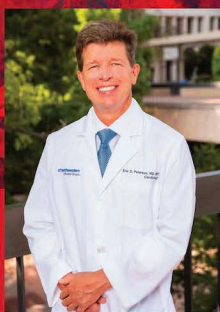


60 ANNUAL MEDICAL STUDENT RESEARCH FORUM

The University of Texas Southwestern Medical Center



Keynote Speaker

Eric Peterson, MD, MPH

Vice Provost

Sr Associate Dean for Clinical Research

Department of Internal Medicine

February 1, 2022 on TEAMS
Oral Presentations from 3-5 pm
Poster Presentations from 5-6 pm

**THE UNIVERSITY OF TEXAS
SOUTHWESTERN MEDICAL CENTER
AT DALLAS**

**60th ANNUAL
MEDICAL STUDENT RESEARCH FORUM**

**TUESDAY, FEBRUARY 1st, 2022
Oral Presentations 3-5:00 pm
Poster Presentations 5-6:00 pm**

PROGRAM DIRECTOR: Rene Galindo, MD, PhD

PROGRAM COORDINATOR: Amanda Arista, MAEd

EDUCATION ASSISTANT: Kira Seaton, MPH

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THE SOUTHWESTERN MEDICAL FOUNDATION

60th ANNUAL MEDICAL STUDENT RESEARCH FORUM

LIST OF ORAL PRESENTATIONS

Ashish Chowdary

“Macrophage PDGF Signaling to Mesenchymal Progenitors Drives Normal Musculoskeletal Healing”

Mentor: Benjamin Levi, MD, Department of Surgery- Center for Organogenesis and Trauma

Juliana Kim

“Identification of Metabolic Alterations in Human BRAF Mutant Melanomas”

*Mentors: Jennifer Gill, MD, PhD & Ralph DeBerardinis, MD, PhD
Department of Dermatology & Children’s Research Institute*

Michael Li

“Using Dipstick Urinalysis to Predict Development of AKI in Patients with COVID-19”

Mentor: Susan Hedayati, MD, Department of Nephrology

Garrett Ray

“Novel Antisense Antibiotics Display Synergy and Biofilm Activity Against Pseudomonas Aeruginosa”

Mentor: David Greenberg, MD, Department of Internal Medicine

PRESENTATION OF GUEST SPEAKER

Eric Peterson, MD, MPH

Vice Provost and Senior Associate Dean for Clinical Research
Professor, Internal Medicine

Adelyn and Edmund M. Hoffman Distinguished Chair in Medical
Science

POSTER SESSION IMMEDIATELY FOLLOWING

60th Medical Student Research Forum

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KEY

Ω Oral Presenter- UT Southwestern Medical Student Research Forum

Δ T35 NEI Training Grant Funded, τ T35 NHLBI Training Grant Funded

* Poster Presenter

Changes in the C-Terminus of Fibulin-3 Cause Secretion Defects

Ali Abbas

Mentor: John Hulleman, PhD, Department of Ophthalmology

Age-related macular degeneration (AMD) is the leading cause of progressive and irreversible vision loss in individuals over the age of 65. Although AMD is an etiologically complex disease due to a variety of genetic and environmental factors, insight into its pathogenesis can be gained by studying phenotypically similar monogenic macular diseases, such as Malattia Leventinese (ML). ML is caused by a specific R345W mutation in the fibulin-3 protein (F3). It has been shown that the R345W mutation causes the protein to misfold, resulting in a significant secretion defect. However, it is unknown whether the disease is caused by intracellular mutant F3 or the small portion of secreted mutant F3. To investigate this question, we looked for ways to retain mutant F3 inside the cell. One way to do this is by using the KDEL (Lys-Asp-Glu-Leu) sequence. The KDEL sequence is a four amino acid peptide that is recognized by a KDEL receptor in the Golgi. Once recognized, the peptide along with the cargo to which it is attached is recycled back into the endoplasmic reticulum and ultimately retained inside the cell. Since F3 does not naturally contain the KDEL sequence, we hypothesized that attaching the KDEL sequence to the C-terminus of the protein will retain mutant F3 inside the cell. We transfected HEK293A cells with 3X FLAG WT F3 with the KDEL sequence (WT F3 +KDEL) and 3X FLAG R345W F3 with the KDEL sequence (R345W F3 +KDEL). We also included a variety of other amino acids to attach to the C-terminus of the protein to verify that F3 was being retained due to the KDEL sequence. The data show that R345W F3 +KDEL has a significant secretion defect when compared to R345W -KDEL. Interestingly, however, the data show that attaching the following amino acid sequences to the C-terminus of F3 also cause a significant secretion defect in either WT or R345W F3: KD(Lys-Asp), E(Glu), F(Phe), and Q(Gln). We concluded that attaching almost any combination of amino acids to the C-terminus of F3 will result in a significant secretion defect in both WT and R345W F3. In future studies, we would like to investigate any potential interaction between the C-terminus and the site of R345W mutation to explain the secretion defect observed after the addition of amino acid(s) to the C-terminus of F3.

Machine Learning Methods for Automated CT Abdominal Muscle Segmentation: First Steps Toward Pre and Postoperative Monitoring Model

Usamah Chaudhary

Mentor: Baowei Fei, PhD, Department of Radiology &
UTD Department of Bioengineering

Collaborators: Ka'Toria N. Leitch; Avneesh Chhabra, MD; Ajay Kohli, MD

Computed tomography (CT) is widely utilized in the clinical analysis of abdominal muscle mass in surgical patients for pre-surgical outcome predictions and post-surgical monitoring. Sarcopenia and abdominal muscle atrophy have been shown to be quality metrics for post-surgical status and are part of the clinical prediction framework for survival and outcomes [1-3]. In order to track muscle mass changes, radiologists must manually segment individual CT slices of patients, a highly time-intensive process. Thus, a robust and efficient automated abdominal muscle segmentation algorithm would greatly aid in the analysis of patient abdominal sarcopenia in the clinical setting. In the current work, we present a fully convolutional neural network (CNN) with capability to effectively segment abdominal muscle on input CT scans. We also utilize a series of computer vision and image processing based pre-processing steps using atlas-based registration algorithms to augment and improve our model through the removal of extraneous regions. A CNN-based approach is implemented to remove the arms and fat from each input slice and then apply a series of registrations with a diverse atlas set of abdominal muscle segmentations to identify a best fit mask which is then used to remove many unwanted parts of the abdominal cavity. After this pre-processing, slices are then fed into our segmentation CNN which utilizes a Unet architecture with Room mean square propagation as the optimizer and Dice Similarity Coefficient (DSC) as the loss function. Our dataset includes CT imaging retrospectively obtained from 72 patients (age ranging from 18-75) and abdominal muscle was manually segmented by trained readers under supervision of a fellowship-trained musculoskeletal radiologist. Utilizing our hybrid computer vision-artificial intelligence approach we were able to achieve an overall DSC average of 0.94 on our independent test set and a minimum DSC of 0.87.

Reference:

- [1] Gibson, Debra J., et al. "The role of computed tomography in evaluating body composition and the influence of reduced muscle mass on clinical outcome in abdominal malignancy: a systematic review." *European journal of clinical nutrition* 69.10(2015):1079-1086.
- [2] Sui, Kenta, et al. "Correlation between the skeletal muscle index and surgical outcomes of pancreaticoduodenectomy." *Surgery today* 48.5 (2018): 545-551.
- [3] Lee, Jun Ho, et al. "Abdominal shape of gastric cancer patients influences short-term surgical outcomes." *Annals of surgical oncology* 14.4 (2007): 1288-1294.

