vessel lumen and associated deep vein thrombosis (DVT). We aim to determine whether children who are medically complex are more likely to develop DVT and if they have worse complications after developing DVT

Methods: We are performing a retrospective chart review on patients who had CVCs placed at CHLA and classifying them according to (1) if they developed DVT and (2) if they meet criteria for CMC, using published frameworks. We will use logistic regression to determine the odds ratio of developing DVT using CMC as a risk factor. We will compare outcomes between CMC and non-CMC DVTs using t-test for continuous variables and chi-square for categorical variables.

Results: We expect that a higher proportion of children who developed DVT will meet the definition of CMC. We also hypothesize that CMC who developed DVT will have worse outcomes (size of clots, duration of therapy, etc.) than non-CMC who developed DVT. Finally we predict that certain risk factors within the overall group of CMC may predispose to developing DVT.

Conclusions: We hope to demonstrate with this data a heightened risk of DVT in medically complex children who have CVCs inserted and identify some potential risk factors related to this risk. Ultimately we hope to improve care for these children and reduce associated complications.

Optimization of Optical Clearing for the Murine Liver

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Background: Multicellular organisms have three-dimensional structural organization of functional consequence. Optical clearance (OC) methods with 3D imaging modalities allow visualization of large-scale tissues and structures with preservation of native architecture. 3D visualization helps to qualitatively evaluate structural information that is limited in 2D sections. Published OC methods offer benefits and disadvantages in clearance depth, endogenous fluorescent reporter quenching, immunofluorescence compatibility, distortion, and feasibility. Existing methods were optimized for neural tissue, while little is described for liver. This

investigation aims to establish a practical OC method of the murine liver, optimizing for clearance, fluorescence preservation and speed.

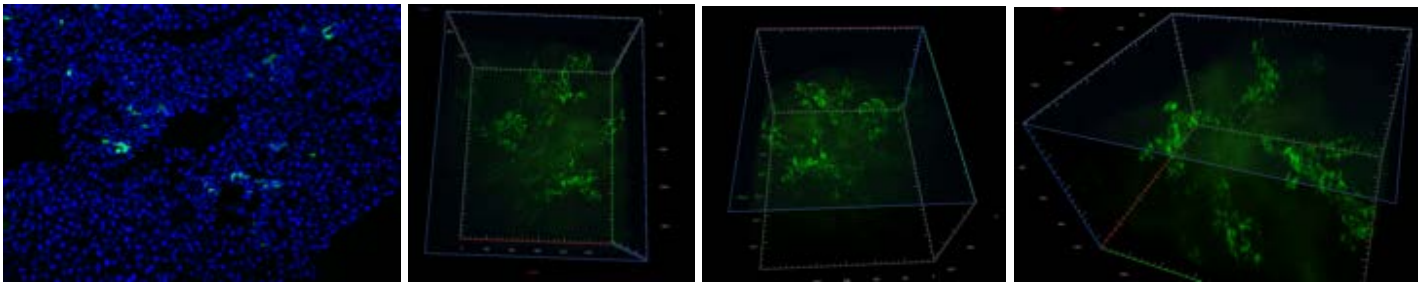


Fig 1. 2-dimensional versus 3-dimensional lineage tracing of murine hepatic progenitor cells using a GFP endogenous fluorescent reporter. Visualization into the complex architectural branching of the biliary tree has potential of further characterizing cell-cell relationships.

Methods: Five established OC methods were applied to the liver: organic solutions BABB and iDISCO; aqueous solutions ScaleS, SeeDB, and UbasM. Murine liver lobes were cleared according to published protocols. Samples were analyzed for whole organ and quantitative transmittance, morphologic distortion, and fluorescence retention.

Results: Our preliminary results establish UbasM as a superior agent in gross transparency, incubation time, and fluorescence preservation; however, UbasM causes sample expansion. BABB and iDISCO are efficient in gross clearance with shorter incubation times; however, both result in sample contraction through dehydration and quench fluorescent proteins. ScaleS and SeeDB retain morphology and endogenous fluorophores; however, both are ineffective in clearance in usable time-frames. Our data for quantified transmittance, morphologic changes, and fluorophore retention is pending.

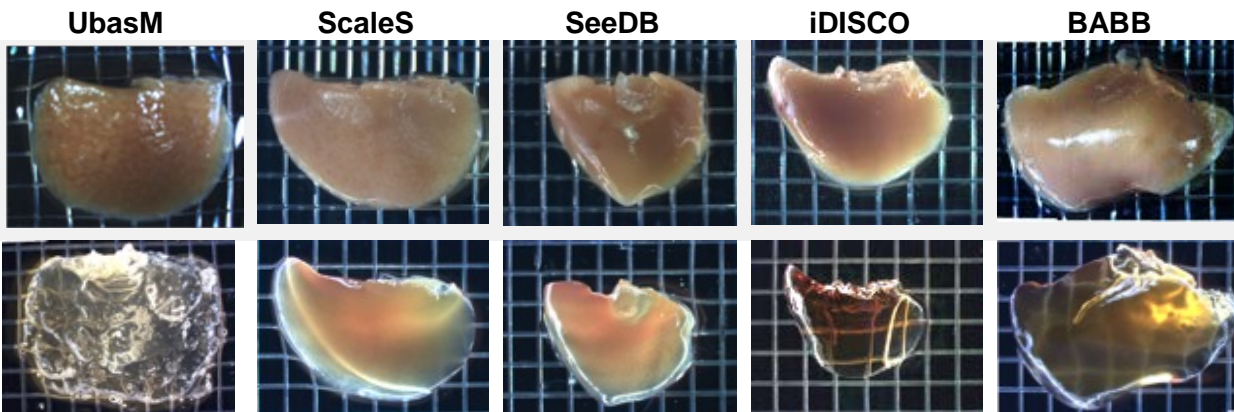


Fig 2. Gross transparency comparison across each OC method. 2mm crosshatches for reference.

Conclusion: Preliminary data find many favorable optical clearing characteristics of agent UBasM.

Impact of Mindfulness Training on Resilience for Urban Youth: An Exploratory Mixed Methods Pilot Study

Lee, Erin¹; Renov, Veronica¹; **Jones, Madison**²; Locke, Evan²; Hudson, Sharon³; Daigle, Amanda¹; Chattopadhyay, Lily¹; Gera, Mona P.¹

Background: Children today are exposed to a variety of stressors, ranging from the inherent hurdles of daily life to traumatic adverse childhood experiences (ACEs). There is a disproportionate exposure of low-income youth to ACEs, which have been shown to have a cumulative detrimental effect on long-term health outcomes. Mindfulness training is a promising tool that has been shown to promote resilience in such a population by improving cognitive and emotional control, empathy and stress physiology with a marked decrease in symptoms of depression and peer-rated aggression.

Objective: Through collaboration between a public elementary school, non-profit organization Tools for Peace, and Children's Hospital Los Angeles, we have implemented a 6-month-long mindfulness curriculum to help kindergarten through 5th-grade students learn healthy coping mechanisms and resilience. We aim to evaluate the feasibility and effectiveness of a large-scale mindfulness-based health curriculum at the elementary school level.

Design/Methods: We are conducting an IRB-approved longitudinal study. Teachers complete the Kinder Associates Behavioral Rubric at 0, 3 and 6 months to evaluate changes in students' mental, emotional, physical and social behaviors. Every month for 6 months there is a school-wide assembly (approximately 30 minutes) for each grade, led by a certified mindfulness instructor. Surveys were collected at 0 and 3 months (pending 6-month data collection) and the combined behavioral scores were analyzed for students who had signed permission forms.

Results: 83% of teachers completed the survey at 0 and 3 months, evaluating 185 students. The instrument demonstrated good internal consistency in this sample ($\alpha=0.77$). At both time points, scores ranged from 4 to 16. Average scores increased by 0.43 points for the entire sample at follow up ($p=0.003$), with the largest increase seen in third grade students (mean=1.04, $p=.0001$). This represents a portion of quantitative data obtained from our ongoing study.

Conclusion(s): This data suggests that teachers have noticed a positive change in student behavior after receiving mindfulness training. This study is somewhat limited by lack of a control population; however, we expect to demonstrate progressive improvement in classroom behaviors and self-regulation in this at-risk population as data collection continues. We hope this data will support the continued implementation of structured mindfulness programs at an elementary school level.

The role of technology in coping and stress reduction for parents of children with medical complexity

Angela Judd, BS and Margaret Trost, MD

Background: Children with medical complexity (CMC) require extensive healthcare services, have one or more chronic conditions with functional limitations, and often have frequent or extended hospital stays. Parents of CMC report higher levels of stress and worse physical/psychological health. There is some evidence that Internet-based interventions can improve mental health. Therefore, we sought to determine if and how parents of CMC are currently using technology vs. non-technology modalities to aid coping and if there are differences between Spanish and English speaking parents.

Methods: CMC at CHLA are identified using a search for Complex Chronic Conditions based on published algorithms. Parents completed the Perceived Stress Scale (PSS), the Rand Medical Outcomes Study 36 Item Short Form (MO), and an online survey about coping

strategies including technology use. We will compare scores on the PSS and MO using t-tests and frequency of coping strategies using chi-square.

Results: Participants include 40 parents (49% Hispanic/Latino, 27% White (non Hispanic), 25% Other). The average age was 40 years (26-64). 26 speak English at home and 14 speak Spanish (6 monolingual). Most (n=38, 90%) parents used a smartphone to access the Internet at home. 21% of Spanish speakers did not use technology to cope versus 4% of English speakers. Parents who do not use technology appeared to score worse on the PSS (2.03 average score vs. 1.85 average score) but not on the MO (540.43 vs. 542.58). English and Spanish speaking parents scored the same on the PSS (1.86 average score) but Spanish speakers seemed to score worse on the MO (499.96 vs. 567.92).

Conclusion: Technology may improve stress levels of parents of CMC. 50% of parents use the Internet or a smartphone app (Google 60%) to learn about their child's illness and 35% use social media (Facebook 67%) to help cope with their child's illness. Spanish speakers appear to have slightly decreased health and are less likely to use technology.

The Effect of Tumor Associated Macrophages (TAM) and Cancer Associated Fibroblasts (CAF) on Tumor Cell Drug Resistance Using an *In Vitro* 3 D Model

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Background: Chemoresistance of cancer cells promotes relapse, cancer dissemination, and the death of patients. Growing scientific research proposes that the components of the tumor microenvironment contribute to the cells' resistance to treatment. In this study, we will investigate the effect of tumor associated macrophages (TAM) and cancer associated fibroblasts (CAF) on tumor cell drug resistance using an *in vitro* 3D model. Recent studies show that a 3D tissue culture system as opposed to historically utilized 2D models, may better recreate the physical 3D structure of the tumor as well as the interactions within it. We will measure the response of cancer cells to chemotherapy in the presence and absence of TAMs and CAFs. Further, we will compare our results with previous 2D model studies.

Methodology: 3D spheroid tissue culture is set up in the *in vitro* hanging drop system. After 3 days drops with spheroids are transferred to a U-bottom plates where they are treated with increasing concentrations of chemotherapeutic drugs for 48 hours. 3D spheroid cultures can consist of cancer cells or combination of cancer cells, TAMs and CAFs. The effect of chemotherapy on co-cultures compared to cancer cells alone is assessed by luminometry.

Results: In experiment 1, the experimental group maintained a general trend of increased cell viability as compared with the control in response to the chemotherapy, with a few data points of significant difference. In experiments 2-3B, there was no general trend or significant graphical data to report.

Conclusion: In our study, we hoped to confirm that MSCs and CAFs promote cell viability in chemotherapy-treated cancer cells. While experiment 1 aligned with our hypothesis, additional experiments will be done to extrapolate significant data. Experiments 2-3B did not provide significant data but they may have helped us eliminate inactive cell lines, while improving our technique in executing the experiment.

Access to early intervention services for low-income families after NICU discharge

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Goals: Early Intervention (EI) services are designed to promote healthy childhood development. However, a discrepancy exists between families' use of service and referrals from physicians. To improve interventions, we sought to understand families' experiences with EI services following discharge from the neonatal intensive care unit (NICU).

Method: Families of preterm and high-risk infants participated in semi-structured interviews and focus groups. These families included those enrolled in Medicaid who visited an urban high-risk follow up clinic located at a safety-net center.

Results: Semi-structured interviews were conducted with parents (n=21) and five focus groups were completed by participants (n=12). The group consisted of 67% Hispanic, 13% Black non-Hispanic, 10% White non-Hispanic and 10% Asian individuals. Thematic content analysis of families' attitudes toward EI programs yielded three major themes: challenges accessing EI services, positive experiences with services, and ideas to improve the referral process. Challenges included (1) getting connected to services from the NICU (2) long wait times (3) multiple phone calls to connect to services and (4) the perception that EI staff are overworked. Positive experiences were (1) the development of a bond and trust with therapists and (2) gratitude towards the services. Ideas to improve the process include parents (1) not comparing their children to "normal babies" (2) staying positive but realistic about the referral process and for hospitals to (3) create a class in order for families to learn more about the process and (4) have a patient advocate assigned to aid the process.

Conclusions: Although families that used EI services expressed their gratitude, there were challenges that they described, including ideas to improve the referral process from the NICU at a safety-net hospital. Developing programs with patient advocates/navigators, as well as educational sessions aimed at the families may ease the transition from the NICU.

Survey of Parents of Children with IBD for Management Preferences

Sarah Rotondo

Background: Children with Ulcerative Colitis and Crohn's Disease are usually managed using medications such as corticosteroids and immunosuppressants. These medications, while usually effective, also carry several serious risks with long term use. Many people with Ulcerative Colitis and Crohn's Disease have looked to diet as therapy in order to reduce or eliminate medication use. While some patients report relief of symptoms with diet therapy, research still is not strong enough to support any one diet therapy strategy. In addition, while diet therapy could be effective, most diets that have been proposed are extremely restrictive and difficult to maintain. If diet therapy is to be researched more thoroughly, it is important to identify whether patients want to use dietary therapy or if it is simply too difficult to restrict a child's diet for it to be an effective disease management strategy.

Methods: This study utilizes a survey given to a parent or guardian of a child, 0-20 years old and previously diagnosed with Inflammatory Bowel Disease (IBD), while their child is being seen by their physician at CHLA. This survey collects demographic information, pertinent medical history, as well as parent preferences for diet versus drug therapy. Information on past diets attempted and the level of difficulty of restricting their child's food will also be collected. If parents indicate they are interested in trying diet therapy, they may be recruited into future diet therapy studies.

Results: Thus far, three surveys have been completed. All children included were of Hispanic origin and were diagnosed with Ulcerative Colitis. Parents reported their child's IBD symptoms as being managed "well" or "very well". Two parents reported being interested in a diet that could help better managed their child's symptoms, while the third reported "maybe". Parents also reported that putting restrictions on their child's diet would be "easy" or only "moderately difficult". However, while two parents reported preferring their child's disease be managed with "diet alone", the third preferred "medication alone".

Conclusions: While this is a very limited data set, it provides preliminary evidence that parents are interested in managing their child's IBD with diet therapy, even though their child's disease appears well managed with current medication. We hypothesize that this trend will continue as we collect more data. This could potentially identify a large cohort of interested parents and patients for future diet therapy research in children with IBD.