Macrophage PDGF Signaling to Mesenchymal Progenitors Drives Normal Musculoskeletal Healing

Ashish Chowdary

Mentor: Benjamin Levi, MD, Department of Surgery

Collaborators: Nicole Patel, BS; Chase Pagani, BS; Dominic Henn, MD; Simone Marini, PhD; Amanda Huber, PhD; Jacqueline Larouche, MS; Carlos A. Aguilar, PhD; Robert Tower, PhD

Macrophages are hypothesized to fine tune the immune response after damage, promoting either normal regenerative, or aberrant fibrotic healing. Our objective was to identify macrophage subpopulations and gene signatures which could direct healing through regenerative or fibrotic means across different musculoskeletal (MSK) injury types. Single-cell RNA sequencing data (scRNA-seq) at baseline, early and late timepoints after injury were assembled from a variety of MSK injuries, including regenerative and fibrotic mouse volumetric muscle loss (VML), regenerative digit tip amputation (DTA) and fibrotic heterotopic ossification (HO). After individual dataset clustering and analysis, macrophages and *Pdgfra*-expressing mesenchymal progenitor cells (MPCs) were identified and analyzed for receptor-ligand interactions using *CellChat*. Unsupervised clustering of integrated macrophages from DTA, HO and VML models identified five unique clusters, with two clusters enriched for fibrotic macrophages, one cluster enriched for regenerative macrophages and two clusters of mixed baseline/regenerative macrophages (Table 1). KEGG pathway analysis suggested fibrotic macrophages (clusters 2 and 3) were enriched in genes related to chemokine signaling and hypoxia inducible factor-1 (HIF-1) pathways while baseline/regenerative (clusters 1, 4, and 5) macrophages were enriched in mitogen-activated protein kinase (MAPK), tumor necrosis factor (TNF), and proliferation pathways. Receptor/ligand analysis showed enhanced expression of platelet derived growth factors (PDGF) in regenerative, but not fibrotic conditions. Specifically, ligands *Pdgfa* and *Pdgfb* in macrophages from cluster 4 and their receptor *Pdgfra* in MPCs were found to be upregulated, suggesting an increased macrophage-MPC crosstalk via the PDGF pathway driving regenerative healing. Our research identified divergent subsets of macrophages present within regenerative and fibrotic injury models. Further characterization of these macrophage subtypes could be used to predict fibrotic or regenerative responses following injury and tune the healing microenvironment towards more favorable conditions.

Cluster	Baseline	Fibrotic	Regenerative
1	44.29%	11.43%	44.28%
2	15.40%	76.96%	7.64%
3	8.00%	80.96%	11.04%
4	18.14%	29.67%	52.19%
5	48.82%	17.98%	33.20%

Alterations in Cortical and Hippocampal Activity in Schizophrenics as Drivers for Cognitive Dysfunction

Alexa Ciarolla

Mentor: Elena Ivleva, MD, PhD, Department of Psychiatry

Collaborators: Anastasia Bobilev, PhD; Yan Fang, PhD; Carolyn Sacco, PhD; Sina Aslan, PhD; Carol Tamminga, MD

Abstract: We examined regional brain activity that is thought to be implicated in the cognitive dysfunction of schizophrenia (SZ). Effects of illness and medication status on cortical and subcortical regional activity in individuals with SZ as well as in their first-degree relatives were evaluated.

Methods: Seventeen healthy comparison (HC) subjects, 42 SZ subjects (27 on antipsychotic medication and 15 currently unmedicated), and 33 first-degree relatives (15 with mild psychotic presentations and 18 unaffected) were included. Cognitive assessments included measurements of general intellectual ability, executive function, episodic memory, visuospatial learning and memory, and general functional capacity. Pseudo-Continuous Arterial Spin Labeling (pCASL) brain images were acquired on a 3T Philips MR system. Cortical and subcortical region-of-interest (ROI) masks were derived using a standardized brain atlas (Automated Anatomical Labeling, AAL). The pCASL signal for each voxel was calibrated using conversion constant between pCASL MRI signal and the physiologic unit to yield absolute cerebral blood flow (CBF) maps. Absolute CBF values for each ROI were divided by global (whole brain) CBF values specific to each subject to generate normalized CBF (nCBF) values for each ROI to be used in all further analyses.

The nCBF values for each ROI were compared between HC and SZ groups, with stratification for medication status, using ANCOVA with gender and age as covariates, then repeated with pair-wise ANCOVAs (2x1) in order to examine differences between specific groups. Partial correlations covaried for age and gender between nCBF in each ROI and PANSS scores, cognitive measures, and illness duration were calculated for all SZ, medication-based subgroups, and relatives.

Results: Pair-wise comparisons between SZ-on medication and HC revealed differences in right vmPFC nCBF. Comparing HC and SZ-off medication, the proband group showed lower activity in the left anterior hippocampus. When comparing SZ on- versus off- medication, the left middle cingulate, left dlPFC, and left vmPFC showed higher nCBF in the SZ-off medication group. Partial correlations between cognition measures and nCBF revealed a unique pattern of activity in hippocampal and cortical structures that may contribute to aspect of mechanism driving cognitive dysfunction in SZ.

Development of Ex Vivo Femoral Head Deformity Model to Test Restorative Surgical Techniques

David Edwards

Mentor: Harry Kim, MD, Department of Orthopaedic Surgery

Collaborators: Chi Ma, PhD; Brad Niese, MEng

Legg-Calve-Perthes disease (LCPD) is a childhood ischemic hip disorder which produces femoral head deformity due to weakened bone structure. The femoral head deformity causes pain, stiffness, and debilitating osteoarthritis; if left untreated, a total hip replacement is eventually required. Currently there is no reliable ex-vivo deformity model to develop and test the efficacy of new surgical devices and methods to improve the deformity and to restore the round shape. We hypothesize that a reliable model of deformity comparable to LCPD can be created using porcine cadaver bone by applying compressive force methods. Due to the availability of porcine humeral heads in the lab, we performed our preliminary studies using the humeral heads.

We tested four mechanical approaches. Our first approach involved the application of static and cyclic compressions to mature humeral heads. However, the method failed to deform the heads due the high compressive strength of the mature bone. Our second approach involved drilling into the mature heads to create stress risers before applying the compression forces. This resulted in undesirable fracture of the bone. Our third approach used juvenile porcine humeral heads with cyclic compressions which resulted in deformity, but was inconsistent in the number of cycles required to achieve the appropriate deformity.

Finally, we successfully achieved a reliable deformity model resembling LCPD by mounting juvenile humeral heads in a specific orientation and applying successive increases in static compression force at 50, 100, 150, 200, and 250 lbs using a Bose Electroforce 3330 test instrument. The amount of collapse after each static compression was measured using calipers. Identical measurements were taken after each compression test, up to 250lbs of force. This method created a 2 mm collapse of the humeral head which was reproducible.

In summary, we developed a novel ex-vivo model of deformity which will facilitate the development of new restorative surgical devices and techniques to improve the femoral head deformity of LCPD.

Genus-Level Identification of Bladder-Resident Bacteria Associated with Recurrent Urinary Tract Infection in Post-Menopausal Women by Fluorescence In-Situ Hybridization

Parker Kenée

Mentor: Philippe E. Zimmern, MD, Department of Urology

Collaborators: Jashkaran Gadhvi, MSc; Fatima Khan, BS; Alana Christie, MS; Nicole De Nisco, PhD

Introduction/Background: Antibiotic-recalcitrant recurrent urinary tract infection (rUTI) is common in postmenopausal women. Many women elect to undergo electrofulguration (EF) of areas of chronic cystitis when standard antibiotic therapies fail. One potential benefit of this procedure is the removal of tissue-resident bacterial communities.¹ Although tissue-resident bacteria have been observed in the bladder walls of postmenopausal women with rUTI by fluorescence in situ hybridization (FISH), genus and species level identification of these bacteria by FISH has not yet been reported.² Here, we use genus-specific probes to quantify *Escherichia spp.* present in the bladder biopsies taken from postmenopausal women with rUTI undergoing EF and investigate the relationship between detected bacterial community sizes and stage of cystitis.

Methods: Following IRB approval, bladder biopsies were obtained from consenting postmenopausal women who elected EF for the advanced management of rUTI. Biopsies were immediately fixed in paraformaldehyde and then paraffin-embedded and sectioned (5 μm). FISH was performed as described previously² using the following probe sets: 1. Scramble-AlexaFluor488/647 (control), 2. Universal 16s rRNA-AlexaFluor647 (all bacteria), and 3. *Escherichia* 16s rRNA-AlexaFluor488. Slides were imaged using a Zeiss LSM880 with a 63x objective. 10 randomly sampled images were collected for each biopsy section. Images analysis was performed blinded to quantify bacterial community sizes. Patients were classified by cystitis stage (Stage 1 (trigone alone) to 4 (pancystitis)) determined by cystoscopy at time of the biopsy. Least mean squares statistical analysis was used to generate an average number of bacterial organisms per $10 \times 1 \mu\text{m}^2$ for each cystitis stage.

Results: Genera-specific FISH was performed on bladder biopsies from 23 women. The universal 16s rRNA probe detected tissue-resident bacteria in the biopsies of 95.7% (22/23) women. Tissue-resident *Escherichia spp.* were detected in the bladder biopsies of 52.1% (12/23) women. The highest average bacterial community sizes were observed in Stage 1 cystitis bladder biopsies (8.4 per $10 \times 1 \mu\text{m}^2$, 95% C.I. 6.6 – 10.1).

Conclusion: For the first time, 16s rRNA FISH was used to detect *Escherichia spp.* in the bladders of postmenopausal women electing to undergo EF for the advanced management of rUTI. Interestingly, bladder-resident bacterial community sizes were highest in bladder biopsies from women with Stage 1 cystitis.

Identification of Metabolic Alterations in Human BRAF Mutant Melanomas

Juliana Kim

Mentors: Jennifer Gill, MD, PhD & Ralph DeBerardinis, MD, PhD, Department of Dermatology & Children's Research Institute

Collaborator: Aparna Rao, MBBS, PhD

Background: Melanoma is the deadliest skin cancer due to its high metastatic potential. How melanoma reprograms its metabolism to sustain its aggressive behavior and proliferation is poorly understood. Characterizing the key metabolic pathways used by the most common type of melanoma (BRAF mutant) in vivo may help identify novel therapeutic strategies for patients. Objective: Based on in vitro data, we aim to test the hypothesis that BRAF mutant patient melanomas display increased utilization of glycolysis in vivo compared to BRAF WT melanomas. We also aim to identify other novel metabolic features of BRAF mutant melanomas.

Methods: We compared BRAF WT and mutant melanomas using the Human Melanoma Metabolism (HuMM) Biobank, which consists of LC-MS metabolomics/lipidomics data from >100 patient samples from various metastatic sites. A subset of patients were also infused with [U-¹³C]glucose intraoperatively to measure glucose utilization in glycolysis and the TCA cycle. Analysis of other metabolites and pathways was performed using MetaboAnalyst software.

Results: Among 11 [U-¹³C]glucose-infused patient samples, BRAF mutant tumors displayed increased labeling in glycolytic intermediates and similar labeling in TCA cycle intermediates as compared to BRAF WT tumors. In LC-MS data from 30 non-infused melanomas, BRAF mutant melanomas had decreased abundance in glycolytic metabolites (frequently seen in pathways with high substrate consumption). While additional samples will be needed to prove statistical significance, these findings align with studies in cell culture and patient-derived xenografts. Beyond glycolysis, an unbiased pathway analysis on ~300 metabolites found BRAF mutants had significant alterations in fatty acid metabolism (p-val < 0.05). A lipidomics analysis specifically showed that ceramides and triglycerides were significantly elevated in the BRAF mutant samples (p-val < 0.05) compared to WT samples from patient lymph nodes. Interestingly, these differences were not seen in primary tumors, suggesting unique selective pressures may exist during the process of metastasis.

Conclusion: We observed that BRAF mutant melanomas in patients in vivo had increased utilization of glycolysis despite having a smaller pool of glycolytic intermediates. We also found that fatty acid pathways were altered with ceramides and triglycerides accumulating in BRAF mutants. Future studies will be performed in pre-clinical models to determine whether pharmacologically targeting these pathways may limit the growth and/or metastasis of BRAF mutant melanomas.

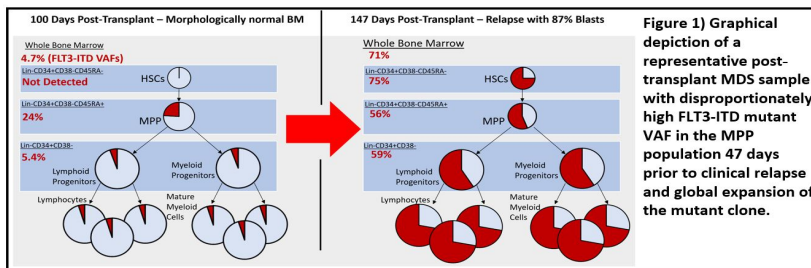
Less Can Be More: Novel Insights into Therapeutic Resistance in Myeloid Malignancies Revealed in Rare Stem and Progenitor Populations

Benjamin Kroger

Mentor: Stephen Chung, MD, Department of Internal Medicine

Collaborators: Elaine Huang, PhD; Yazan Madanat, MD; Prapti Patel, MD; Madhuri Vusirikala, MD; Robert Collins, MD

The myelodysplastic syndromes (MDSs) are a group of myeloid disorders characterized by ineffective hematopoiesis as a result of acquired mutations within the hematopoietic stem cell (HSC) pool. While cytogenetic and genomic profiling has allowed for prognostic stratification, existing standard therapies such as hypomethylating agents fail to induce durable remissions, with the only curative therapy being bone marrow transplant. Treatment refractory MDS stem cells reside in the HSC compartment, serving as reservoirs of therapeutic resistance. While these stem cells are postulated as the source of relapse, little is known about the mutational dynamics of these or other rare progenitor populations following treatment. Here, we characterize the clonal dynamics of residual MDS HSCs following transplantation both prior to relapse and in the setting of ongoing relapse-free survival. We identified residual disease comprising large percentages of progenitor populations that was otherwise undetectable on clinical sequencing of bulk bone marrow. In one sample, biallelic TP53 mutations, which carry devastating prognostic implications in MDS, had variant allelic frequencies (VAFs) of 48% and 52% in the HSC 51 days prior to clinical relapse. In a separate case, a residual FLT3-ITD mutant disease allele was present at a VAF of 23% in lymphoid-primed multipotent progenitors vs. just 5% in unfractionated bone marrow 47 days prior to clinical relapse and AML progression. Our results represent the first characterization of the clonal dynamics of MDS with resolution of distinct progenitor populations along the course of hematopoietic differentiation. This provides an immensely useful tool for both the assessment of therapeutic response and to understand the mechanisms of resistance specific to immature hematopoietic cells. We expect to use these and future findings to answer outstanding questions in the field regarding treatment strategies prior to and succeeding transplantation, as well as the mechanisms underlying therapeutic resistance in MDS.