3D Printing of Cardiac Abnormalities

Cory Schlabs, Dr. Jon Detterich, Assistant Professor of Clinical Pediatrics, Keck School of Medicine of USC

Background. Three-dimensional (3D) printing is a rapidly emerging technology that has the ability to transform the field of cardiac imaging. 3D models provide the viewer with spatial visualization of heart anatomy that other technologies do not. They are currently being used in a limited clinical capacity, including for the preoperative visualization of heart defects. Significant opportunity exists for the use of the same technology for the education of medical students and clinicians.

Methods: Cardiac magnetic resonance (MR) studies are obtained from pediatric patients at Children's Hospital Los Angeles (CHLA), and segmented in 2-dimensions using Materialize Mimics Innovation Suite, highlighting relevant cardiac and vascular structures. The studies are then converted into 3D format with Mimics Materialize 3-Matic, creating a fully navigable electronic rendering of the heart. The final representations are then sent out for 3D printing, or physically printed on site at CHLA.

Results: We have created 10 patient-specific models, with cardiac anatomy ranging from tetralogy of fallot to complex single ventricle lesions in patients with heterotaxy syndrome. Initial models have been well received when the critical structures that require visualization are defects in the heart muscle or positioning of the systemic venous structures, pulmonary venous anatomy, or great arteries. However, limitations are presented when thin valvar structures are needed to determine the appropriate surgical or catheter based intervention.

Summary of findings: Relating these complex anatomies in 3-dimensions for the physicians performing surgical and catheter based interventions has made our team realize that normal cardiac anatomy represented in 3-dimensions may be an excellent tool for education of the medical students, residents and fellows. When complete, a database of 3D printed congenitally normal and abnormal hearts will be produced, allowing medical students and physicians to better understand the anatomy of normal and abnormal heart structures.

Impact of laryngeal cleft on gastrointestinal biopsy and bronchoalveolar lavage findings in pediatric aerodigestive population

Moizza Shabbir BA, Beth Osterbauer MPH, Vrinda Bhardwaj MD, Manvi Bansal MD, Christian Hochstim MD, PHD

Introduction: Pediatric patients with aerodigestive disorders are seen by multiple subspecialists to diagnose and manage their conditions. A triple scope procedure coordinates same-day laryngoscopy, bronchoscopy with BAL, and endoscopy with biopsy. The purpose of this study is to evaluate the associations of laryngeal cleft (LC) identified on triple scope with BAL and GI biopsy abnormalities. Our hypothesis was that a diagnosis of LC increases a patient's risk for esophagitis, gastritis, inflammatory BAL profile, and potential BAL markers of aspiration and hemorrhage.

Methods: A retrospective chart review of 109 patients seen between 2016 and August 2018 at CHLA's aerodigestive clinic was conducted. Data collected included birth history, gender, presence of LC, gastric biopsy results, and BAL results. 69 of the 109 patients received a triple scope, and 14 of these had LC identified.

Results: Patients with LC had an increased prevalence of esophagitis (27.27% vs 22.22%) and reflux esophagitis (27.27% vs 9.26%) versus non-LC patients. Although the overall percentage of gastritis was higher in non-LC patients, LC patients had a larger percentage of H. Pylori gastritis (9.09%) than non-LC patients (5.56%). On BAL, while non-LC patients had a larger percentage of hemosiderin-laden macrophages (30.19 % vs 14.29 %), LC patients had a larger percentage of RBCs (21.43% vs 11.32%). Of interest, both groups had a roughly equal percentage of BALs that showed an acute inflammatory profile, 28.57% in LC patients and 28.30% in non-LC patients.

Conclusion: Subjects diagnosed with LC had a higher rate of esophagitis, reflux esophagitis, H. Pylori gastritis, and RBCs on BAL than non-LC patients. Prevalence of inflammatory BAL profile was roughly equal in both groups. Further analyses are planned to investigate the statistical significance of these differences and other co-factors.

Impact of Perioperative Pain Management on Length of Stay of Neonates After Esophageal Atresia and Tracheoesophageal Fistula Repair

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Background/Goal: Esophageal atresia with tracheoesophageal fistula (EA/TEF) is a congenital abnormality requiring surgical intervention and pain management in the neonatal period. With many risks associated with various analgesics and/or sedatives^{1,2}, we wanted to determine the approaches to pain control for EA/TEF repair and how timing and initiation of these agents impact patients' length of stay (LOS).

Method: We performed a retrospective cohort analysis of infants ≤ 30 days old in the Pediatric Health Information System (PHIS) who underwent TEF repair (ICD-9 procedure code 31.73) from 2005-2015. We determined the first analgesic/sedative drug initiated and the time of perioperative initiation up to 7 days post-op. The Kruskal-Wallis test was used to compare the median LOS for patients started on opioids pre-op, the day of surgery, and post-op.

Results: 2,822 patients from 47 hospitals were analyzed. Fentanyl was used as a first line agent in 49% and morphine in 25.3% of neonates. Midazolam was given for 11.4% and lorazepam for 6% of patients. Lastly, acetaminophen was used in 7.5%, while dexmedetomidine was given to 0.5% of patients. Median LOS was longer for patients that started on opioids prior to surgery, 41 days (20-89), compared those first receiving opioids on the day of surgery, 24 days (14-45), or post-op 1d, 24 days (14-44) ($p < 0.0001$).

Conclusions: Opioids are the most commonly initiated pain management medications in the perioperative period for EA/TEF repair. Opioid-sparing agents are underutilized in the perioperative period and may play a role in adjunctive pain control to minimize the cumulative dose of opioids and decrease LOS.

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Pharmacological Treatment of Preschool-Aged ADHD

Kelli Stager, Alexis Deavenport-Saman, DrPH, Douglas Vanderbilt, M.D.

Introduction: Attention-Deficit/Hyperactivity Disorder (ADHD) affects approximately 10% of preschool-aged children. ADHD is characterized by significant inattention and/or hyperactivity and impulsivity, which are maladaptive and inconsistent with the child's developmental level. In the past, ADHD was a disorder that was primarily diagnosed in children during their school-aged years after showing persistent behavioral and academic difficulty. In recent years, there has been a shift towards earlier screening for ADHD with the goal to treat the disorder before academic difficulty begins. Although there has been a shift towards earlier screening and treatment, there is a lack of research on the efficacy and safety of different treatment options for this age group. Currently, methylphenidate is the only medication with proven safety and efficacy in preschool-aged children. The purpose of this study is to answer the questions: 1) What medications are prescribed most frequently for the treatment of preschool-aged ADHD and what are the most common side effects? 2) What percentage of children with ADHD have a comorbid neurodevelopmental disorder?

Methods: We are conducting a retrospective chart review of patients under the age of 6 treated with ADHD at Children's Hospital Los Angeles.

Results: We are currently in the process of reviewing charts and analyzing the data.

Conclusion: We hope to gain a better understanding of current treatment trends in preschool-aged ADHD, in particular the use of medication and behavioral therapy in children with comorbid neurodevelopmental disorders. Through analysis of data, we aim to highlight gaps in research, provide direction for future studies, and ultimately reduce the negative impact of ADHD on academic achievement.

Preferred Access to Resources Among Families in an Urban Complex Care Coordination Clinic

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Background: In 2002, the American Academy of Pediatrics (AAP) released a policy statement defining the pediatric medical home, a care model established on the values of accessible, continuous, coordinated, comprehensive, and family-centered care. Children's Hospital Los Angeles (CHLA) has established a Medical Home program (PCMH) for Children with Medical Complexity (CMC) nested within their Federally Qualified Health Center. PCMH provides care coordination services to over 1,300 families of CMC who are from a predominantly Latino, low-income urban community. An important pillar of the medical home model is the incorporation of community resources to aid in addressing social inequities. Structured screenings and dedicated resource materials have been demonstrated to increase patients' contact with community resources. However, there is limited research on what screenings and interventions to use and how to incorporate them into the medical home, particularly for families of CMC.

Objectives:

1. Identify the greatest areas of need among patients and their families at the CHLA Medical Home Clinic
2. Determine availability of and access to technology
3. Identify preferred methods of accessing resources

Design/Methods: We developed a researcher-designed needs assessment to determine what resources families need additional help accessing. It also incorporates a validated health literacy screen, and a technology access questionnaire. The survey was administered to parents of CMC during their clinic appointments at PCMH.

Results: 51 families completed the needs assessment. The most common areas of need were parental support, income and disability benefits, daycare, and healthcare access. Parents reported having a high degree of technology access but prefer to receive resource information directly from their care team.

Conclusion(s): Low income families of children with CMC have a variety of nonmedical needs, and they prefer to turn to their care team for help in finding resources. These families have significant access to technology and the internet, and supplemental resources could be made available to them using information technology.

Prevalence and characteristics of disaccharidase deficiencies among pediatric patients

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Purpose: The aim of our study was to assess the prevalence and clinical characteristics of disaccharidase deficiencies among pediatric patients.

Methods: A retrospective chart review was performed on patients 6 months to 21 years old who presented with gastrointestinal (GI) symptoms and underwent esophagogastroduodenoscopy (EGD) with biopsy between May 2017–2018 at Children’s Hospital of Los Angeles (CHLA). Disaccharidase analysis was performed by Joli Diagnostic with spectrophotometry.

Demographic and clinical characteristics were reviewed, including GI symptoms, duodenal histology findings, diagnosis of GI disease, and use of proton pump inhibitors (PPI), histamine receptor antagonists (H2RA), probiotics, and/or laxatives 3 months prior to EGD. This study was conducted as approved by the Institutional Review Board at CHLA (CHLA 1800267).

Results: Of the 466 patients reviewed, 7 underwent EGD twice, yielding 473 biopsy specimen for analysis. The prevalence of lactase deficiency (LD), maltase (MD), palatinase (PD), and sucrase (SD) was 59.62%, 16.91%, 14.38%, and 13.95%, respectively. Pan-disaccharidase deficiency was identified in 13.53% of patients, of which 59.38% had normal duodenal histology. Of the cases of LD, MD, PD, and SD, 71.99%, 58.75%, 54.41%, and 60.61% had normal histology. Caucasian ethnicity was associated with normal lactase activity ($p<0.01$). PPI use was negatively associated with lactase and maltase deficiencies ($p<0.01$). Celiac disease was associated with presence of maltase, palatinase, sucrase, and pan-disaccharidase deficiency ($p<0.01$).

Conclusions: The prevalence of all disaccharidase deficiencies in pediatric patients was found to be higher than reported in previous studies. Sucrase, maltase and palatinase deficiency often occur in the context of pan-disaccharidase deficiency. Disaccharidase deficiency is prevalent in patients without abnormal histology, highlighting the significance of tissue testing in normal appearing mucosa.

Examination of the Microbiome in Patients with Celiac Disease on and off of a Gluten Free Diet

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Background: Celiac disease (CD) is a gluten-sensitive enteropathy resulting from exposure to the gliadin fraction of wheat protein and prolamins in barley and rye. CD is a multisystem disease with variable clinical presentations due to malabsorption of critical vitamins, minerals, and calories. It affects the gastrointestinal, neurological, endocrine, orthopedic, reproductive and hematologic systems.

Our goal is to study the longitudinal changes in celiac patients’ microbiome as they remove gluten from their diet. We hypothesize the gut microbiome in patients with CD will differ from that of healthy controls. With initiation of a gluten free diet, the gut microbiome of CD patients will further adapt in the setting of decreased intestinal inflammation.

Methods: Patients referred to Dr. Pietzak at her Celiac Clinic with potential CD were studied at the time of their confirmed diagnosis. We used Gluten Detective kits as an objective method to monitor the patients for gluten contamination. Stool samples were collected at their initial visit, at 6 months on the gluten free diet, and at 1 year on the gluten free diet. A variety of techniques were used on these samples to analyze the microbiome profile, including 16S rRNA gene microarray, shotgun sequencing, mass spectroscopy for proteomics, and NMR spectroscopy for metabolite analysis. We then compared the CD patients’ microbiome changes to the healthy controls.

Results: At this time, we have not collected all the results. We predict that at the time of diagnosis, the microbiome profile will be drastically different from the healthy controls. As the patients continue on their gluten free diet at 6 months, which will be confirmed with the Gluten Detective home kits, their microbiome will begin resemble the microbiome of the healthy controls. At 1 year, the patients’ microbiomes will be indistinguishable from the controls’.

Conclusions: Patients with CD have significantly different microbiome profiles that can be corrected with a gluten free diet.

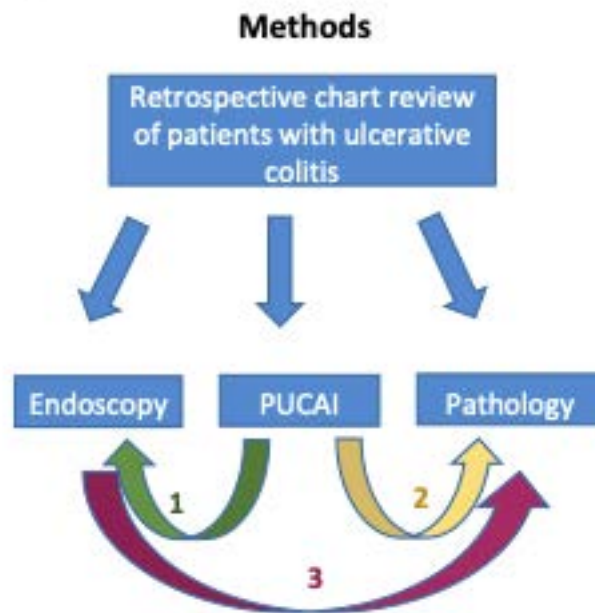
Correlation between clinical, pathology and endoscopy scores in pediatric ulcerative colitis

Lyndon Yu

Background: The Pediatric Ulcerative Colitis Activity Index (PUCAI) was developed to serve as a clinical marker for disease severity in pediatric ulcerative colitis patients. The current gold standard to assess disease severity is a combination of endoscopy with concomitant biopsy scored by a pathologist.

The PUCAI was originally developed and validated with the physician global assessment, which is based on clinical acumen, and with colonoscopy findings. Not enough research has been performed to investigate its correlation with pathological healing, which may be the most reliable indicator of disease progression. In addition, there has not been research about the validity of PUCAI in a majority Hispanic population.

The primary aim of this study is to determine the relationship between PUCAI and endoscopy and biopsy scores in a majority Hispanic population.



Results:

	PUCAI x Endoscopy	PUCAI x Pathology	Endoscopy x Pathology	Total
Male	0.674	0.67	0.738	96
Female	0.718	0.629	0.746	94
Z-score	0.58	0.48	0.15	
Hispanic	0.545	0.558	0.751	102
Non-Hispanic	0.81	0.717	0.722	88
Z-score	3.49	1.84	0.43	
Pancolitis	0.657	0.605	0.705	140
Left-sided	0.739	0.436	0.492	36
Z-score	0.83	1.21	1.75	
Age ≤ 13	0.653	0.583	0.691	60
Age > 13	0.753	0.699	0.763	130
Z-score	1.25	1.24	0.96	
Males Age ≤ 13	0.665	0.594	0.691	60
Males Age > 13	0.69	0.709	0.743	63
Z-score	0.21	0.9	0.48	
Females Age ≤ 13	0.636	0.559	0.661	27
Females Age > 13	0.741	0.649	0.784	67
Z-score	0.77	0.54	1	

Summary: The difference in the strength of correlation between Hispanic and Non-Hispanic patients is concerning for medical providers that use the PUCAI to monitor the treatment of ulcerative colitis, especially in hospitals such as Los Angeles where a majority of patients are Hispanic. The statistically significant difference in the correlation strength in Hispanic and Non-Hispanic patients may underlie a problem in either the communication and understanding of the PUCAI questions or a cultural difference in reporting of these symptoms. The PUCAI x Endoscopy cross tabulation data shows a marked and consistent over-reporting of symptoms compared to the severity of the disease by endoscopic reporting.

Feeding Outcomes after Frenotomy

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Background: Tongue tie, or ankyloglossia, has been considered one reason for breastfeeding difficulty and early breastfeeding cessation in infant-mother dyads. Reported benefits of frenotomy include improved latch, reduced maternal nipple pain and maintained breastfeeding. The goal of this study is to identify the number of infants with breastfeeding difficulties in the Newborn Nursery at LAC+USC. Further, if a frenulum is present, we want to determine if it contributes to feeding difficulties. Finally, we want to quantify how many infants continue breast feeding after hospital discharge.

Methods: This is a 6-month retrospective observational analysis on all infants born at LAC+USC who were admitted to the Newborn Nursery from December 2015 to June 2016. Any infant admitted to the NICU during birth hospitalization was excluded. Data was collected from electronic medical records in National Information System and Orchid.

Results: Data was collected from 344 infants. Breastfeeding difficulty occurred in 62%, with nipple pain described in 32% of mothers. Nearly 40% of patients had a documented frenulum, 13% of which underwent frenotomy. Patients without a frenulum had the highest rate of exclusive breastfeeding. Mixed breastmilk-formula feeding was highest in patients who had a frenotomy. During the birth hospitalization, 40% of mothers exclusively breastfed. This decreased to 30% by 2 months of life. Exclusive formula feeding increased from 8% to 36% by 2 months. At 12 months, over 70% of infants were using formula. Notably, 55% of all patients were lost to follow-up.

Summary: Breastfeeding difficulties were common in our patient population, with nipple pain described in 1/3 of mothers. Mixed feeding was highest in patients who had a frenotomy, highlighting the increased feeding difficulties in this subgroup. Breastfeeding rates drop significantly during the first year of life. Future directions include analysis of 5 years of data and comparing the outcomes of patients who had a frenotomy to those who did not. Areas of opportunity include improved documentation of suck assessment and surveying mothers for their feeding plan for their infant.

PHARMACOLOGY & PHARMACEUTICAL SCIENCES

Anti-Inflammatory Effect of Cannabidiol and Palmitoylethanolamide on Skin in a 12-O-Tetradecanoylphorbol-13-Acetate Dermatitis Model in Mice

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Goal: Atopic dermatitis (AD) is a chronic pruritic skin disorder associated with abnormal immune and inflammatory pathways. Cannabidiol (CBD) has been found to inhibit numerous pathways associated with the pathophysiology of AD. We undertook this study to better understand the potential of using CBD to treat AD.

Methods: Male Swiss Webster (CFW) mice ($N = 42$) that weighed approximately 26–32 grams were randomized by body weight into treatment groups. The ears of the animals were measured for thickness and then treated with TPA or TPA vehicle. Mouse ear edema induced by croton oil and its irritant principle, TPA, is a well-characterized test for anti-inflammatory activity. Topical application of TPA causes an acute, innate-mediated immune response. Thirty minutes after TPA exposure the animals were treated with a CBD topical (CQuellas) or Mometasone Furoate, a prescription topical steroid. Treatment was repeated 4 hours post-TPA exposure. Ears were calipered again 8, 24, and 48h post-TPA exposure to determine efficacy.

Results: Treatment with CQuell reduced inflammation of the ear by 51.23% at 24h and 65.61% at 48h post application. Treatment with Mometasone reduced inflammation of the ear by 89.82% at 24h, and 95.25% at 48h. Natural reduction in inflammation in the TPA animals was 26.32% at 24h and 44.21% at 48h.

Conclusion: Topical corticosteroids such as mometasone continue to be the mainstay of therapy for AD despite their potential for significant local cutaneous adverse effects, as well as systemic side effects when used over larger body surface areas. While the impact was not as robust, the reduction in inflammation in the CBD treated mice suggests that CBD based topicals may present a new strategy for treating inflammatory conditions. A digital study is now being undertaken to gather preliminary data on the efficacy of such a topical for treating eczema and psoriasis.

Topical Treatment of Psoriasis with California Verbena Plants

John Um, Dr. James David Adams, Dept. of Pharmacology and Pharmaceutical Sciences, USC

Background: Psoriasis is a common skin disease with an unclear etiology and no cure. Current modalities of treatment include topical steroids, phototherapy, and biologics, but all of these treatments can be costly and cause side effects to varying degrees. Plants in the genus *Verbena* have historically been used for many medicinal purposes, but there is little literature available on the mechanisms or efficacies of these usages. *Verbena* plants tend to contain myrcene, a monoterpene compound with potentially analgesic and anti-inflammatory effects that could be useful in the treatment of psoriasis. The purpose of this study is to determine if myrcene extracted from California *Verbena* plants can be used to treat psoriasis effectively.

Methods: Safe topical balms will be made from essential oils extracted from *Verbena* plants. A control balm will also be made that contains no *Verbena* essential oil or myrcene. Patients with psoriasis will be enlisted and randomly separated into a control group and a treatment group and instructed to apply the respective balms twice a day and keep a daily journal to record any adverse and therapeutic events. After 14 days, patient satisfaction will be measured via a survey and compared across groups.

Results: We anticipate there to be a higher level of patient satisfaction among the group that receives the myrcene-containing balm. We also anticipate that no adverse reactions will occur in either group.

Summary: Due to the potentially harsh side effects and high costs associated with existing psoriasis treatment options, many psoriasis patients already look to alternative modalities for therapy. We believe that this study will be important in providing psoriasis patients with a readily available therapeutic option that is both safe and efficacious.

PLASTIC SURGERY

**Malnutrition and Postoperative Outcomes Among Pediatric Patients:
A comprehensive literature review
Jasmine Peters**

Background: Across the less developed world, malnutrition is a growing challenge, especially among patients who require surgical intervention. This challenge is twofold with both the result of the inability to provide care due to malnourishment as well as poor surgical outcomes when surgery is provided, adding to the burden of the patient. This problem is further exacerbated in pediatric populations because of both the extremely high rates of undernutrition and increased complexity of surgery. We conducted a literature review to understand what is currently known about the relationship between either short or long-term nutrition intervention in lower and middle-income countries and surgical outcomes

Methods: A literature search was done using Pubmed, EMBASE, and CINAHL evaluating all papers published in the past 10 years that reported statistics related to nutrition and postoperative outcomes in pediatric patients. Papers including adults, obesity related malnutrition, cancer, and burn victims were excluded due to the unique metabolic demands of these groups.

Findings: Only 9 studies met inclusion criteria, including 5 prospective cohort studies, 2 literature reviews, and 2 retrospective cohort studies. The majority of these studies focused on congenital heart defect patients, though other surgeries were also included. Each study used different methods for categorizing nutritional status, making it difficult to compare results across studies.

Interpretation: There is some evidence that nutrition status can have major impacts on surgical outcomes and complication risk, however more research is needed. Nutrition supplementation was not the primary intervention in any of the studies even though it was a factor that was measured. The lack of data demonstrates a strong need for a high-quality study that uses nutritional intervention as a treatment for malnourished pediatric patients to determine the impact on those who need surgery. Particularly in the global context, where surgical resources are scarce, nutrition status is a modifiable risk factor that could improve survivability and lower the risk of complications.

**Crowd-Sourcing the Public's Perception of Surgical and Non-Surgical Interventions for
Erectile Dysfunction**

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Background: Given the rise in conditions predisposing to erectile dysfunction (ED) such as prostate cancer, coronary artery disease, sleep apnea, and diabetes, addressing ED with both medical and surgical therapy is necessary.

Aim: To quantify and assess the public's perception of currently available non-surgical interventions for ED in comparison to surgical treatments and outcomes.

Methods: A prospective cross-sectional study was conducted with random volunteers recruited through an internet crowd-sourcing service, Amazon Mechanical Turk© (Seattle, WA). Survey responses were crowd-sourced to analyze the prevalence of erectile dysfunction across the United States population and patient opinions regarding adverse outcomes of novel microsurgical treatment options for ED. Patient feelings towards existing surgical and non-surgical treatment options, as well as microsurgical intervention were also surveyed.

Outcomes: Prevalence of ED across age, household income, and ethnicity was investigated, and perception of interventions were measured as visual analog scale (VAS) scores.

Results: Study participants on average rated PDE5i treatment for mild ED at 58.38, moderate ED at 48.62, and severe ED at 50.54. Furthermore, patients rated microsurgical intervention

(VAS = 74.55) almost 20 points higher on the visual analog scale as compared to any other intervention. This demonstrated a significantly higher satisfaction with microsurgical intervention as opposed to PDE5i therapy (VAS = 52.51), vacuum erection device (VED) use (VAS = 39.77), or even surgical placement of a penile prosthesis (VAS = 54.82).

Clinical Implications: Patients are not satisfied with currently available medical interventions for ED and may be more receptive to surgical treatment options.

Strengths & Limitations: A potential limitation of using Amazon MTurk© may be that a single study participant could submit multiple survey responses or could circumvent the survey by using a random number generator. However, internet crowd-sourcing is still an extremely powerful tool in its ability to elucidate ideas and opinions from a diverse group of individuals that may otherwise be inaccessible. In addition, many of these participants may be more truthful in their disclosure of private health conditions such as ED under a veil of anonymity. Using this methodology significantly reduces costs, response-times, accuracy, and barriers to access difficult to reach patient populations.

Conclusion: Utility data indicates that many men undergoing non-surgical therapy for ED are unhappy with their current medical treatment yet are willing to consider surgical interventions. As such, novel interventions must become more accessible to patients and presented as realistic options for their treatment.

PREVENTIVE MEDICINE

LA Street Medicine & Outreach Inventory

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Goal: New initiatives have been funded and rapidly implemented by the city of Los Angeles and NGOs to address the lack of healthcare continuity for the 52,765 homeless in Los Angeles of which 39,396 are unsheltered. The goal is to establish the level of care and needs in each SPA.

Methods: We worked with Los Angeles County to gather an exhaustive list of healthcare providers and created a survey with experts in the field to identify the types of services provided, the frequency of care, and the population served by each provider in each SPA. We distributed surveys and plan to use heat mapping integrated into the software overlaid with the data from the point in time count.

Results: While the results have yet to be analyzed we expect that the biggest differences will not be in the quantity of providers per population or area, but rather the level of services rendered in each SPA.

Summary/ Conclusion: Our hope is these findings will help pinpoint for the county areas where additional providers are necessary. In addition, we hope to help connect street providers, institute trainings and create best practices, ensuring that all homeless in Los Angeles are receiving the same standards of care. Furthermore, we hope that demonstrating this need will aid in lobbying to change legislation that will empower providers with more agency to provide care outside four walls.

Identifying factors contributing to gaps in knowledge gained through *promotora*-led cervical cancer prevention intervention

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Background/ Purpose/ Goal/ Hypothesis: The incidence of cervical cancer has dropped since the introduction of the pap smear, and the HPV vaccine. Unfortunately, disparities exist and the incidence rate in Hispanic women is 44% higher than in non-Hispanic whites (American Cancer Society, 2015-2017). Promotora-led sessions are effective in raising Latina's knowledge and intention to treat, but gaps are seen in what women gain from sessions. This study identified contributing factors to gaps in knowledge in promotora-led educational sessions.

Methods: Latina women in Boyle Heights attended an educational promotora-led session on cervical cancer screening and HPV vaccination. Trained promotoras delivered an educational session in a culturally and linguistically appropriate manner, including use of a short film (Tamale Lesson). Women were asked to complete a pre and post-test survey to assess knowledge gained.

Results: A total of 117 women with a mean age of 42 attended cervical cancer education sessions. An overwhelming majority spoke Spanish as primary language (91%) and identified as housewives (72%). High school was the highest level of education for 44%. A large majority (84%) had some form of health insurance. There was an increase in knowledge scores ranging from 10%-39% from pre and post-test assessment, although differences were not significant. Younger women aged 18-45 had a lower baseline knowledge score compared to older women (aged 46-73).

Summary/ Conclusion: There is an increasing trend in pre to post-test knowledge after the session. This shows the importance of using a culturally sensitive approach to health education. Knowledge attainment was not proven different based on women's baseline education. Moving forward, efforts should be made to educate women, particularly those newly eligible with the new HPV vaccine recommendations.

**Patient Views on Preventing Hospital Readmissions
Andrew Rosales**

Research from AHRQ's Healthcare Cost and Utilization Project have found alarmingly high rates of hospital readmissions in the Medicare and adult, non-obstetric Medicaid populations. The high rates of readmissions are a major patient safety issue that have been associated with problems such as medical errors, misdiagnoses, and complications with prescription medications. There has been extensive research focused on developing practices and programs for reducing hospital readmissions with program development within hospital-based settings. However, evidence-based guidance for the primary care setting is comparatively lacking. The primary care setting is a well-suited and crucial practice in playing a vital role across the healthcare system in reducing readmission rates, unnecessary hospitalizations, lowering costs, and improving outcomes. To provide data on patient experiences for program development and implementation within the primary-care setting, telephonic interviews were conducted with recently hospitalized patients. These interviews were conducted to capture patient's perspectives on their initial hospitalizations, and the challenges in making the transition from receiving care in the hospital, to the primary care setting. The recorded interviews will serve as recommendations for program development within primary care sites to contribute to decreases in hospital readmission rates.

PSYCHIATRY

Social Instability in Mice as a Model for Depression

Alaniz, J., Featherstone, R., Siegel, S.

Introduction: Ketamine is a novel treatment for depression that has become more mainstream in recent years. The long-term effects of therapeutic ketamine administration are understudied despite its newfound popularity. Testing a therapy on model organisms is an important first step in verifying its efficacy and safety. Before moving onto using a mouse model to study the long-term effects of ketamine, we first must establish that we can create a stress model and then reverse the effects of stress using a therapy with a known effect. In this study, social instability in developing mice will induce a depressive state that can then be reversed or reduced by SSRI therapy.

Methods: Male B6 mice are assigned to two initial groups: stress and control. Stress group mice are housed in groups of 4 and are moved to cages containing novel mice twice a week for 15 weeks. Control group mice are housed identically but are not exposed to novel mice. After 15 weeks, the mice experience a month without cage swapping and then undergo baseline behavioral testing. Each group is then randomly divided into 2 more groups: one receiving SSRI and another receiving saline injections. The mice undergo behavioral testing again after administration of SSRI/saline. Behavioral testing includes forced swim test, open field test, elevated plus maze, social interaction, and sucrose preference. Upon completion of the second round of behavioral testing all mice will also undergo EEG analysis and a corticosterone immunoassay.

Results: Preliminary results for baseline behavioral testing do not show significant differences in forced swim test. Open field, elevated plus maze, social interaction, and sucrose preference are in progress and require further analysis and interpretation.

Conclusion: Behavioral differences would suggest that we have successfully achieved a depressive state in the stress group of mice. Further work is required to show that we can attenuate this state with SSRI therapy.

The Efficacy of Mindfulness Training in Medical Students

Kush Bhatt, Sahit Menon, Dr. Rael Cahn

Background: Mindfulness meditation has shown to alleviate anxiety and promote self-awareness and compassion in a variety of contexts. Its benefits for medical students has, however, not been fully explored. This study explored the efficacy of mindfulness in medical students.