Comparison of Uropathogenic and Non-Pathogenic Escherichia Coli Growth Characteristics in the Presence of an Antimicrobial Peptide and Limiting Nutrient Availability

Sam Kusin

Mentor: Philippe Zimmern, MD, Department of Urology

Collaborators: Larry Reitzer, PhD; Jacob Hogins, MS

Introduction: An important component of a urinary tract infection is survival and growth in urine prior to invasion of uroepithelial cells. Uropathogenic Escherichia coli (UPEC) grow faster and to a higher cell density in urine than non-pathogenic Escherichia coli (NPEC). Explanations for this difference are either UPEC ability to utilize low levels of nutrients in urine, or UPEC resistance to inhibitory factors, such as antimicrobial peptides (AMP). We examined UPEC and NPEC growth in medium with a limiting carbon/energy source and in the presence of an AMP. We found that a UPEC strain handled each environment better than NPEC strains.

Method: The UPEC strain UTI89 and NPEC strain W3110 were grown in Luria-Bertani (LB) broth for 2 hours. Actively growing cells were centrifuged, washed twice to remove residual nutrients from LB, and resuspended in a buffer before inoculation in a minimal medium containing varying concentrations of glycerol and the AMP LL-37 (cathelicidin). Bacteria were added to media in either high (1:20) or low (1:200) density, and grown for 24 hours in a 96-well plate at 37°C. Growth was continuously monitored in a gel plate reader. Doubling times, CFU per mL (using OD600), final OD600, and change in OD600 were determined in triplicate.

Results: Low-density inoculation resulted in less resistance to LL-37, slower growth, and less growth when compared to high-density inoculation. Increasing LL-37 concentrations slowed the growth rate, but did not effect the final cell density. Variation of limiting glycerol effected the final cell density as expected. Limiting glycerol enhanced the effectiveness of LL-37 (cathelicidin), which indicates that nutrient availability effects AMP sensitivity.

Conclusions: Compared to the NPEC strain, the UPEC strain UTI89 has adaptive mechanisms to grow in a low nutrient environment and resist AMPs. LL-37 effected the growth rate, while nutrient limitation effected the final cell density. The synergism between nutrient limitation and LL-37 is more potent at lower bacterial densities and may result from effecting different aspects of growth.

The Anti-Cancer Toxin TK216 is a Potent Microtubule Destabilizer

Katherine Lake

Mentor: David McFadden, MD, PhD, Department of Internal Medicine

Collaborators: Juan Manuel Povedano Selfa, PhD; Vicky Li; Xin Bai; Rameshu Rallabandi, PhD; Jef K. De Brabander, PhD; Jiwoong Kim; Yang Xie, PhD

Microtubules (MTs) are a highly validated chemotherapeutic target in cancer and are targeted clinically in a diverse range of malignancies. Drugs targeting MTs are distinguished in their effect on MT dynamics: those that promote catastrophe, such as vinca alkaloids, and those that promote stabilization, such as paclitaxel. A chemical screen aimed at identifying novel small molecules that are selectively toxic to small cell lung cancer detected 51 unique chemical scaffolds capable of potent cytotoxicity. Using a cell-based chemical probe competition assay for tubulin binding, we establish that 16 of these 51 small molecules are capable of binding to tubulin. Of these 16 scaffolds, 2 are chemically related to TK216, a compound currently in phase I/II trials for Ewing Sarcoma patients. TK216 has previously been described as a first-in-class small molecule inhibitor of EWSR1-FLI1, a driver fusion protein unique to Ewing Sarcoma. However, further work has established that TK216 is also an effective toxin against cancers that do not harbor the EWSR1-FLI1 fusion, and its cytotoxic phenotype of G2/M arrest and synergy with vincristine is in opposition to its proposed mechanism of action. Based on its structural similarity to small molecules known to bind tubulin and phenotypic inconsistencies with its proposed mechanism of action, we hypothesize that TK216's anti-cancer action is due to tubulin-mediated effects unrelated to EWSR1-FLI1 and may have chemotherapeutic uses beyond the targeted treatment of Ewing Sarcoma. With a cell-based chemical probe competition assay in concert with biochemical reconstitution of MT polymerization, compound-resistant β -tubulin alleles, and an unbiased forward genetics approach, we determine that TK216 binds MTs, disrupts MT dynamics in vitro as a destabilizing agent, and exerts its anti-cancer action through its interaction with MTs in Ewing Sarcoma. We further establish that its active enantiomer (-)-TK216 binds and destabilizes MTs potently, whereas its inactive (+) enantiomer counterpart does not. These results suggest that TK216 has been mischaracterized as an EWSR1-FLI1 inhibitor and ongoing clinical trials involving this compound should be reevaluated.

Optimal Sequence of Combination Radiation Therapy with α CD40 Immunotherapy

Peter Leung

Mentor: Todd Aguilera, MD, PhD, Department of Radiation Oncology

Collaborator: Katy Swancutt, DVM, PhD

Background: The combination of radiotherapy (RT) and anti-CD40 agonist antibody (α CD40) immunotherapy is a promising cancer treatment; however, there the ideal temporal sequence of this combination is unknown. Here, we investigate the systemic anti-cancer response of combination α CD40 and RT with a dual-tumor model of MC38 colorectal cancer tumors in C57BL/6J mice.

Methods: In this model, cancer cells were injected into the left and right flanks of each mouse, but only one of the resulting tumors (primary tumor) was irradiated in groups assigned to RT. This allowed for cure rate of the unirradiated tumor (secondary tumor) that may act as a proxy for systemic immune response. While holding RT at a set time (9 days) after tumor injection, α CD40 therapy was administered either 3 days before, 3 days after, or on the same day of RT. Due to variability in experiments, we measured differences between tumor site across groups using Fisher's exact test.

Results: Evaluating the secondary tumor for cure comparing same-day combination α CD40 + RT (20/25 cures) to α CD40-only (13/25 cures) treated mice had a P-value of 0.0718. Same-day α CD40 + RT (20/25 cures) vs RT-only (5/20 cures) P-value was .0003. There was no difference when α CD40 was given 3 days before or 3 days after RT. Comparing combination same-day α CD40 + RT (20/25 cures) to α CD40-3-days-after RT (2/10 cures) resulted in a P-value of 0.0017.

Discussion: The results suggest there may be an interaction between α CD40 and RT to achieve a secondary (unirradiated) tumor cure when the therapies are given with different timing. Comparisons of combination α CD40 and RT suggest that same-day combination therapy may be more effective in terms of secondary tumor cure rates compared to combination α CD40 given 3 days after RT. Unexpectedly, α CD40-alone 6 days after tumor injection (1/10 cures) did worse than α CD40-alone on day 9 (13/25 cures) with P-value of .0280: this could mean α CD40 alone on day 6 somehow disrupts or less efficiently stimulates the mouse's natural innate-to-adaptive immune development compared to day 9. These results need to be confirmed with bigger tumors and a separate animal model (ex. CT26 colorectal cancer cell line in BALBc mice). The mechanisms behind these differences could be due to changes of immune cell populations and the time course for developing an adaptive immune response after RT, so flow cytometry analysis of mouse lymph nodes and tumors will be investigated. We hypothesize that timing of therapy on dendritic cell maturation and T cell priming play an important role in the clinical effect so defining these interactions to propose optimal therapy sequencing will be important, along with further mechanistic studies.

Analysis of the Metabolic Profiles of Surgically Removed Thymomas

J. Wyatt Miller

Mentor: Ralph Deberardinis, MD, PhD, Department of Children's Medical Research Institute at UT Southwestern

Collaborators: Brandon Faubert, PhD; Kemp Kernstine, MD, PhD; John Waters, MD

Thymoma is the most common primary tumor of the anterior mediastinum. The importance of studying thymoma is highlighted by the significant damage it can cause for patients: these tumors are destructive, invade local mediastinal structures, and can lead to paraneoplastic syndromes. Little research has investigated altered metabolism in thymoma tumors. We hypothesized that thymomas are metabolically distinct from normal thymus tissue and that this distinction could be utilized to differentiate thymomas from benign thymic cysts.