Methods: Twenty-three 2nd year medical students participated in a 12 week, 6-session MBSR class. Students completed the Brief Symptom Inventory (BSI), Self-Compassion Survey (SCS), Five Factor Mindfulness Questionnaire (FFMQ), and Perceived Stress Scale (PSS) at pre-and post- intervention. Students also logged weekly time spent meditating outside of class.

Results: Analysis of surveys showed trend-level increase in mindfulness ($p=0.15$), but significant increases in self compassion ($p=0.005$), driven largely by increases in the self-kindness subscale ($p<0.05$). The BSI Positive Symptom Distress Index ($p<0.05$), and Global Severity Index ($p<.01$) demonstrated decreases driven largely by decreases in anxiety ($p<0.005$), somatization ($p<0.05$), interpersonal sensitivity ($p<0.05$). Furthermore, time spent practicing meditation correlated with improvements in perceived stress ($p<0.01$), enhanced self-compassion ($p<0.05$), strong trend-level increases in overall mindfulness ($p=0.06$) and significant increases in the nonreactivity subscale of the FFMQ ($p<0.05$).

Conclusions: This study evidences that mindfulness is beneficial for mental health and well-being of medical students. While mindfulness scores only increased marginally, participants reported increased self-compassion and self-kindness, and decreased anxiety, somatization, and interpersonal sensitivity. Further, time spent in mindfulness correlated with decreased

stress, increased self-compassion, and increased mindfulness components. Moving forward, larger sample size, control group, and additional psychometrics will allow for a more nuanced understanding of the changes which mindfulness may be achieving in students' psychological states.

Meditation and Self-Related Neural Processing **Ganesh Krishnamurthi, Rael Cahn M.D., PhD**

Goal: Meditation, a tradition that comprises numerous methods for training one's awareness, has been said to enhance practitioners' capacity for empathy. It is hypothesized that meditation may modulate self vs. other related processing and thereby create a diminished sense of self-identification in meditators compared to non-meditators (controls).

Methods: Long-term meditators (n=57) as well as controls (n=27) both engaged in meditative and non-meditative (mind-wandering) tasks while being monitored for EEG recordings. Furthermore, the meditator group was divided into 3 separate sub-groups based on style of practice: Vipassana meditation (V, n=18), the Himalayan Yoga tradition (H, n=23), and the Isha Yoga tradition (I, n=16). A *self vs other name* paradigm was invoked during the tasks to assess the subjects' level of reactivity to their own names in contrast to the names of others. These reactions were calibrated through event related potentials (ERP) markers, such as the p300 component amplitude for central parietal electrodes in the 400-1000 millisecond range.

Results: The self-name stimulus evoked a higher p300 amplitude in controls than in meditators as a whole ($p < .002$). Within the controls, the self-name stimulus evinced a higher p300 amplitude than the other-name stimulus ($p < .002$). However, in meditators, there was no statistically significant difference between the self and other-name induced p300 amplitudes ($p < 0.05$). Furthermore, none of the V, H, or I sub-groups displayed significant differences in p300 amplitudes in response to the self vs other name stimuli ($p < 0.05$).

Conclusions: The findings provide preliminary evidence that long-term meditation practice may modulate self vs. other-related processing. This effect also seems to be present in varying meditation traditions. Such alterations may lead to diminished self-identification in meditators, potentially resulting in greater levels of empathy.

Unmet Need for Electroconvulsive Therapy in a County-Based Outpatient Population **Dr. Marguerite Maguire, Ryan Ruppert and Dr. Isabel Lagomasino**

Background: Electroconvulsive therapy (ECT) has been well established as an effective treatment for severe depression, psychosis, and bipolar disorder (Lisanby, 2007), diseases that profoundly affect our outpatient, county-based population and incur significant morbidity, mortality, and healthcare utilization. Despite its efficacy, ECT is under-utilized (Wilkinson, 2017). The purpose of this study is to delineate the number and characteristics of patients that would benefit from ECT and analyze the barriers that exist to implementing an ECT program.

Methods: Residents in our adult outpatient psychiatry clinic were surveyed about the number of their patients who would benefit from ECT. These patients' charts were reviewed and general characteristics were extracted to better characterize the type and disease severity of patients' illnesses. Finally, key faculty were given a semi-structured narrative interview to understand barriers to implementing a county-based ECT program

Results: 16.7% of patients in our clinic had a diagnosis for which ECT was an appropriate treatment yet none were referred. These patients were severely mentally ill by many measures. Lack of ECT availability was the main reason cited for not referring patients. Barriers to starting county-based ECT practice include: lack of trained staff, lack of patient volume, lack of Medicare

coverage, poor Medi-Cal reimbursement for ECT, lack of space, cost of the ECT machine, lack of patient transportation, and the multiple evaluations mandated by California state law.

Discussion: Residents perceive a need for ECT yet rarely refer patients, primarily because they know no avenue for obtaining ECT. Many patients within the county system would benefit from ECT and they are often the most severely ill. Barriers to starting an ECT program include a lack of patient volume that likely stems from poor referrals. Future studies should examine whether increased education around ECT improves ECT referral.

PUBLIC HEALTH

Connecting uninsured emergency room patients to healthcare enrollment services at The Wellness Center

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Background: Since the LAC+USC ED cares for the most vulnerable populations in LA county, a referral pathway between the ED and The Wellness Center (TWC), which houses many preventative health-oriented non-profits, was created to connect this population to needed services, especially healthcare enrollment. This study evaluates whether this pathway is effective and seeks to describe the characteristics of patients who benefit from this pathway.

Methods: From April-July 2017, around 12,000 ED patients were referred to TWC. Those who presented to TWC were referred by a Navigator to Maternal and Child Health Access (MCHA) for healthcare enrollment and/or to other TWC partners. Demographic and referral data on these patients was recorded and merged with outcome data collected by MCHA in order to describe and compare the patient populations at different parts of the pathway.

Results: This pathway introduced 851 new patients to TWC and led to 225 successful healthcare program enrollments. The patients in this pathway were found to differ from the general population served by TWC during the same period in age, gender, and distance travelled to TWC. The type of healthcare patients expected to receive significantly impacted their likelihood of completing the enrollment process (54% My Health LA vs. 41% Medi-Cal, $p < .01$).

Conclusions: This data shows that the referral pathway from the ED to TWC linked new patients to TWC services, including healthcare enrollment. These patients represent a different demographic than other TWC clients, which may indicate that this pathway brought in some patients who would not have otherwise visited TWC. Observed differences in those patients who completed healthcare enrollment with MCHA are useful in understanding why patients may or may not pursue this service.

RADIATION ONCOLOGY

Impact of Time to Treatment Initiation on Overall Survival in Patients with Squamous Cell Carcinoma of the Anus: An Analysis of the National Cancer Database

Dennis Chen BSE, Eugene Lin MD, Stella Yoo MD, Shelly Bian MD

Background: Due to the stigma and health disparities associated with anal squamous cell carcinoma (SCCA), there has been concern over whether treatment delays have an impact on survival outcomes. We aim to determine if time to treatment initiation (TTI) is a predictor of overall survival (OS) in patients with SCCA.

Methods: We collected data from the National Cancer Database (NCDB) for all patients with nonmetastatic SCCA treated with standard chemoradiotherapy (CRT). Our covariate of interest was TTI, defined as the number of days from diagnosis to the first day of definitive chemoradiation. Our endpoint was overall survival, defined as the number of days from diagnosis to the time of death or last contact.

Results: We identified 17,547 patients for our study. A Kaplan-Meier analysis demonstrated that TTI intervals less than two weeks, or greater than two months, were associated with poorer OS when compared to TTI intervals between two weeks and two months. A cubic spline modeling of TTI based on a Cox regression model predicts a nonlinear relationship between TTI and OS, suggesting that an ideal range of TTI intervals may exist.

Conclusion: Our analysis suggests that preventing treatment delays may be an important consideration for oncologists treating SCCA. However, a very short TTI may also be detrimental if it sacrifices thorough and proper planning.

RADIOLOGY

Quantitative magnetic resonance imaging (q-MRI) for the assessment of soft-tissue sarcoma necrosis, viable tumor volume, and treatment response

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Background: Soft-tissue sarcomas (STS) are a heterogeneous class of tumors that exhibit varying degrees of cellularity, resulting in unique challenges in the radiographic assessment of treatment response. Conventional markers such as tumor diameter (RECIST criteria) are often unhelpful, as necrosis, intratumoral hemorrhage, inflammatory infiltrate, and cystic degeneration can all contribute to tumor size and confound estimations of viable tumor volume. This makes it difficult to evaluate for early response to therapy via standard imaging modalities and can result in premature termination of treatment. Our study employs a novel approach to estimate viable tumor volume and percent necrosis using whole tumor volume quantitative magnetic resonance imaging (q-MRI).

Methods: For each study tumor (n=8), digitally subtracted post- minus pre-contrast T1 fat saturation scans obtained pre-and post-neoadjuvant chemotherapy (NAC) therapy were manually segmented in order to generate histograms comparing whole tumor volume to normalized signal intensities. Subsequent analysis allowed us to estimate the viable tumor volume from percent necrosis relative to whole tumor enhancement volume.

Results: Q-MRI was able to predict responders versus non-responders for both percent necrosis and viable tumor volume calculations when using a constant cutoff value for signal intensity to define necrosis on both pre- and post-NAC scans ($p=0.05$). Preliminary analysis suggests that radiomic texture analysis may also be useful in predicting treatment response based on tumor heterogeneity.

Conclusions: Q-MRI of the whole tumor volume can be used to estimate percent necrosis and viable tumor volume and may provide a more objective assessment of early response to treatment in STS. Decreased attenuation or contrast enhancement may more accurately predict tumor response than relying on size-based criteria alone.

Correlating Radiomics Features to Epigenomics in Clear-Cell Renal Cell Carcinoma

Derek Liu, Bino Varghese, Steven Cen, Christopher Lau, Kim Siegmund, Gangning Liang, Vinay Duddalwar

Background: Despite increases in abdominal imaging leading to earlier detection and advances in targeted therapies, survival rates of renal cell carcinoma (RCC) have remained stagnant. Epigenomic studies have led to the discovery of many prognostic markers and insights into the pathogenesis of clear cell renal cell carcinoma (ccRCC), the most common subtype of RCC. However, these discoveries have not been applicable, as genetic studies are often confounded by tumor heterogeneity. Radiomics is the high-throughput quantitative analysis of standard-of-care images. Relying on the principle that molecular changes lead to observable phenotypes, we hope to identify radioepigenomic associations in order to develop radiomics as surrogate markers for predicting prognosis, treatment response, and more.

Methods: 78 patients have been retrospectively identified from a prospectively-maintained surgical database at USC. All patients had histologically-confirmed ccRCC, with CT imaging and tumor tissue available. CT images were analyzed using nine texture methods developed by the USC Radiomics lab, and DNA methylation was analyzed using the Illuminati MethylationEPIC array. Nine canonical genetic pathways implicated in ccRCC pathogenesis were identified. Each pathway and radiomic method were entered into a Gene Set Enrichment Analysis, using the t-value as the statistic.

Results: GSEA calculates an enrichment score with an associated p-value, and is an indication of the relative significance of a defined set of genes. Statistically significant associations between a genetic pathway and a texture method indicates possible predictive value or underlying tumor mechanisms.

Summary: Radioepigenomics represents an opportunity for new decision-making tools based on standard-of-care imaging techniques.

MRI of the Relationship Between White-Matter Hyperintensities, Hemosiderin Deposition and Paravascular Spaces for a Mechanism of Brain Injury in Vascular Cognitive Impairment and Alzheimer's Disease

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Background: Paravascular spaces (PVSs) are fluid-filled channels that surround the blood vessels penetrating brain parenchyma and they are thought to be involved in the glymphatic system. It has been proposed that an impairment in this system may play a role in neurodegeneration. We hypothesize that decreased cerebral blood flow due to arterial aging and stiffness, coupled with a disrupted blood-brain barrier (BBB), results in fibrin and hemosiderin deposition (HD) into PVSs, resulting in tissue injury, astrogliosis, and demyelination of the surrounding white matter.

Methods: 76 subjects with vascular risk factors from the USC Alzheimer's Disease Research Center were studied. Young and old healthy subjects were used as controls. MRI scans were performed on a 3T scanner. PVSs were measured using a validated clinical 5-point visual rating scale on T2-weighted images. The degree of white matter hyperintensities (WMH) were qualitatively calculated using the Fazekas scale and their volume was quantitatively measured for all subjects on FLAIR. The degree of hemosiderin deposition in the basal ganglia was also calculated using high-resolution SWI sequences. The BBB permeability was assessed using dynamic contrast-enhanced MRI with administration of Gd-DTPA. Spearman's correlation coefficient was used for correlation between PVSs, WMH, and HD.

Results: HD was significantly correlated with BBB permeability (Spearman's $\rho = 0.574$, $p < 0.001$), enlarged PVSs (Spearman's $\rho = 0.245$, $p = 0.038$), and WMHs (Spearman's $\rho = 0.260$, $p = 0.027$). WMHs and enlarged PVSs were also significantly correlated (Spearman's $\rho = 0.346$, $p = 0.002$).

Conclusions: In this study, we demonstrated a relationship between BBB permeability, hemosiderin deposition, enlargement of PVSs, and WMHs in subjects with vascular risk factors. These findings may represent early biomarkers for neurodegeneration.

Identification of molecular subgroups of medulloblastoma using noninvasive 3T Magnetic Resonance Spectroscopy

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Background: Medulloblastomas can be categorized into 4 molecular subgroups with differing clinical characteristics as follows: WNT, SHH, Group 3, and Group 4. Magnetic resonance spectroscopy (MRS) is a widely available, noninvasive tool that is used to determine the metabolic characteristics of tumors and provide diagnostic information without the need for tumor tissue. 3T MRS has superior resolution compared to 1.5T MRS, but limited research is available that compares the effectiveness of the technique to characterize subgroups. In this study, we investigated the hypothesis that metabolite concentrations measured by 3T and 1.5T MRS would distinguish between molecular subgroups of medulloblastoma and allow accurate subgroup determination.

Methods: Frozen tumor tissues from 100 patients with medulloblastoma at CHLA were studied for molecular subgroup determination. MRS on either a 1.5T MR or 3T MR system was used to measure metabolites across subgroups. Levels of 27 metabolites and lipid signals were analyzed to determine those that were the most discriminant for subgroups in order to construct a multivariable classifier for distinguishing between medulloblastomas. Paired student's T-test was used to generate preliminary findings and identify trends.

Results: Preliminary analysis indicates that medulloblastoma subgroup WNT can be distinguished from Group 3/4 tumors by glycine levels and from SHH tumors by choline and myo-inositol concentrations. SHH tumors show lower levels of choline and glycine than Group 3/4 medulloblastomas. These initial findings are based upon a small cohort of patients (Gr 3/4: n=9, SHH: n=3, WNT: n=4).

Conclusions: The data show that medulloblastoma molecular subgroups have distinct spectral features based on 3T MRS. Analysis of MRS for the remaining patients will be required to confirm these preliminary findings and verify the utility of MRS for subgroup determination and treatment stratification in children with medulloblastoma.

SURGERY

Clinical and Imaging Characteristics of Pure Palpable Ductal Carcinoma In-Situ (pDCIS)

Nina Balac, Robert M. Tungate, Julie E. Lang MD

Background: Pure palpable DCIS (pDCIS) is subtype of DCIS, a pre-cancerous hyperplasia of breast lactiferous duct cells that is confined to the basement membrane. pDCIS is important to recognize as it presents differently than DCIS and is associated with more aggressive pathological features and higher risks for local treatment failure and recurrence. This project aims to delineate the relationship between various characteristics of pDCIS and recurrence rates in order to help guide treatment decisions.