To investigate this hypothesis, we recruited patients (n=20) undergoing surgical resection for a suspected thymoma. Prior to surgery, several patients (n=11) were infused with ^{13}C -glucose, a safe, non-radioactive tracer, which can be measured by mass spectrometry to trace the flow of carbon through metabolic pathways. Tissue samples were resected and snap frozen for metabolic analysis.

Histologic examination of the tissues revealed (n=9) patients had thymomas of diverse subtypes and (n=11) patients had a variety of benign cysts. All samples, including thymomas, normal thymus tissue, and benign cysts, were analyzed by metabolomics to assess the abundance of >100 metabolites at the time of resection as well as ^{13}C isotope tracing to compare the metabolic profiles of the tissue types. In our metabolomic analysis, we found that thymomas are distinct from normal thymus tissue and benign cysts. The profiles of metabolite abundance in each of our samples were compared via unsupervised and supervised clustering analyses, which revealed distinct clustering of thymomas from thymic cysts and normal thymus tissue. The metabolites that best distinguished these clusters were involved in DNA replication and translation, amino acid metabolism, and fatty acid metabolism. In our metabolite tracing analysis, the ^{13}C -glucose infused thymoma samples displayed differential utilization of nutrient sources compared to benign cysts and normal thymus tissue, including the utilization of lactate as a fuel. Taken together, our results demonstrate that metabolic reprogramming within thymomas distinguishes them from benign tissues.

Several results in this study are worthy of future investigation. Increased asparagine abundances in thymomas could reflect preferential uptake and potential susceptibility to treatments such as L-asparaginase. Other therapeutic targets could also be investigated such as the inhibition of lactate uptake into thymomas. This study suggests that further investigations into the metabolic reprogramming of thymomas could yield novel therapies and biomarkers for this disease.

Mesenchymal Progenitor Cell Discoidin Domain Receptor 2 Regulates Heterotopic Ossification

Chase Pagani

Mentor: Benjamin Levi, MD, Department of Surgery

Collaborators: Alec Bancroft, BS; Nicholas Livingston, BS; Amy L. Strong, MD, PhD; Yuxiao Sun, PhD; Charles D. Hwang, MD; Johanna Nunez, MD; Geoffrey E. Hespe, MD; Simone Marini, PhD; Amanda Huber, PhD; Renny T. Franceschi, PhD

Tissue regeneration following injury is a highly orchestrated process that requires the proper programming of tissue-resident progenitor cells. Aberrant progenitor cell differentiation can occur following severe injuries such as burn or blast wounds leading to heterotopic ossification (HO), which is ectopic bone formation in soft tissues of the musculoskeletal system. Mesenchymal progenitor cells (MPCs) are tissue-resident progenitor cells responsible for differentiating into tenocytes, osteoblasts, chondrocytes, and adipocytes, and aberrantly differentiate into chondrocytes and osteoblasts within muscle and tendon leading to HO following severe injury. Recent work has found that MPCs are influenced by cellular responses to collagen in the extracellular matrix (ECM) including content and alignment, however, it is unclear which cell surface proteins bind to collagen and what the effect of receptor-ligand binding is. To answer this question, we employ a reproducible and reliable murine injury model of HO by performing a 30% total body surface area burn and concurrent Achilles' tenotomy (BT) yielding HO lesions at the Achilles' tenotomy site nine weeks following injury. Utilizing single-cell RNA sequencing (scRNA), single-nucleus ATAC sequencing (snATAC), and proteomic analyses, we identified discoidin domain receptor 2 (DDR2), a cell surface receptor tyrosine kinase for fibrillar collagen, as a key regulator in the formation of HO showing specific expression to MPCs. *Ddr2*^{slie/slie} mice with a congenital deletion of *Ddr2* show decreased HO formation following BT. MPCs from *Ddr2*^{slie/slie} also showed decreased osteogenic capacity *in vivo*. Interestingly, both *Ddr2*^{slie/slie} mice showed more unaligned collagen matrix deposition at the injury site following BT compared to wildtype controls. Similarly, MPCs from *Ddr2*^{slie/slie} deposited less collagen and more unaligned collagen. These findings were replicated *in vitro* when MPCs were treated with Dasatinib, a small-molecule inhibitor of DDR2. Together, these findings suggest that DDR2 expression and signaling in MPCs are required for HO formation and leads to modulation of ECM alignment following injury.

Effects of Cholinergic Blockade on Hippocampal and Temporal Cortex Gene Expression

Meghana Rao

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Collaborators: Genevieve Konopka, PhD; Haley Moore, MD/PhD Student

Memory is integral for shaping our experiences. The devastating effects of memory disruption are shown in patients with conditions such as Alzheimer's disease. In order to alter the course of cognitive diseases, we must first strive to understand the basic mechanisms of memory. The most common treatments for Alzheimer's disease are acetylcholinesterase inhibitors, relaying the importance of the cholinergic system on memory formation. There is evidence that muscarinic acetylcholine receptor antagonists, like scopolamine, impair episodic memory, though their mechanism is not fully understood.

The purpose of this project, then, is to help elucidate the molecular mechanisms of cholinergic signaling in human brain tissue. We tested the effects of scopolamine *in vitro* on memory-related gene expression levels in fresh human temporal lobe tissue. Previous research in this lab has uncovered gene expression patterns linked with memory-related brain oscillations. As shown by Berto et al., several genes (e.g. SMAD3 and IL1RAPL2) are associated with memory-related theta oscillations. We hypothesized that scopolamine treatment will result in the downregulation of gene expression of these memory-linked genes.

To test this hypothesis, we cultured human brain slices of the temporal cortex and hippocampus from patients undergoing temporal lobectomies. We added 10 μ M of scopolamine, carbachol (a cholinergic agonist), or placebo to the culture medium for one hour. We then measured gene expression changes of seven select genes using qPCR.

Preliminary results show a decrease in gene expression of all analyzed genes in scopolamine-treated slices compared to carbachol-treated slices of the temporal cortex, suggesting that cholinergic tone may modulate memory-related activity in part via upregulation of theta-oscillatory-related genes. Future work includes the addition of more samples, as well as examining gene expression in the hippocampus. Electrical activity of slices from the three treatment groups will also be recorded and compared using slice physiological techniques.

In summary, the goal of this project was to identify molecular differences brought on by disruption of the cholinergic system in the human temporal lobe. The downregulation of the different oscillatory genes explored in this experiment has several clinical implications, as these genes could be targeted to develop treatments for those with Alzheimer's disease, traumatic brain injuries, or other memory-related conditions.

Novel Antisense Antibiotics Display Synergy and Biofilm Activity Against *Pseudomonas Aeruginosa*

Garrett Ray

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Collaborators: Christine Pybus, MS; Ibrahim Alamin, MS

Growing antibiotic resistance in *Pseudomonas aeruginosa* necessitates the need for new therapeutic approaches. Peptide-conjugated phosphorodiamidate morpholino oligomers (PPMOs) are novel antibiotics that inhibit translation of bacterial mRNA representing a potential solution to this problem. Our group has previously tested PPMOs targeting the essential genes *acpP*, *lpxC*, and *rpsJ* in *P. aeruginosa* and has demonstrated inhibition *in vitro* and *in vivo* when used by themselves or in combination with conventional antibiotics. However, it remains unclear whether combining PPMOs against different gene targets could provide a synergistic response.

PPMOs targeted to essential *P. aeruginosa* genes *acpP*, *lpxC*, and *rpsJ* were combined in antimicrobial synergy assays to elucidate any relevant interactions, as measured by the fractional inhibitory concentration (FIC). Among the PPMOs tested, the combination of PPMOs targeted to *acpP* and *lpxC* showed potent synergy, with almost all pairings resulting in additive or synergistic effects (average FIC= 0.437, range 0.25 to 1.01). Combinations of *acpP* and *rpsJ* also demonstrated FIC indices that ranged from 0.5 to 1.00. The combination of *lpxC* and *rpsJ* displayed few synergistic relationships (average FIC= 0.682; range 0.26 to 1.03).

The propensity of *P. aeruginosa* to form biofilms represents a major obstacle for novel antibiotics. Our group has previously shown that one PPMO targeted against *acpP* displayed inhibition of biofilm growth, but comprehensive biofilm testing has not yet been completed.

PPMOs targeted to *acpP*, *lpxC*, and *rpsJ* were tested separately for anti-biofilm activity in minimum biofilm eradication concentration assays. The results of these assays were quantified through counting colony forming units (CFU). The 5 most successful PPMOs included 3 5'(RXR)₄ conjugated PPMOs (*acpP*-0445, *lpxC*-0251, and *rpsJ*-0066) and 2 3'(RXR)₄ conjugated PPMOs (*acpP*-0400 and *lpxC*-0505). Each of these PPMOs displayed at least a 2-log reduction in mean CFU count, with each of the 5'(RXR)₄ PPMOs achieving a 3-log reduction. PPMOs show promise as narrow-spectrum, pathogen-specific antibiotics that can help combat the antimicrobial resistance crisis by minimizing off-target effects. The synergistic PPMO-PPMO interactions and biofilm activity described above suggest that PPMOs can have a meaningful role in the clinical management of *P. aeruginosa* without inducing widespread antibiotic resistance, as seen in conventional antibiotics.

Novel Collagen Chondroitin Sulfate Scaffold Regenerates Cartilage In Vivo

Aaron Shi

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Orthopedics and Sports Medicine

Collaborators: Guillermo Bauza-Mayol, PhD; Patrick McCulloch, MD

Introduction: Focal chondral lesions of the knee, the most frequent type of trauma in younger patients, are associated with a high risk of developing early osteoarthritis, and all current treatments do not provide regrowth of the damaged cartilage. Tissue engineering based on biomimetic scaffolds has emerged as a possible solution, and there is a lack of literature investigating immune modulation as a means for cartilage regeneration. In this study, we developed and tested a novel chondrogenic chondroitin sulfate functionalized cartilage scaffold (CLCS) in an orthotopic Lapine model in vivo to assess cartilage regeneration and inflammation suppression following chondral trauma.

Methods: CLCS was developed by our group, and its structure was assessed with SEM imaging and compressive tests. CLCS was implanted into a critical size defect in vivo model at an orthotopic site in a lapine joint and compared to untreated models. All rabbits were processed for post-surgical delayed gadolinium-enhanced MRI of cartilage (dGEMRIC) at post-surgical, 1 week, and 12-week timepoints. Animals were sacrificed, and tissue was harvested at 1 and 12-weeks post-surgery for RNA sequencing analysis and histological evaluation.

Results: On dGEMRIC imaging, T1 relaxation time was significantly increased in the treated group at post-surgical timepoint compared to untreated control (1.17 ± 0.35 -fold, $p < 0.05$) but exhibited no difference at 1 and 12 weeks, respectively (563.58 ± 123.01 s and 538.43 ± 68.24 s), indicating successful suppression of inflammation. On gene analysis, anti-inflammatory markers ADIPOQ, CXCR4, IL7R, IL1RA, and IL10 were significantly upregulated ($p = 0.001$), and pro-inflammatory cytokines TNF α and NOS2 were subsequently found to be downregulated (0.18 ± 0.01 -fold, $p < 0.0001$ and 0.30 ± 0.01 -fold, $p < 0.0001$). Matrix protease ADAMTS13 was found to be significantly decreased (0.43 ± 0.01 -fold, $p < 0.05$). Furthermore, COL1A1, COL1A2, COL4A1 COL4A2, and COL22A1, genes for collagen and cartilage synthesis, were significantly increased compared to healthy controls. Histology supported these findings, revealing greater integration and cellular infiltration throughout the depth of CLCS.

Conclusion: Our chondroitin sulfate scaffold has shown to enhance formation of cartilaginous tissue, suppress host cartilage degeneration, support tissue integration, and increase tissue regeneration over a 12-week recovery period. Our study is one of the first to demonstrate immune modulation for cartilage regeneration and supports CLCS as an excellent candidate for cartilage tissue repair and a biomaterial which may alter the landscape of orthopedic surgery.

A Cerebellar-Cortical Nexus for Feeding Control with Implications in Anorexia Nervosa

Tommy Tan

Mentor: Peter Tsai, MD, PhD, Department of Neurology

Collaborators: Fantao Meng, PhD

Maintaining a homeostatic body weight requires integration of hunger signals and nutrient status to influence feeding behavior. The cerebellum plays an important role in integration of internal and external cues to fine tune behavioral response. However, the role of the cerebellum in maintaining homeostatic control over feeding remains unknown. More so, how disturbances in cerebellar activity manifests in forms of disordered feeding also remains unknown. In this study we demonstrate that cerebellar Purkinje cell TSC1 knockout mutants show impaired body weight gain due to a restricted eating phenotype. We then show using chemogenetic and immediate early gene labeling that Crus1 Purkinje cells bidirectionally control feeding and that Crus1 granule cell activity, which carries sensory information to Purkinje cells, is responsive to the nutrient status of the animal. We then delineate a neural circuit from Crus1 to the medial prefrontal cortex (mPFC) culminating in the paraventricular nucleus of the hypothalamus as critical in mediating cerebellar control of feeding. The mPFC and cerebellum play critical roles in neuropsychiatric disease, so we investigated if cerebellar circuitry is implicated in eating disorders, specifically anorexia nervosa (AN). To study anorexia nervosa in mice, we turned to the activity-based anorexia (ABA) mouse model which models core aspects of AN including progressive weight loss, reduced food intake, and hyperactivity. Using this model, we show that cerebellar mutants display increased weight loss due to decreased intake and hyperactivity.

In Vivo Changes in Placenta Bivalent Histone Profile Across Pregnancy

Lauren Truitt

Mentor: David Owen, MD, PhD, Department of Obstetrics and Gynecology

Collaborator: Lee Kraus, PhD

The bivalent epigenetic motif, defined as the simultaneous presence of activating H3K4me3 and inactivating H3K27me3 histone modifications, was first discovered in embryonic stem cells, but its prevalence and implications in human tissue in vivo remains unclear. It has been postulated that this motif plays a role in tightly regulated temporal switches between transcriptionally on and off states. This study sought to explore the presence of this motif in placenta tissue over the course of pregnancy and analyze correlations with RNA expression in the same tissue. ChIP-seq (H3K4me3 and H3K27me3, 15 patients) and RNA-seq (36 patients) datasets were collected from terminated (first and second trimester) or delivered (third trimester) placenta samples obtained between 8 and 39 weeks estimated gestational age. Computationally, promoter sites were classified at each timepoint as expressing “H3K4me3 only,” “H3K27me3 only,” “bivalent,” or “neither” using randomly simulated ChIP-seq datasets as comparison. Gene ontology analysis was performed on sites listed as “bivalent” at any point. A group of “activated” promoter sites, defined as “bivalent” in the first or second trimester and “H3K4me3 only” later, were analyzed for temporal RNA profile. About 7,000 promoter sites were identified as bivalent in at least one of the 15 patients, with the number of sites identified during each trimester decreasing over the course of the pregnancy. This decline in bivalent sites correlated with a decrease in total H3K27me3 while total H3K4me3 stayed relatively constant. Additionally, consensus among samples during a given trimester was highest in the first trimester, with the most variability in the third trimester. Bivalent promoter sites were ontologically enriched for embryologic developmental pathways such as artery morphogenesis and Wnt signaling pathways among other cellular processes. Finally, no significant change was found in RNA expression of promoter sites when temporally changing from “bivalent” to “H3K4me3 only.” This study demonstrates the presence of the bivalent motif in developmentally relevant genes from in vivo placental tissue. The correlation between the decrease in “bivalent” sites and decrease in total H3K27me3 suggest that the bivalent motif is driven by removal of the inactivating histone modification. However, the molecular and transcriptional consequence of the bivalent motif remains elusive. Future work on samples separated by cell type isolated from the mixed trophoblast samples used in these analyses could prove useful.