Methods: This retrospective chart review used an electronic database of female patients (aged 18-80) diagnosed with DCIS on core biopsy at USC Norris Cancer Center and LAC+USC Medical Center between 1/2006-12/2013. The variables collected include age, personal and family history of cancer, receptor status, pathology and imaging factors, recurrences, and surgical and hormonal treatments. Independent t tests and chi squared tests will be used to study the association of DCIS with continuous and categorical variables respectively, while Kaplan Meier analysis will be used to evaluate survival. The pDCIS results will be compared to the asymptomatic DCIS control group. In this study, pure DCIS is defined as cases diagnosed as such both pre and post-operatively, with no component of invasive disease.

Results: The database comprised of 705 patients, 99 of whom were diagnosed with DCIS on core biopsy. Post-operatively, 91 patients were diagnosed with pure DCIS and 8 patients with invasive breast cancers. Of the 91 (pre/post-op DCIS), 28 were pDCIS and 63 were asymptomatic DCIS. Of the 8 (pre-op DCIS, post-op invasive breast cancer), 3 were pDCIS and 5 were asymptomatic DCIS. Distal recurrence was found in 1 pDCIS patient and local recurrence was found in 1 asymptomatic DCIS patient. Statistical analysis is in the process of being completed.

Conclusion: A greater understanding of the recurrence rate of pDCIS and additional variables that may influence recurrence risk holds great clinical value and prognostic significance. Such information can help inform treatment decisions and prevent overtreatment.

Resuscitative Endovascular Balloon Occlusion of the Aorta, a Retrospective Analysis of the National Trauma Data Bank

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Background: Controlling traumatic bleeding is an essential initial step in any trauma setting especially when 40% of patients die before hemorrhage control is achieved. Resuscitative endovascular balloon occlusion of the aorta (REBOA) offers another potential for hemorrhage control with the additional benefit of it being minimally invasive. There are currently no clear indications for REBOA over other hemorrhage control methods. Thus analysis of REBOA outcomes may provide better understanding of indications for the use for REBOA. The goal of the study is to identify patient conditions that can be indication REBOA over other techniques.

Methods: We conducted a retrospective study from the 2016 National Trauma Data Bank (NTBE). Patients who underwent REBOA and were 18 and older were included for the analysis. Univariate analysis was performed to identify whether injury type, time to REBOA, systolic blood pressure (SBP) affected the REBOA mortality.

Results: A total of 71 patients who underwent REBOA were included in the preliminary analysis. The median age was 48 (IQR: 29-62) and 73% were male patients. Patients with blunt injury had a mortality rate of 46% (N = 61) and patients with penetrating injury had a mortality rate of 38% (N = 8). The mean time to REBOA was 4.3 hours for patients survived and 3.3 hours for patients who did not survive. The median SBP for patients who survived was 120 while the median SBP for patients who did not survive was 94.

Conclusion: REBOA appears to have slightly better outcomes for penetrating trauma and for patients who had shorter slightly longer time to REBOA. SBP was higher for the patients who underwent REBOA and survived and thus could be to estimate success rate of REBOA. Further analysis comparing REBOA patients to more classic hemorrhage control techniques (such as resuscitative thoracotomy) may provide more insight into specific indications for REBOA.

Effects of Comorbid Psychiatric Disorder on Weight Loss Outcomes After Bariatric Surgery

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Background: Although it has been shown that anxiety and depression are strongly associated with weight gain, little research has been done on how and to what extent comorbid psychiatric disorders affect the success of bariatric surgery. This study will examine the effects of anxiety and depression on post-operative weight loss, surgical success, and perceived quality of life.

Methods: Data was collected via retrospective chart review for 515 patients who underwent laparoscopic sleeve gastrectomy and Roux-en-Y gastric bypass from August 2002 to November 2017. We then conducted telephone surveys which included questions about demographic and personal information, preoperative and postoperative mental health, and a standardized satisfaction survey.

Results: We found post-operative improvement in depression and anxiety in over half of patients (56.4%, 51.7%), as well as a significant association between improvement in depressive symptoms and patient satisfaction with surgical outcome ($P = 0.003$), job satisfaction ($P = 0.013$), and satisfaction with self ($P = 0.003$). A pre-operative diagnosis of depression or anxiety was correlated with slightly higher % excess weight loss ($P = 0.040$, $P = 0.026$); however, depression was negatively correlated with surgical success ($P = 0.048$). There was no association between improved anxiety symptoms and any other characteristic.

Conclusions: These data suggest that there is indeed a relationship between depression and weight loss following bariatric surgery. Although we cannot reach any definitive conclusions about the predictive power of comorbid psychiatric illness on surgical success, we hope that further research will lead to more effective pre-operative screening, post-operative care, and improved overall outcomes for individuals struggling with morbid obesity.

Assessment of the Global Practice of Living Donor Liver Transplantation: Comparison of U.S. and International Programs

C. Conrad, M. Kim, C. Lane, P. Singh, C. Niemann, L. Sher, Y. Genyk, and J. Emamaullee

Background: As programs have become more experienced with living donor liver transplantation (LDLT), technical hurdles have been overcome and superior graft and patient survival has been reported. While surgical aspects of LDLT are well established, other parameters regarding acceptable donor and recipient selection criteria are not well defined.

Study Design: The WHO Transplant Observatory was analyzed to determine global prevalence of LDLT. A 34 question survey was designed to address common aspects of donor and recipient selection in LDLT and distributed globally to individuals associated with LDLT programs in 2018.

Results: There were 125 survey respondents representing 41 countries. The U.S. Program (USP) response rate was 97.7%. At least one respondent was obtained from 94.9% of countries with ≥ 10 LDLT cases in 2016 (International Programs, "IP"). USP were more likely to have

defined donor age criteria (93.1% vs. 82.4% for IP, $p=0.03$) and recipient MELD ranges (76.7% vs. 43.9% for IP, $p<0.01$). IP were more likely to consider LD of any blood group (66.7% vs. 36.9% for USP, $p=0.02$) or consider LDLT for fulminant recipients (61.0% vs. 27.9% for USP, $p<0.01$). Overall, 68% of programs have defined donor BMI ranges (median 18-32), and the mean acceptable macrosteatosis cutoff was higher for IP (19.0% vs. 14.9%, $p=0.02$). USP were more likely to consider anonymous donors (65.1% vs. 36.6%, $p=0.003$). There were no differences in willingness to consider complex anatomical variations. Overall, 79.5% of programs perform LD surgery via an open approach ($p=NS$).

Conclusions: This study represents the first comprehensive global analysis of living donor selection and utilization for LDLT. While there are considerable global variations in LDLT practice patterns largely due to availability of deceased donor organs, this study has identified key aspects of donor selection criteria and utilization that can establish the standard of care for this procedure.

The Role of a Surveillance Echocardiogram Before Discharge in Low-Risk Pediatric Cardiac Surgery Patients

Matt Cummins, Ram Kumar Subramanyan, MD, PhD, Department of Surgery, KSOM

Goal: Current clinical guidelines require a pre-discharge surveillance echocardiogram in all pediatric patients leaving the hospital after receiving cardiac surgery. We initiated this study to examine the efficacy and utility for this procedure in low-risk patients.

Methods: This retrospective study involved low-risk cardiac surgery patients' charts ranging from 2007 to 2017. These patients included procedures for ASD/VSD Repair, PDA Closure, and PVR Repair. Key data parameters collected were: change in medication, delay in discharge, intervention, subsequent cardiac event, and patient mortality. The various groups of procedures and their clinical outcomes will be assessed for statistical significance, comparing patients who did receive the pre-discharge echo vs. those that did not.

Results: We expect there to be no statistical significance between clinical outcomes and changes in medical management between the patients that received the echo vs. those that did not across all groups of low-risk procedures.

Conclusion: Upon completion of this study, we anticipate changes in current clinical guidelines regarding pre-discharge echocardiography in pediatric cardiac surgery patients, eliminating this practice from the management of low-risk patients.

Chest Tube Output and the Need for Thoracotomy

Matthew Demarest, Eevee Hojberg, Marianne Marchini Reitz, Kenji Inaba

Background/Introduction: The current standard for treatment of thoracic trauma dictates that when chest tube blood output exceeds 1000-1500mL an urgent, exploratory thoracotomy is indicated. This treatment practice has its roots in the battlefield hospitals of the Second World War. However, few studies have attempted to ground this practice in evidence. Our objective is to clarify the cut point in chest tube blood output where urgent exploratory thoracotomy would be beneficial in both blunt and penetrating trauma.

Methods: This is a retrospective cohort study of adults who had a chest tube placed in the Emergency Department (ED) between January 2015 and December 2018. Patients who underwent an urgent, exploratory thoracotomy will be compared to patients who did not undergo any thoracotomy. Patients that underwent a resuscitative thoracotomy in the ED and patients that had an exploratory thoracotomy after forty-eight hours of admission were excluded.

The primary outcome of interest was chest tube output in mL. In addition, for patients who underwent thoracotomy, the chest tube output in mL at the time the decision was made by the physician to go to surgery was recorded.

Results: Of the patients analyzed so far, 258 patients did not undergo a thoracotomy after chest tube placement in the ED compared with 25 patients who did. For the thoracotomy group, the mean initial chest tube output was 746.32 mL compared with 135.77 mL for the no thoracotomy group. For patients who underwent thoracotomy, the decision to go to the operating room was made at an average chest tube blood output of 1062.75 mL. Further analysis will be performed to determine confidence intervals and statistical significance.

Conclusion: When complete, our analysis will likely contradict the notion that chest tube blood output should be the sole indicator for urgent, exploratory thoracotomy. A more nuanced approach which considers radiograph findings, mechanism of injury, and hypotensive status should be considered when approaching thoracic trauma patients.

Diagnostic Laparoscopy for Conclusive Diagnosis in Undifferentiated Chronic Abdominal Pain

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*First author for purposes of RSP

Goal: Patients suffering from undifferentiated chronic abdominal pain (UCAP) often undergo extensive and inconclusive workup when standard imaging reveals no definitive pathology. Pain management without a definitive diagnosis is compounded by anxiety lasting many months to years. This study will assess the utility of Diagnostic Laparoscopy (DL) as a tool for definitive diagnosis for UCAP while exploring patient satisfaction.

Methods: Twenty-nine patients undergoing DL for UCAP (between July 2009 and November 2017) were included in a retrospective review. Participant age ranged from 20 to 81 (avg = 48), 69% were female, 31% male, 53% had suffered from UCAP for at least 12 months, and time to last follow-up ranged from 1 week to 6 years (avg = 19 months). Later, patients were surveyed by phone regarding pain management and further testing.

Results: We found that prior to DL, patients had already undergone an average of 3.4 imaging studies (e.g. CT, endoscopy, ultrasound, MRI) without receiving a clear diagnosis. Findings obtained during DL included adhesions (62%), hernias (24%), abdominal wall lipoma (7%), and inflamed appendix (3%), and therapeutic procedures subsequently performed included adhesiolysis (55%), hernia repair (17%), lipomectomy (7%), and appendectomy (3%). Among patients surveyed, none had undergone further surgical intervention nor received new diagnoses since DL. Furthermore, 91% were satisfied with post-operative outcomes and 81% said they would undergo DL again with their outcome in mind. Finally, abdominal pain recurred in only 36%.

Conclusion: A total of 93% of exploratory procedures yielded a positive finding demonstrating the diagnostic efficacy of laparoscopy. In addition, a vast majority of patients reported satisfaction and willingness to undergo the procedure again. These data suggest that patients suffering from chronic abdominal pain should be candidates for diagnostic laparoscopy earlier in their workup.

Stimulant Abuse in Burn Patients: Clinical Outcomes linked with Comorbidity

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Introduction: Stimulant (cocaine, methamphetamine, amphetamine) abuse compromises the peripheral vasculature through endothelial injury. In combination with the physiologic derangements seen in burn injuries, patients abusing stimulants may have additional impairments in wound healing. Our objective was to examine the outcomes between burn patients with positive urinary toxicology screens for stimulants (ST(+)) compared to controls (ST(-)). We hypothesized that ST(+) patients were at increased risk for mortality and wound healing complications.

Methods: A retrospective review from July 1st, 2015 to July 1st, 2018 was performed at an ABA-verified burn center. ST(+) and ST(-) patients who sustained burn injuries were identified and matched by age and TBSA. Patient and burn characteristics were recorded, including tobacco use, nutritional status on admission (prealbumin and albumin), presence of full-thickness burns (FTB), and inhalation injury (INHI). The primary outcome was mortality, and secondary outcomes included total length of stay (LOS), ICU LOS, ventilator days, and need for surgery (grafting).

Results: In total, 130 ST(+) and 133 ST(-) patients were identified. There were no significant differences in age (40.9±13.5 years vs. 39.2±23.7 years, P=0.46), presence of FTB (24.8% vs. 15.0%, P=0.16) INHI (12.3% vs. 9.0%, P=0.39), or nutritional status (prealbumin: 17.3±6.1 mg/dL vs. 17.1±12.7 mg/dL, P=0.66; albumin: 3.5±0.6 g/dL vs. 3.6±0.7 g/dL, P=0.45). There were no differences in mortality (6.1% vs. 4.5%, P=0.55), ICU LOS (9.3±16.5 days vs. 10.2±20.9 days, P=0.81), ventilator days (10.6±18.0 days vs. 11.0±15.1 days, P=0.93), wound infections (15.4% vs. 23.9%, P=0.07), or wound conversion (6.9% vs. 3.0%, P=0.14). ST(+) patients had a significantly longer LOS (15.0±16.9 days vs. 10.7±17.3 days, P=0.04), greater tobacco use (56.9% vs. 18.0%, P=0.00001), and greater need for grafting (54.6% vs. 33.1%, P=0.0004). Linear and logistic regressions did not show a significant effect of stimulant abuse on any of the outcomes.

Conclusions: ST(+) patients require more hospital resources – surgical operations and hospital days - than ST(-) patients. The increased need for surgical intervention may partially explain the increase in hospital days, in addition to the observation that ST(+) patients had more complex disposition issues than ST(-) patients. Although there were no significant differences in wound healing outcomes, a prospective study is needed to better define these differences, if any exist.

Applicability of Research to Practice: ST(+) patients required more operations and hospital days than ST(-) patients. Earlier surgical intervention, in addition to social work support, may reduce their length of stay and reduce the costs of their care.

External Funding: None.

Urinary Bladder Matrix for the Treatment of Chronic Radiation-induced Skin Damage

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Background: Radiation therapy is a commonly-used treatment modality for solid tumors. However, a fraction of patients will develop chronic, progressive skin damage secondary to treatment. These effects include ulceration, fibrosis, edema, and necrosis. Several case reports have described porcine-derived urinary bladder matrix (UBM) as an effective adjunctive treatment for nonhealing wounds; however, no experimental data exists to support using UBM

for nonhealing radiation wounds. We aim to determine whether topical UBM is an effective treatment for chronic radiation-induced skin damage.

Methods: C56BL/6 mice were irradiated with 5.5Gy/day over the right mid-dorsal region for 5 consecutive days and allowed to recuperate for 6 weeks. Mice were anesthetized with 2.5% isoflurane prior to creation of an 8mm in diameter full-thickness skin wound in the irradiated area. Wounds were stented in place. The treatment group received 2.5mg topical UBM, followed by UBM wound sheet. The control group received saline and non-adhering wound dressing. Treatment was reapplied weekly. Photographs of the wounds were taken, and percentage of wound closure was tracked using ImageJ. Wounds were harvested for histological staining and RT-qPCR analysis for TGF- β levels.