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 * Poster Presenter

Breast Cancer Presentation, Follow-up, and 5-Year Outcome Between a Safety-Net and a Tertiary Care Hospital in the Same District

Zachary Acevedo

Mentor: Basak Dogan, MD; Ann R. Mootz, MD, Department of Radiology,
Breast Imaging Division

Collaborators: Nisha Unni, MD; Chika Nwachukwu, MD, PhD

Objective: To compare presenting stage, biomarker, and follow up patterns following successful treatment of breast cancer at a safety-net hospital (SNH) or a same-district university affiliated tertiary care center (UH).

Materials and Methods: We reviewed electronic health records of 645 patients with newly diagnosed breast cancer at SNH and UH between 3.1.2014 and 3.1.2016. We excluded patients who underwent upfront bilateral mastectomy or were lost to follow-up before 6 months post definitive treatment. Patient follow-up imaging was collected for 5-years post definitive treatment. Statistical analysis used Chi-square and Fisher exact tests for dichotomous variables and t-test for continuous variables

Results: Of the 645 patients, 251 (38.9%) were diagnosed in SNH and 394 (61.1%) in UH. SNH had a significantly higher rate of Stage IV cancers at presentation [SNH 7.6% (19/251) vs. UH 1.8% (7/394), $p<0.001$], Hispanic patients [SNH 47.1% (80/170) vs. UH 6.5% (16/246), $p<0.001$] and Black patients [SNH 36.5% (62/170) vs. UH 17.5% (43/246), $p<0.001$], while UH had more Non-Hispanic White patients [SNH 10.0% (17/170) vs. UH 61.4% (151/246), $p<0.001$]. Mean patient age was younger at SNH [54.5 years vs. UH 62.4 years, $p<0.001$]. T3 and T4 cancers [SNH 17.6% (30/170) vs. UH 2.8% (7/246), $p<0.001$], grade 2 and 3 cancers [SNH 84.1% (143/170) vs. UH 71.8% (176/245), $p=0.004$], and nodal metastasis (pN0 vs. pN+) [SNH 29.4% (50/170) vs. UH 15.0% (37/246), $p<0.001$] were higher at SNH. Adjusting for patient deaths and bilateral mastectomies, SNH cancers were significantly less likely to undergo imaging follow up at all timepoints ($p<0.05$). The rate of recurrence was higher [SNH 12.4% (21/170) vs. UH 5.7% (14/246), $p=0.02$] and earlier at SNH (22.1 M vs. UH 33.7 M, $p=0.049$). Significantly more cancers at SNH were lost to follow up over the study period [SNH 27.6% (47/170) vs. UH 16.3% (40/246), $p=0.005$]. Of the remaining patients, who completed therapy, death rates [SNH 14.6% (18/123) vs. UH 9.2% (19/206), $p=0.13$] and time of death (35.8 M SNH vs. 33.7 M UH, $p=0.76$) were similar.

Conclusions: Despite having comparable access to healthcare, SNH patients had a higher rate of presenting with biologically unfavorable breast cancers at advanced stage, and were significantly less likely to have follow-up imaging, while also having higher rates of and earlier recurrence.

Differences in Patient Reported Outcome Scores between FAI and Dysplasia

Ahmed Alshaikhsalama

Mentor: Joel Wells, MD, MPH, Department of Orthopaedic Surgery

Collaborators: Holden Archer, MS1; Ajay Kohli, MD;
Avneesh Chhabra, MD, MBA

Objectives: 1. Calculate HHS and iHOT-12 scores for dysplastic and FAI hips.
2. Examine differences in patient reported outcomes for hip dysplasia vs. FAI that may be predictive of these conditions.

Hypothesis: Hip dysplasia is caused by undercoverage of the acetabulum that can lead to instability. Dysplasia results in distinct mechanical factors such as statically increased contact pressures, and a decreased contact surface. In contrast, FAI results in repeated shear forces on the chondro-labral junction. Since the mechanical properties of hip dysplasia differ from FAI, there are likely differences in patient reported quality of life and function measurements that can help differentiate dysplasia and FAI.

Design: Cross sectional retrospective study examining 377 patients and 426 hips with hip pain. Dysplastic and FAI hips were identified and further examined using completed patient surveys focusing on Harris hip score (HHS) for function and iHOT-12 for quality of life.

Results: 135 dysplastic hips from 106 patients were identified with a mean HHS of 54.4. 97 FAI hips from 85 patients were identified with an HHS of 62.7. From the dysplastic group, iHOT-12 scores from 123 hips and 93 patients yielded an average of 64.5. From the FAI group, iHOT-12 scores from 89 hips and 81 patients averaged 56.9.

Conclusions: HHS and iHOT-12 differ between dysplastic and FAI hips. FAI hips on average report greater function than dysplastic hips according to HHS. In contrast, dysplastic hips have a better quality of life based on iHOT-12 scores. However, both dysplastic and FAI hips have poor function (HHS <70), so differences in values may not hold clinical significance. Interestingly, dysplastic hips achieved the PASS threshold (>63) on iHOT-12, whereas FAI did not despite reporting greater hip function. Nevertheless, for both HHS and iHOT-12, more analysis is required to determine whether these differences are significant.

The Interplay between Systemic and Targeted Therapies in Cachexia in NSCLC

Christian Alvarez

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Collaborators: Santiago Olaechea, MS3, Rodney Infante, MD, PhD;
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Cancer cachexia is an adverse paraneoplastic condition that results in rapid weight loss and predisposes patients to poor outcomes across all malignancies irrespective of therapeutic interventions via inflammatory and metabolic derangements. Today, cancer therapies that target specific tumor phenotypes are increasingly being utilized as first line, including in non-small cell lung cancer (NSCLC). However, the associations of these new treatments in the setting of cachexia are poorly understood. With the implication that type of therapy was selected clinically due to heterogeneity driven by inherent underlying tumor microbiology such as changes in driver oncogenes ALK, KRAS or ROS1, we aimed to determine if selected treatment modalities were associated with cachexia incidence at diagnosis and to explore factors contributing to survival in a cohort of NSCLC patients.

Post exclusion, our cohort was comprised of 948 patients with stage IV NSCLC from 2014-2020. One of four treatment groups (no treatment, standard chemo, targeted biologics, immune modulating) was assigned by determining first-line treatment via retrospective analysis. We performed univariate, stepwise cox regression and Kaplan- Meier curves to determine group variation in survival and cachexia incidence.

Patients who received no treatment, standard chemotherapy, immune modulating therapy, and targeted biologics had 57.6%, 43.4%, 40.8%, and 32.2% cachexia incidence at diagnosis, respectively. Improved overall survival outcomes were observed in identical order. There was significant increase in survival between targeted biologics with a mean of 787 d, and standard chemo, mean of 477 d ($p < .0001$). Of note, within the targeted group there was no significant difference in survival between patients with and without cachexia. These findings coupled with the fact that targeted therapy had the highest survival and lowest cachexia incidence suggest that this therapy may have a role in overcoming the cachexia-survival burden seen in other treatment groups. A potential confounder is that patients who have targetable mutations have different relative rates of variables including age, gender, alcohol and tobacco use, medical comorbidities and histological type with respect to treatment assignment. We must decipher this via further multivariate analysis.