Results: 47 mice were included in this experiment. The healing rate of wounds treated with UBM were compared against control over 21 days. The data showed no significant differences in healing rates between experimental and control groups. However, by day 21 all wounds in control animals (n=6) were fully contracted, while one wound in the experimental group (n=6) remained partially uncontracted (p=0.018). We plan to have RT-qPCR data available for the poster presentation.

Conclusion: These findings do not support using UBM as a therapy for chronic radiation-induced skin damage. We plan to repeat this experiment while using a different mouse strain, keeping wounds moist at all times with a hydrogel dressing, and modifying our radiation protocol.

Lobectomy to Wedge Resection Ratio as a Quality Indicator in Treatment of Early Stage NSCLC

Dustin Lieu, Li Ding, Elizabeth A. David, Scott M. Atay, P. Michael McFadden, Anthony W. Kim

Background: Surgery remains the mainstay of therapy for early stage NSCLC with lobectomy being the standard operation. Non-anatomic wedge resections are performed occasionally for a variety of reasons with worse oncologic outcomes. Our objective is to assess the use of lobectomies relative to wedge resections, including the ratio (L:W), for early stage NSCLC as a quality indicator.

Methods: The National Cancer Database (NCDB) Participant User Data File was queried to identify patients ≥ 18 diagnosed with clinical Stage I NSCLC ($T_1N_0M_0$, and $T_{2a}N_0M_0 < 4$ cm) undergoing wedge resection or lobectomy in 2010. Hospitals with ≥ 1 wedge resection and ≥ 1 lobectomy in 2010 were divided into quartiles according to L:W ratios. Multivariable Cox proportional hazard modeling was used to identify factors associated with overall mortality.

Results: 7451 patients from 634 institutions were identified as having Stage I NSCLC undergoing non-anatomic wedge resection or lobectomy. L:W quartile was not an independent predictor of survival after adjusting for variables of age, sex, income, insurance type, facility type, Charlson-Deyo score, histology, lobectomy volume, number of lymph nodes resected, and tumor size. Hazard ratios when compared to L:W first quartile were 1.082 (95% CI: 0.928, 1.260, p = 0.3052) for second quartile, 1.012 (95% CI: 0.868, 1.181, p = 0.8775) for third quartile, and 1.022 (95% CI: 0.874, 1.195, p = 0.7890) for the fourth quartile.

Conclusion: The ratio of institutional lobectomies to wedge resections does not appear to be associated with 5-year survival of patients undergoing lobectomies for early stage NSCLC. Further research will be focus on refining the cohorts used for comparison in order to determine the relationship between lobectomy and wedge resection volumes and surgical outcomes. We plan on focusing on the relationship between perioperative outcomes and lobectomy and wedge resection volumes as well as the impact of overall hospital lobectomy volume on wedge resection outcomes.

Magnetic Sphincter Augmentation for Gastroesophageal Reflux Disease After Failed Anti-Reflux Procedure

Kimberly Shemanski, Evan T. Alicuben, Jamil S. Samaan, Nikolai A. Bildzukewicz, Kamran Samakar, Adrian Dobrowolsky, **Jeffrey Liu**, Caitlin C. Houghton, Kulmeet Sandhu, John C. Lipham

Conflict of Interest: Dr. Lipham and Dr. Bildzukewicz are consultants for Torax Medical.

Introduction: The use of the magnetic sphincter augmentation (LINX) device has become more prevalent and while the initial selection criteria were very narrow, increasing experiences have demonstrated safety and efficacy in other GERD populations. Data is still lacking for use in patients that have failed previous anti-reflux procedures. Our aim was to evaluate outcomes in this group of patients.

Methods: A retrospective review was performed for all patients who had LINX device placement from 2012-2017. All patients with previous anti-reflux procedures were included, and their post-operative outcomes were evaluated.

Results: 13 of 389 patients reviewed met inclusion criteria. There were 6 males and 7 females with a median age of 51 (range 31-74) and a median BMI of 26.9 (range 18.5-44.3). 6 patients had a previous Toupet or Nissen fundoplication, 2 patients had previous transoral incisionless fundoplication and 4 patients had a previous Stretta procedure.

All patients presented with recurrent reflux symptoms. All procedures were performed laparoscopically with 8 patients undergoing hiatal hernia repair with a median hernia size of 3 cm. At a median follow up of 2 years, 8 patients' symptoms improved, 4 patients' symptoms resolved, and 1 patient's symptoms were unchanged. DeMeester scores improved from median 20.8 pre-op to 2.75 post-op and there have been no hiatal hernia recurrences. 3 patients have required dilation for dysphagia, and 1 patient has had the device removed.

Conclusions: LINX devices can be placed safely in patients after failed anti-reflux procedures and results in adequate symptom control with low hiatal hernia recurrence.

Safety and Efficacy of Robotic-Assisted Repair of Inguinal Hernia **Marissa Maas**

INTRODUCTION: Robotic technology provides another tool in the arsenal of the minimally-invasive surgeon with emerging uses for general surgical procedures. Given the limited working space in the pelvis, the increased dexterity offered by the robot may prove beneficial in the repair of inguinal hernias. Currently, there are only a few studies examining the use of robotic technology for inguinal hernia repair. Our aim was to detail our experience with robotic inguinal hernia repair at an academic institution.

METHODS AND PROCEDURES: We performed a retrospective chart review on all patients who had undergone robotic inguinal hernia repair from March 2015 to April 2018. Preoperative demographics, operative characteristics, and postoperative outcomes were analyzed using RStudio software. The primary outcome was hernia recurrence.

RESULTS: There were 43 patients, 40 of which were male. The patients had a mean age of 56 years (range 18-85 years). Thirteen of the patients had bilateral hernias. The mean patient BMI was 26.4 (range 17.5-42.3). All operations were performed transabdominally and all but one included fixation of synthetic polypropylene mesh. Regarding mesh attachment, 23 patients had suture only, 14 had tacks only, 1 had a combination of suture and tacks, 2 had suture and glue, 2 had tacks and glue. The mean patient in-room time was 4.0 hours, mean operative time was 2.9 hours, and the mean robot docked time was 2.0 hours. Thirty-two patients were discharged on the day of surgery. One patient was kept overnight for treatment of urinary retention. The other 10 patients were kept for one or two nights for observation. There was one bladder injury discovered intraoperatively, which was primarily repaired. Post-operatively, none of the patients

had wound infections, 11 developed seromas, and one patient had a groin hematoma. At a median follow up of 37.5 days, there was one recurrence. This was discovered incidentally during a urological procedure and was repaired.

CONCLUSIONS: Robotic surgery in inguinal repair is safe and effective and should be considered a viable alternative to laparoscopic and open repairs. Longer term studies will further define the role of this technology.

Non-Fatal Gunshot Wounds with Retained Bullet Fragments: Epidemiology and Outcomes

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Background: The optimal management for a retained bullet fragment (RBF) is unclear. The aim of this study was to characterize the epidemiology and outcomes of patients sustaining a non-fatal gunshot wound (GSW) with an RBF.

Methods: The LAC+USC Trauma Registry was utilized to identify all patients sustaining a GSW (07/01/2015-06/31/2016) with an RBF. Clinical injury demographics, imaging, interventions, RBF management, and outcomes were analyzed.

Results: During the study period, 344 patients were admitted after sustaining a GSW; 298 (86.7%) of these were non-fatal and 225 (75.5%) had an RBF at presentation. During the index admission, 23 (10.2%) had complete RBF removal, 35 (15.6%) had partial RBF removal, and 167 (74.2%) had no removal. The main indication for RBF removal was easy access intraoperatively (66.1%), followed by superficial location of RBF (17.2%). There were no statistically significant differences in indications for RBF removal between those who underwent complete removal and those who underwent partial removal. Overall, 202 (89.3%) patients were discharged with an RBF; the mean age was 29.5 ± 10.6 years, 92.5% were male, with a mean ISS of 8.6 ± 9.4 , and median GCS of 15. 116 received follow-up and of these, 13 (11.2%) returned to the ED or outpatient clinic with a complication specifically related to the RBF [infection (n=4, 3.4%), pain (n=7, 6.0%), bone nonunion (n=1, 0.9%) and bone erosion (n=1, 0.9%)], with a mean time to complication of 130.2 ± 137.6 days. Four (3.4%) required RBF removal with a mean time to removal of 146.0 ± 223.4 days.

Conclusion: RBFs are common after a GSW. During the index admission, only a minority are removed. While the rate of patients returning to the hospital with an RBF related complication requiring removal is low, as the overall RBF rate is high, and with data regarding lead toxicity accumulating, further follow-up studies are warranted.

An Experimental Animal Model for Head and Neck Lymphedema

Connie Paik, BS, Giulia Daneshgaran, BS, Michael N. Cooper, BA, Wan Jiao, MD PhD, Ivett Vorobyova, BS, Tea Jashashvili, MD PhD, Yang Chai, DDS PhD, Alex K. Wong, MD

Background: Head and neck lymphedema (HNL) is a disease that affects over 75% of patients treated for head and neck cancer, impairing vision, breathing, and quality of life. Therapeutic approaches to HNL have been understudied and to date, no animal model for HNL has been cited in the literature. This study aims to establish the first reproducible animal model for HNL.

Methods: 36 rats were split into 2 groups: 1) 18 experimental animal received a combined lymphatic injury protocol, involving a circumferential intradermal incision with superficial and deep cervical lymphadenectomy followed by cervical irradiation, 2) 18 control animals received sham surgery. Fluorescence imaging was used to identify green fluorescence protein (GFP)

expressing cervical lymphatics (Figure). Neck circumference (NC), cheek to cheek distance (CCD), and MRI fat volume of the head and neck region were measured on days 0, 15, 30, and 60. On day 60, indocyanine green (ICG) lymphography was performed. Rats were then sacrificed for histological and immunohistochemical (IHC) analysis. Student's t-test was used to compare outcomes between groups and between timepoints.

Results: Postsurgical lymphedema was observed in 94% of experimental animals (17/18). Compared to controls, experimental animals had increased changes in NC, CCD, and MRI fat volume in the head and neck region by 880% ($P < 0.0001$), 160% ($P = 0.0003$), and 160% ($P = 0.04$), respectively. ICG lymphography also demonstrated slower lymphatic drainage ($P < 0.05$). Histology and IHC revealed subcutaneous tissue expansion (103% greater hypodermal thickness ($P < 0.0001$) and 33% greater dermal thickness ($P = 0.01$) vs. control) accompanied by increased chronic inflammatory markers (190% greater CD3+ cell density ($P < 0.0001$) vs. control).

Conclusion: The data reflects changes consistent with postsurgical HNL in the experimental group. We conclude that the combined lymphatic injury protocol creates a reproducible model of HNL. This model can serve to investigate future pharmacologic therapies for HNL.

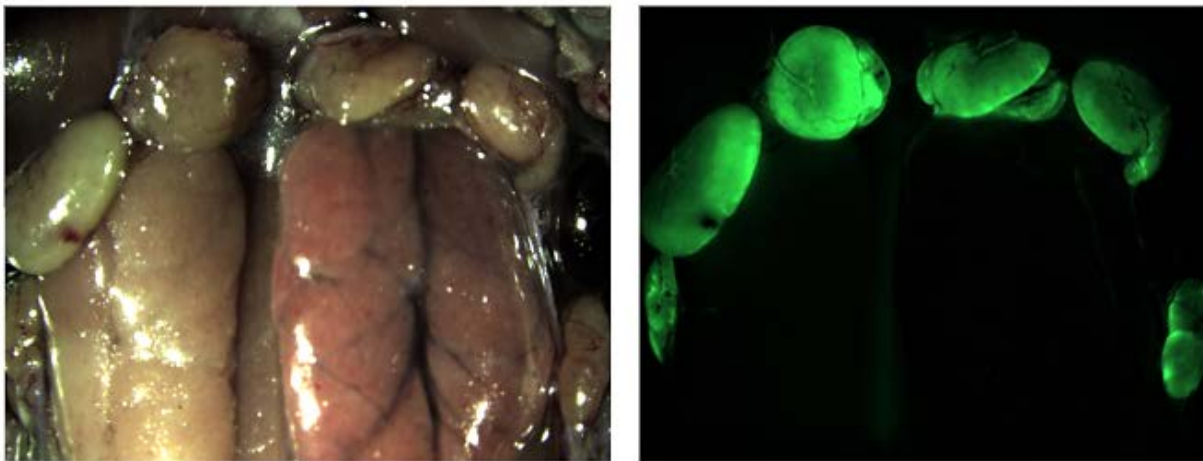


Figure: (Left) Gross picture of cervical lymph nodes overlying submandibular glands in rat. (Right) Same picture under fluorescence imaging.

Regression of intestinal metaplasia following magnetic sphincter augmentation device placement

Einav Silverstein, Evan T. Alicuben, James M. Tatum, Nikolai Bildzukewicz, Kamran Samakar, Jamil S. Samaan, Kulmeet Sandhu, Caitlin C. Houghton, John C. Lipham

Background: One consequence of uncontrolled gastroesophageal reflux disease (GERD) is intestinal metaplasia (IM), a pre-malignant transformation of the cells of the esophageal mucosa. Fundoplication has been shown to cause regression of intestinal metaplasia in patients with severe GERD. Magnetic sphincter augmentation (MSA), a minimally-invasive surgery in which a ring of magnetic beads is placed around the gastroesophageal junction, is a relatively novel alternative to fundoplication. Currently, the effect of MSA on regression of pre-existing IM is unknown. Our goal is to clarify the effect of MSA on the natural progression of IM. We anticipate that MSA device placement will be effective in causing regression of the disease.

Methods: We performed a retrospective chart review of patients who have undergone MSA device implantation between April 2007 and November 2017. Only those patients with biopsy-

proven IM were selected for inclusion in the study. Pre-operative endoscopy results were used to categorize patients as having ultra-short segment (< 1cm), short-segment (1-3 cm), or long-segment (>3 cm) disease. We also compared pre- and post-operative DeMeester scores to assess esophageal acid exposure.

Results: 86 patients were identified as having pre-operative IM. Of the 67 patients who completed post-operative endoscopic follow up, 48 patients (71.6%) achieved complete regression of their IM at a median follow-up of 1.2 years. Patients with normal post-operative DeMeester scores were more likely to achieve regression, as were patients with shorter-segment disease.

Conclusion: MSA device placement is effective in achieving regression of intestinal metaplasia in patients with severe GERD. Further studies are needed to meaningfully compare regression rates in patients who undergo MSA vs. fundoplication. Additionally, longer-term follow-up of these patients is needed to establish the longevity and durability of these results.

Limb Salvage vs Amputation: A Crowdsourcing-Based Study of Population Preferences.

Samuel Teles, MSII; Orr Shauly, MSII; Gregory Stone, MSII; Daniel J. Gould, MD, PhD, Ketan M. Patel, MD.

Background: Lower extremity amputations are frequently performed due to peripheral arterial occlusive disease, and the rate of amputation has remained steady even with the advent of vascular interventions and microsurgical reconstruction. However, recent optimization in microsurgical techniques, equipment, and training have allowed surgeons to circumvent the need to amputate, instead opting to salvage the limb using microsurgical free flaps. Free flaps are reported to have a lower 30-day mortality rate when compared to amputations in similar cohorts, but studies have not compared complication rates, nor have they compared significant differences in patient experience such as hospital length of stay, time to operate, and quality of life. The goal of this study was to perform a full review of the literature to better define operative differences of microsurgical free flap reconstruction and amputation. This study also sought to survey population preferences between the two in hopes of guiding decision making for both the patient and surgeon.

Methods: A search of PubMed and Embase found 44 papers (24 free flap, 20 amputation) that were reviewed to assess the likelihood of reported outcomes. Data was extracted into an Excel document and included study characteristics, complications and rates, length of stay, time to operate, and follow-up time. Relative risk analysis of shared complications and absolute risk analysis of complications unique to each surgery was performed. These data were then used to create a survey to assess the level of impact each complication would have on a study participant using a 0-100 scale.

Results: The authors hypothesize that the general population will prefer the complication risks and benefits associated with microsurgical free flap reconstruction over major amputation given that post-operative ambulatory outcomes have largely been similar.

Conclusion: The results of this study may help guide decision making between both surgeon and patient when placed in a situation with no clear indication between free flap microsurgical intervention or amputation.

Surgical ICU Early Mobility Intervention

Ian Thomas, Torey Alling, Nofal Kahwaji, Guadalupe Yetter, Meghan Lewis MD,
Demetrios Demetriades MD PhD

Introduction: Patient immobility confers significant morbidity in the Intensive Care Unit (ICU), including patient deconditioning, venous thromboembolism, respiratory complications and pressure ulcerations. We identified a need for earlier mobilization in our surgical ICU and implemented a three-pronged intervention for performance improvement.

Methods: The mobility of two cohorts were compared: patients admitted before (n=90) and after (n=127) the intervention in July of 2018. The components of the intervention included a nursing in-service training, patient motivation with verbal acknowledgement and stickers from staff, and the purchase of new specialized walkers for post-surgical patients. Mobility events were considered any charted activity status (i.e. "up to chair", "ambulating in hall", etc.)

Results: The goal was to decrease time from admission to first mobility event, as well as specifically to first day sitting upright in chair and first ambulation. Results demonstrated a significant decrease in time to first mobility event from 11.06 days pre-intervention to 4.45 days post-intervention (Figure 1). Additionally, there was a decrease in time to first day sitting upright in chair and first ambulation (Figure 2).

Conclusion: The significant morbidities associated with immobility in the ICU underscore the importance of early mobilization. Our three-pronged, multi-disciplinary intervention was successful in improving early mobility.

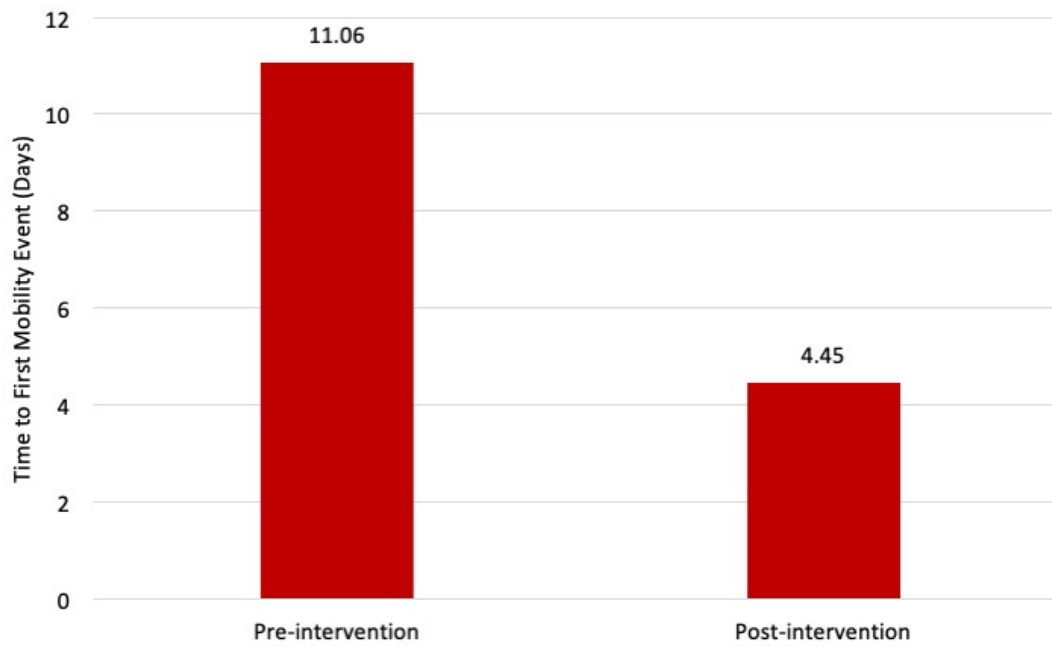


Figure 1. Time from admission to patients' first charted mobility event (T-test for difference of the means, $p < .0121$).

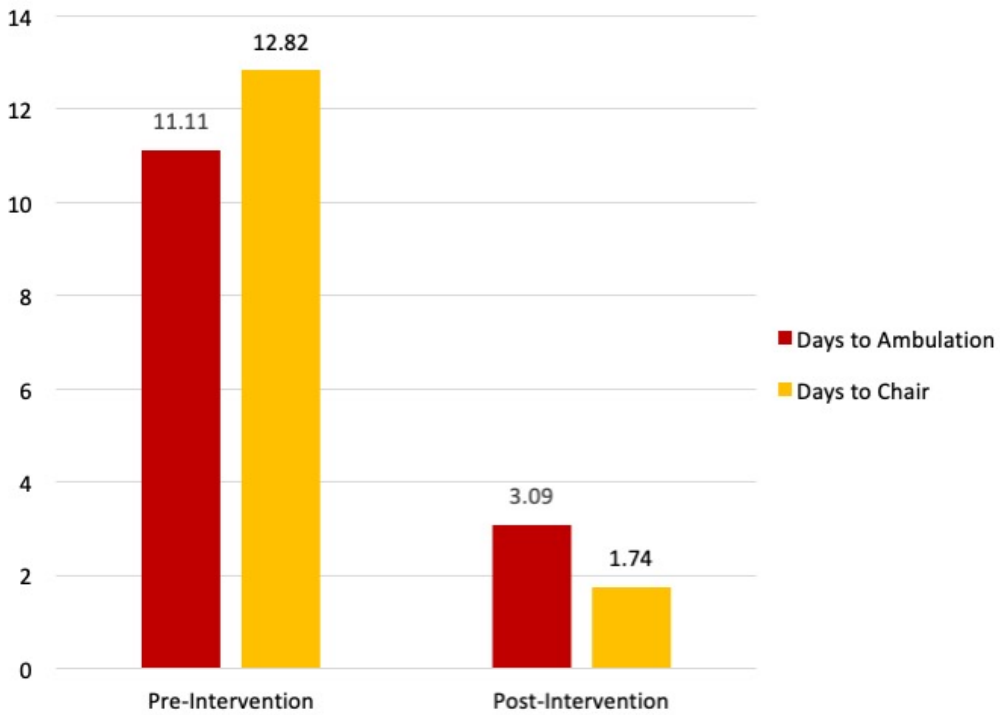


Figure 2. Time to Upright in Chair and First Ambulation for ICU Patients

Factors contributing to superior outcomes in pediatric liver transplant recipients with maternal living donor allografts

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Keck School of Medicine

Goal: Recent studies have demonstrated improved graft and patient survival in pediatric liver transplant recipients of maternal living donor liver allografts. Nonetheless, there is a lack of information on the effect of HLA matching and cross-match positivity among maternal donors and child recipient pairs. This study compares rates of pediatric graft and patient survival between living and diseased liver donors with a subgroup analysis comparing maternal and non-maternal living donors.

Methods: Pediatric living donor liver transplantations (n=52) were compared to pediatric diseased donor (DD) liver transplantations (n=58) performed at the University of Alberta between Jan 2005 and Dec 2017. Living donor (LD) recipients were sub-categorized into maternal (n=18) and non-maternal (n=34) groups. Patient and donor demographics and factors including immunosuppression therapy, HLA incompatibility, and rates of acute cellular rejection (ACR) were compared. 1- and 5-year graft and patient survivals among DD, maternal LD, and nonmaternal LD were compared.

Results: 1- and 5-year patient survivals were 87.9% in DD recipients, 88.9% in maternal LD recipients, and 93.8% in nonmaternal LD recipients. 1- and 5-year graft survivals were 79.3% and 77.4% in DD recipients, 88.9% in maternal LD recipients, and 91% and 85.2% in nonmaternal LD recipients, respectively. Data on HLA compatibility and rates of ACR are forthcoming.

Conclusions: Preliminary data show evidence of comparable, if not superior, graft and patient survival with living donor allografts when compared to diseased donor allografts. Patient and graft survival does not appear to show any benefit in recipients of maternal living donor liver allografts.

TRAUMA & ACUTE CARE SURGERY

CT Volumetric Analysis of Percent Liver Parenchyma Injured Better Predicts Outcomes Compared to Traditional AAST Grade

Aaron Strumwasser, M.D., **Megan Bocchicchio**

Background: Liver injuries have historically been classified according to the American Association for the Surgery of Trauma (AAST) grading scale, which in part designates grades based on ranges of parenchymal disruption. We hypothesize that the CT volumetric index (CTVI) score for assessment of parenchymal disruption in liver injuries is superior in predicting outcomes compared to the AAST scoring system for liver injuries. Our specific aims are to 1) perform an epidemiologic analysis of outcomes as a function of CTVI % injured compared to predicted AAST outcomes, 2) compare the performance of CTVI % to AAST in the prediction of outcomes after liver injury using receiver operating curve analysis and 3) determine whether AAST percentage liver injured would be better reclassified more specifically under the CTVI scoring system and potentially alter management.

Methods: This is a retrospective study of all trauma patients admitted to LAC+USC County Hospital between 2015 and 2018 (N = 500). Patients without liver injury or those who received a laparotomy prior to a CT were excluded. The CTVI index (%) was computed by calculating the pixels under a regionalized CT slice (x number of slices) that denotes injury divided by the total number of regionalized pixels of the liver (x number of slices). The complications were classified as either liver specific or non-liver specific. The incidence of each complication was determined based on CTVI and compared to the historic rates of complications for AAST grades.

Results: Of the 179 patients analyzed thus far, the incidence of liver specific complications is 27% when the volume of parenchyma disruption is >10% of the total liver volume compared to 4% when the volume of parenchyma disruption is <10% total liver volume.

Conclusion: Due to the inadequate population size, we are not yet able to compare the utility of CTVI and AAST grading as a predictor of complications or outcomes. However, only 22 of the 179 patients had >10% parenchymal disruption and only 12 total had liver specific complications, illustrating a need for more data collection.

Airway management standard of care should be changed due to improvements in emergency airway management

Hojean Yoon, Aaron Strumwasser, MD

Background/Hypothesis: The "Three Strikes Rule" is often invoked in emergent surgical airway management when intubation is difficult. However, with newer techniques (video laryngoscopy, rapid sequence intubation) providers may be more likely to make repeated laryngoscopy attempts to secure an airway in the ED. We hypothesize that surgical airways (cricothyroidotomy/tracheotomy) have become obsolete due to improvements in emergency airway management. Our specific aims are to determine 1) whether the need for a surgical airway has decreased in parallel with increases in video laryngoscopy, 2) whether there are differences in outcomes between patients that obtain an early surgical airway vs. waiting to secure the airway via laryngoscopy and endotracheal intubation and 3) whether we should re-define the "three strikes" paradigm for surgical airway access.

Methods: We will do a retrospective review of all traumatic admissions requiring endotracheal intubation and/or surgical airway access for trauma LAC+USC years 2000-current to collect data about: # of cricothyroidotomies, who did them, location, equipment used, complications, # of airway views/passes, oxygen saturation during intubation attempts, medications administered during process, # of providers that attempted/failed. We will analyze continuous data via F-test

and unpaired student's t-test. Categorical data will be analyzed via Chi Square analysis or Fisher's exact test, where appropriate. A receiver operating curve will be used to determine the point at which surgical airway management optimizes outcomes.

Results: We expect providers will have made more attempts in recent years to secure the airway due to newer techniques and that the number of surgical airway procedures to decrease.

Conclusion: Confirmation of the increase in number of intubation attempts due to utilization of newer techniques and the number of successful intubations should help re-define the “three strikes” paradigm.

UROLOGY

The impact of a history of previous bladder cancer in patients with newly diagnosed upper tract urothelial cancers on oncologic outcome

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Objective: To determine the impact of a prior history of urothelial carcinoma of the bladder (UCB) and corresponding treatment on the oncologic outcome of those with newly diagnosed upper tract urothelial carcinoma (UTUC).

Methods: A retrospective study will be performed from two different patient databases, one including all UCB patients and the other including all UTUC patients. Patients diagnosed with UTUC without prior history of bladder cancer will be compared against those UTUC patients with muscle invasive UBC, non-muscle invasive UBC treated without radical cystectomy, and non-muscle invasive UBC treated with radical cystectomy. Our primary outcomes will be recurrence free survival (RFS) and 3 and 5 year overall survival (OS). Data will be stratified by known prognostic factors of UTUC including clinical stage of UBC, chemotherapy status, smoking history and comorbidities among others.

Results: Data is currently being gathered. While existing data has shown a prior history of UBC to have a negative impact on overall survival in UTUC, we hope to determine specific features of cancer and treatment that are associated with a worse outcome, if any difference is found at all.

Conclusion: The impact of a previous bladder cancer history, in general, is already known to negatively influence the outcome of those recently diagnosed with UTUC. However, in identifying differences in bladder cancer stage and treatment, we can better risk stratify patients with UTUC and optimize follow up protocols to extend RFS and OS in those most at risk.

Effect of surgeon experience and bony pelvic dimensions on surgical performance and patient outcomes in robot-assisted radical prostatectomy

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PURPOSE: Factors such as a narrow pelvic cavity or high BMI increase difficulty of robotic pelvic surgeries, potentially leading to prolonged operative duration or adverse outcomes. We evaluated the effects of surgeon experience, body habitus, and bony pelvic dimensions on surgeon performance and patient outcomes after robot-assisted laparoscopic prostatectomy (RARP).

METHODS: Pelvic dimensions for 78 RARP patients were measured on preoperative MRI and CT imaging. Surgeon automated performance metrics (APMs) (instrument motion tracking and system events data) were recorded by “dVLogger” during RARP. Two analyses were performed:

Analysis 1: The RARP was deconstructed into 12 steps, and the effects of patient body habitus, surgeon experience, and bony pelvic measurements on APMs were analyzed for each step using linear regression.

Analysis 2: The effects of patient body habitus, bony pelvic measurement, and surgeon experience on short- and long-term outcomes were analyzed by multivariable regression.

RESULTS: Analysis 1 shows that while surgeon experience affects the greatest number of APMs, patient BMI, bony pelvic dimensions, and prostate median lobe also affect APMs in all 12 steps ($p < 0.049$, $p < 0.046$, $p < 0.037$). Analysis 2 shows that a narrower and deeper pelvis was more likely to result in a positive margin (OR=3.75 (95%CI 2.47-5.21), $p = 0.008$). Operative duration was significantly increased by pelvic depth ($\beta = 13.7$, $p = 0.039$) and prostate volume ($\beta = 0.53$, $p = 0.024$). Urinary continence recovery was associated with surgeon prior RARP experience (HR=2.23 (95%CI 1.13-4.41), $p = 0.021$) on multivariable analysis. Patients of more

experienced surgeons had superior continence recovery (no pads) (140 days vs 276 days, $p=0.02$).

CONCLUSION: Limited surgical workspace due to a narrower/deeper pelvis does affect surgeon performance and patient outcomes, most notably in increased surgery time and an increased positive margin rate.

Identifying Cultural and Socioeconomic Barriers Facing Latino Non-Muscle Invasive Bladder Cancer Patients

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Background: Urothelial bladder cancer is the 6th most common malignancy in the US. Of those diagnosed with UBC, 75% will present with non-muscle invasive bladder cancer, and 80% of these patients will progress to muscular invasive cancer- a lethal disease with a 50% probability of developing into metastatic disease. Because of this risk for progression, management of NMIBC requires long-term surveillance and treatment via cystoscopy, biopsy, intravesical therapy, and cross-sectional imaging. The associated costs with management and surveillance of NMIBC contribute to UBC being one of the most expensive cancers to treat in the US, and places a economical burden to patients and the health care system.

Study Purpose: It has been shown through previous investigations that patients in underserved, low-income populations develop poorer outcomes independent of NMIBC disease characteristics. For example, Medicaid and lower income patients tend to present with higher stage disease, and are less likely to receive definitive treatment such as radical cystectomy. Additionally, poor disease outcomes have been correlated with a lack of adherence to treatment/management guidelines; however, little is known about the specific patient level determinants of adherence within Medicaid and low income patients with NMIBC. Identifying these potential barriers to adherence in such populations are necessary for developing future interventions to improve outcomes.

Approach: The first aim of this study is to conduct a qualitative and quantitative analysis to determine specific patient-level obstacles to adherence. The qualitative aspect of this study portion will involve conducting interviews and focus groups with Latino NMIBC patients who present to LAC+USC. We will use specific scripts and discussion topics that have been tailored to help identify potential specific cultural and social influences negatively impacting treatment adherence. The second aim of this study will be to use the information gathered from the qualitative and quantitative studies to develop education tools such as a graphic brochure or short telenovela that will play a role in creating a culturally tailored patient navigation program. The third aim of this study will be to test this patient navigation program on NMIBC patients across 3 different hospitals through a randomized trial.

Hypothesis: We hypothesize that there are specific cultural attitudes and health-literacy related barriers facing Latino Medicaid patients with NMIBC that prevent ideal adherence of guideline management and surveillance, and that identifying these barriers on a patient level can allow physicians to create and utilize a culturally appropriate patient navigation program that will improve adherence rates.

Noninvasive Spinal Cord Stimulation to Recover Bladder Function after Spinal Cord Injury

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Background: Following a spinal cord injury (SCI), lower urinary tract (LUT) and bowel dysfunction are universal and significantly impact this population's health, quality of life. Multiple studies have shown that these are high rehabilitation priorities from the patients' perspective. Current therapies focus on managing complications associated with the dysfunction without attempting to normalize or restore function. This study investigates the use of non-invasive spinal cord stimulation and its ability to modulate the LUT.

Methods: Patients with SCI at T11 or above who rely on clean intermittent catheterization were recruited. 10 individuals (7 male; 3 female) participated in a two-day initial period where the LUT was mapped to spinally evoked responses at T11 and L1. Baseline urodynamic data were recorded, as well as urodynamic data with the stimulation to measure acute changes. Means were compared using paired t-tests. Three (2 male; 1 female) returned for long term stimulation over 8 weeks. This group received stimulation three times a week and maintained bladder diaries to track changes. Longitudinal changes in daily number of incontinence episodes were analyzed using linear mixed models.

Results: During the initial testing period, stimulation to T11 at 1Hz acutely increased voiding efficiency (42% vs 22%; $p < .05$) while stimulation at 30Hz increased bladder storage capacity (259ml vs 151ml, $p < .05$). Long term stimulation was associated with a decrease in the daily number of incontinence episodes ($p < .001$). While not the primary measured outcome, patients reported improvement in their bowel movements and a decrease in time needed to complete their bowel programs.

Conclusions: This study provides initial data supporting the ability of non-invasive spinal stimulation to improve both bladder and bowel function in patients with SCI both acutely and long term. Such a modality has the potential to improve quality of life and overall health in this population and can be synchronized with routine rehabilitation that these patients undergo.

Correlation between virtual reality simulation metrics and dry lab automated performance metrics

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Background: Virtual reality (VR) simulation allows residents to practice their robotic surgery skills and receive feedback through VR metrics (VRMs). However, VRMs have not yet been compared to truly objective measures of surgeon performance in the clinical setting. Automated performance metrics (APMs) are a validated objective measure of live robotic performance. Our study determines whether VRMs correlate to APMs during analogous VR and dry lab tasks.

Methods: 21 medical students with no prior robotic surgery experience performed 2 VR exercises on a da Vinci Surgical Simulator and 2 dry lab tasks on a live da Vinci robot. VR exercises were scored via VRMs and lab tasks were analyzed via APMs (instrument motion-tracking metrics and system events) captured by a systems data recorder (Intuitive Surgical). VRMs were correlated to APMs of analogous exercises using Pearson's correlation. Analysis 1 correlates the "Tubes" VR exercise to dry lab vesico-urethral anastomosis (VUA), analogous tasks which emphasize needle driving and tube manipulation. Analysis 2 correlates the "Ring and Rail 2" VR exercise to dry lab ring roller coaster, analogous tasks which emphasize wrist manipulation.

Results: Analysis 1 showed correlations between VRMs and camera-related APMs. Specifically, a better "Time to Complete" VRM score is associated with increased camera usage

($r=0.796$, $p<0.01$), frequency ($r=0.808$, $p<0.01$), active moving time ($r=0.815$, $p<0.01$), and economy of motion ($r=0.789$, $p<0.05$). Analysis 2 showed that a better “Time to Complete” VRM score is associated with lower active moving time of the left ($r=-0.523$, $p<0.05$) and right instruments ($r=-0.479$, $p<0.05$) and faster camera movement ($r=0.432$, $p<0.05$) velocity.

Conclusion: Our study found significant correlations between VRMs and APMs, especially between temporal VRMs and camera-related APMs. These findings align with our previous studies showing that time and camera usage are particularly good indicators of surgeon experience during robot-assisted radical prostatectomy.

The effect of post-discharge intravenous fluid administration on short-term outcomes following radical cystectomy with enhanced recovery protocol

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INTRODUCTION AND OBJECTIVES: To evaluate 30- and 90-day complication and readmission rates following radical cystectomy (RC) with an enhanced recovery after surgery (ERAS) protocol that includes outpatient intravenous fluid (IVF) administration post-discharge.

METHODS: Using our IRB approved, prospectively maintained bladder cancer database we identified patients who underwent RC with ERAS protocol (intent to cure) from 2013 to 2018. We included those with a hospital stay of 6 days or less. A post-discharge 2-week IVF regimen (every other day with one liter of crystalloid) was ordered for all patients. Some did not receive IVF due to insurance, non-compliance, or patient desire. Outcomes were reviewed in univariate analysis by Fisher’s exact tests and Kruskal-Wallis tests.

RESULTS: Out of 631 patients who underwent RC with ERAS in this time frame, post-discharge IVF data was available in 126 patients (IVF: 91 (72.2%), No IVF: 35 (27.8%)). Demographics were comparable between the two groups. Complication rates were not significantly different between two groups (30-day: 31.9% IVF vs 40.0% non-IVF, $p=0.41$; 90-day: 51.7% vs 60.0%, $p=0.43$). Readmission rates also were not statistically different between groups (30-day: 16.5% vs 11.4%, $p=0.59$; 90-day: 28.6% vs 25.7%, $p=0.83$). Reasons for readmission were mainly infection (52.8%) and dehydration (27.8%), followed by anemia (5.6%) and wound complications (2.8%) (table 1).

CONCLUSIONS: The administration of IVF after discharge from RC with our ERAS protocol is not associated significantly with reduced 30- and 90-day complication or readmission.

Patients		IVF (n=91)	No IVF (n=35)	p-value
90-d Readmissions	Total	26 (28.6%)	9 (25.7%)	0.83
	Infection	13 (50.0%)	6 (66.7%)	0.46
	Dehydration	7 (26.9%)	3 (33.3%)	0.69

Assessment of Surgeon Performance During Robotic Partial Nephrectomy: Validation and Correlation of Automated Performance Metrics with Clinical Outcomes

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PURPOSE: Automated performance metrics (APMs) provide a novel approach to the assessment of surgical skills. We present an initial construct validation of APMs during robotic partial nephrectomy (RPN), and seek to determine if APMs correlate to clinical outcomes after RPN.

METHODS: We recorded APMs (instrument motion tracking and system events data) and synchronized surgical videos from da Vinci Si systems during RPN using a system data recorder. Each case was segmented into 7 steps: colon mobilization, ureteral identification/dissection, hilar dissection, exposure of tumor within Gerota's fascia, intraoperative US/scoring of tumor, excision of tumor and renorrhaphy. APMs from each step were compared between expert (E) surgeons (>100 cases) and novice (N) (<100 cases). Clinical outcomes were collected prospectively and correlated to APMs.

RESULTS: We evaluated 39 RPN cases performed by 7 E and 10 N surgeons.

During primary surgical steps, E had a shorter task duration, more efficient robotic instrument usage (shorter duration of movement, shorter path lengths), more wrist articulation, used the clutch less, and had a greater ratio of dominant to non-dominant instrument use vs N. We found significant correlation between APMs and warm ischemia time (WIT) and estimated blood loss (EBL): EBL was correlated to task completion time ($p < 0.001$, $r = 0.55$), instrument efficiency and dominant to non-dominant instrument usage ratio ($p = 0.01$, $r = 0.56$). WIT was correlated to several APMs, including instrument efficiency and task duration ($p < 0.001$, $r = 0.75$). Nephrometry score did not correlate with either WIT or EBL.

CONCLUSION: Experts are more efficient and directed in their movement during RPN. APMs during key steps may serve as better predictors of clinical outcomes than other clinical measures such as tumor complexity. These data help establish a standardized metric for surgeon assessment and training during RPN.

IMPACT OF A STANDARDIZED TRAINING TUTORIAL ON AUTOMATED PERFORMANCE METRICS AND COGNITIVE WORKLOAD DURING ROBOTIC VESICourethRAL ANASTOMOSIS

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INTRODUCTION AND OBJECTIVES: We previously created a robotic vesicourethral anastomosis (VUA) tutorial with standardized hand gestures for each stitch based on the most efficient automated performance metrics (APMs) and least tissue trauma. In this study, we validate the training effect of this tutorial on robotic surgical novices.

METHODS: 28 novices (no prior surgical experience) were randomized to gestures training (GT) or non-gestures training (NGT) for 7 sessions (S1-7). All participants were trained on synthetic VUA models (3DMed) and were provided with stitch location and needle driving direction (urethra/bladder, in/out). GT was further instructed on needle grip and wrist rotation direction according to the VUA tutorial. Automated performance metrics (APMs) (system events, Endowrist manipulation and instrument kinematic metrics) were captured using a systems data recorder (Intuitive Surgical). Cognitive workload was determined using task evoked pupillary response (TEPR, Tobii Pro Glasses 2) and measured by index of cognitive activity (ICA, Eyeworks).

RESULTS: During S1, GT showed less instrument movement efficiency due to increased distance traveled (L arm: 52 vs 48 cm, $p<0.012$; R arm: 59 vs 48 cm, $p<0.001$) and greater instrument articulation ($p<0.007$). No differences in active instrument time, task completion time and ICA were observed.

During S7, GT demonstrated faster completion time (33.4 vs 39.6 min, $p<0.001$) and superior instrument movement efficiency due to less distance traveled (L arm: 33 cm vs 39 cm, $p<0.001$) and decreased total active instrument time ($p<0.001$). Less left instrument articulation ($p<0.016$) was noted. GT also showed decreased ICA in the left eye, indicating a lower level of cognitive workload for spatial tasks ($p\leq 0.05$).

From S1 to S7, both groups completed the task faster (GT: $\Delta 35.8$ min, $p<0.001$; NGT: $\Delta 30.6$ min, $p<0.001$) and more efficiently with less total distance traveled ($p<0.001$) and decreased total active instrument time ($p<0.001$). GT had a significantly greater improvement in movement efficiency, as measured by less distance traveled ($\Delta 25$ cm vs $\Delta 13$ cm, $p<0.027$). Decreased wrist articulation ($p<0.001$) was noted in both groups.

CONCLUSIONS: Our study demonstrates that novices trained using a standardized robotic VUA tutorial (GT) complete the task faster, more efficiently and with less cognitive workload. While there is a decrease in efficiency as gestures are introduced, our findings suggest that overall efficiency is increased and demonstrates a more robust improvement over time.

Source of Funding: This study was funded in part by an Intuitive Surgical Clinical Grant; Intuitive Surgical provided the systems data recorder.

DISTINGUISHING EXPERT AND NOVICE SURGEONS USING AUTOMATED PERFORMANCE METRICS, HEART RATE VARIABILITY, AND TASK-EVOKED PUPILLARY RESPONSE DURING ROBOTIC DRY LAB EXERCISES

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INTRODUCTION AND OBJECTIVES: Automated performance metrics (APMs) are a validated measure of surgeon performance. Heart rate variation (HRV) and task-evoked pupillary response (TEPR) are physiological biometrics of stress and cognitive workload, respectively. This study investigated whether APMs, HRV (as measured by low frequency to high frequency ratio [LH:HF]), and TEPR (as measured by index of cognitive activity [ICA]) could distinguish expert and novice surgeons during robotic dry lab exercises (ring walks, suturing, and dissection tasks).

METHODS: 26 participants, separated into two groups based on surgical experience: experts (≥ 100 cases, $n=8$) and novices (<100 cases, $n=18$), performed 10 dry lab tasks of varying difficulty on the da Vinci Xi Surgical System (Intuitive Surgical). APMs (instrument motion tracking, endowrist manipulation, and systems events data), LF:HF, and ICA were recorded by a systems data recorder (Intuitive Surgical), Zephyr Bioharness 3.0, and Tobii Pro Glasses 2, respectively. LF:HF and ICA were analyzed by Kubios HRV and EyeWorks Cognitive Workload Software. High values of ICA and LF:HF are indicators of high cognitive workload and stress, respectively. The Kruskal-Wallis test was utilized for comparisons between the two groups.

RESULTS: Three temporal APMs (total duration and time of left/right instrument usage) indicated that experts performed at a significantly faster pace for 8/10 tasks ($p < 0.048$). For 3/4 suturing tasks, experts exhibited significantly more efficiency in Endowrist articulation metrics in their left instrument ($p < 0.048$). Notably, novices exhibited higher stress levels (LF:HF, $p < 0.049$) for 5/10 tasks and a higher cognitive workload (ICA, $p < 0.044$) for 8/10 tasks.

Correlations between APMs and LF:HF or ICA further distinguishes experts and novices.

Experts displayed a positive correlation between LF:HF and master clutch usage ($\rho=0.327$,

$p=0.018$), while novices exhibited a negative correlation ($\rho=-0.026$, $p=0.035$), indicating less clutching in times of high stress. Experts displayed a negative correlation between ICA and linear instrument velocities (R+L) ($\rho >-0.310$, $p <0.016$), while novices presented a positive correlation ($\rho >0.277$, $p <0.006$), indicating faster instrument movement in times of high cognitive workload.

CONCLUSIONS: APMs, LF:HF, and ICA, as measures of surgeon performance, stress, and cognitive workload respectively, can distinguish expert and novice surgeons during robotic dry lab tasks.