Our findings so far suggest that survival and cachexia status are influenced by treatment modality and the molecular underpinnings that inform them. Further investigation will be conducted to better establish the factors that herald the manifestation of cachexia.

The Impact of Prepectoral Versus Subpectoral Tissue Expander Placement on Complications and Outcomes in Delayed-Immediate Autologous Patients who Undergo PMRT

Joshua Amaya

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Collaborators: Edward Wen, BS; John Tycher, BS; Katlin Jones, BS;
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Background: Delayed-immediate autologous (DIA) breast reconstruction is a safe and flexible operative strategy, especially for patients who undergo post-mastectomy radiation therapy (PMRT). Traditionally, tissue expanders (TE) are placed in the subpectoral position, but the development of acellular dermal matrix (ADM) material has led to increased use of prepectoral placement strategies. Our aim is to compare the outcomes of both TE placement strategies in DIA patients who underwent PMRT and determine if they experienced similar outcomes to non-PMRT patients.

Methods: A retrospective analysis of 4 patient groups (314 total patients) who underwent DIA reconstruction from 2012 to 2019 was performed. 98 non-PMRT prepectoral (PP), 106 non-PMRT subpectoral (SP), 39 PMRT prepectoral (PMRT PP) and 71 PMRT subpectoral (PMRT SP) patients were compared. Demographics, TE complications, flap complications and the use of large inferior skin patches were analyzed.

Results: Overall TE complications were compared across all groups and no significant difference was found ($p > 0.05$). A significantly lower percentage of the PMRT PP cohort required large inferior skin patches (30.6% vs 55.7%; $p < 0.05$) and multi-flap procedures (15.4% vs 47.9%; $p < 0.001$) than the PMRT SP cohort. PMRT ($p < 0.0001$), subpectoral placement ($p < 0.05$), BMI ($p < 0.05$), autoimmune diseases ($p < 0.05$), and bilateral mastectomy ($p < 0.001$) were identified as factors predictive of patients requiring a large inferior patch via multivariable analysis. More SP patients experienced flap post-op breast complications than PP patients (35.8% vs 12.2%; $p < 0.0001$). Multivariable analysis identified subpectoral placement (OR: 0.1203, 95% CI: 0.00927 to 1.476; $p < 0.05$) as a predictive factor of 1 or more flap post-op recipient site complications.

Conclusion: DIA patients who undergo PMRT will require more skin and flaps if subpectoral TE placement is chosen over prepectoral TE placement. Prepectoral TE placement is safer and leads to better outcomes than subpectoral TE placement in these patients

Imaging Characteristics Predictive of Pathologic Outcomes in Clinical Stage IIA Testicular Cancer

Armon Do Amini

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Introduction and Objective: The defining thresholds for the size of clinically significant lymph nodes on retroperitoneal cross-sectional imaging of testicular cancer patients is controversial. Decreasing the threshold diameter to identify all pathologically positive nodes has resulted in specificity values of 52- 58%, creating the potential to expose false positive patients to unnecessary primary retroperitoneal intervention. Thus, we evaluated additional imaging features that are predictive of pathologic outcomes.

Methods: This was a retrospective study of a cohort of 19 patients, median age 28, with clinical stage (CS) IIA testicular cancer who underwent primary retroperitoneal lymph node dissection (RPLND) at our institution from 6/1/2015 to 2/28/2021. The cross-sectional imaging was manually reviewed to obtain the radiodensity and right-left, anterior-posterior, and cranio-caudal measurements of the three largest retroperitoneal lymph nodes. Outcomes of interest included pathologic stage (PS), upgrading from cN1 to pN2, and size of largest pathologic node.

Results: Number of nodes ≥ 10 mm on conventional imaging was significantly associated with PS upstage ($p=0.033$) and largest pathologic node size ($p=0.006$). Largest node dimension was significantly associated with PS ($p=0.002$), PS upstage ($p=0.001$), and largest pathologic node size ($p=0.026$). Only largest node dimension was significantly predictive of PS upstage (OR 1.52, $p=0.019$) and largest pathologic node size (OR 1.03, $p=0.026$). The area under the ROC curve for discriminating PS upstaging by largest node dimension was 0.911 ($p=0.003$).

Conclusions: This study demonstrated the long axis retroperitoneal node dimension was more predictive of pathologic node size and stage than other clinical and imaging features in patients undergoing primary RPLND for CS IIA testicular cancer. The craniocaudal dimension was the largest in 16/18 patients, which could be clinically relevant. Due to lack of strong consensus for the true short axis size of a clinically significant retroperitoneal lymph node, incorporation of other measurements such as craniocaudal and overall largest node dimensions may assist in selecting patients for retroperitoneal management. Incorporating these values may improve treatment decisions in stage IIA testicular cancer patients.

SF-12 and VAS on Presentation with Acetabular Dysplasia, Borderline Acetabular Dysplasia, or FAI

Holden Archer

Mentor: Joel Wells, MD, MPH, Department of Orthopaedic Surgery

Collaborators: Ahmed Alshaikhsalama, MS1; Ajay Kohli, MD;
Avneesh Chhabra, MD

Background: Hip dysplasia and femoroacetabular impingement (FAI) are structural hip abnormalities stemming from inadequate or excessive coverage of the femoral head by the acetabulum. Collecting patient reported outcome measures is important to understanding expected outcomes and informing decision making for preservation patients presenting with different conditions. SF-12 assesses general well-being, and VAS assesses pain level.

Purpose: The purpose of this study was to assess the variability of SF-12 and VAS over time for patients presenting with acetabular dysplasia, borderline acetabular dysplasia, or FAI.

Methods: Using our hip preservation database, we identified 240 hips with full radiographic, CT, and MR imaging. These hips were classified as dysplastic, borderline dysplastic, or impinging. The collected PROMs were SF-12 General Health (SF-12) and Visual Analog Scale (VAS) Pain Level. SF-12 was indexed to a 100% scale. The means of each metric were assessed for each classification. SF-12 and VAS were compared over the timespans at which they were collected.

Results: Of the 240 hips classified, 122 had dysplasia, 19 had borderline dysplasia, and 99 had FAI. As of the first survey, the mean SF-12 score was 62% for hip dysplasia patients, 63% for borderline hip dysplasia patients, and 66% for FAI patients. At the end of the period, dysplasia patients displayed 8.5% improvement, borderline dysplasia patients displayed 7.8% improvement, and FAI patients displayed 7.0% improvement.

The VAS average at the first date was 5.3 for hip dysplasia patients, 6.3 for borderline hip dysplasia patients, and 4.7 for FAI patients. At the last date, those with dysplasia, borderline dysplasia, and FAI displayed decrease in VAS pain of 2.3, 2.1, and 2.1 respectively.

Conclusion: Patients with FAI had the highest average general well-being and least average pain. Patients with dysplasia displayed the most improvement. This suggests that those with FAI can expect high well-being and low pain whereas patients with dysplasia can expect their well-being and average VAS pain to improve more.

On average, all classifications improved. Patients with dysplasia, borderline hip dysplasia, or FAI can reasonably expect to improve with respect to the general well-being domains assessed by SF-12 and with respect to pain levels.

Sex Differences in Chronic Rhinosinusitis Presentation and Surgical Outcomes

Annapoorani Asokan

Mentor: Vijay Ramakrishnan, MD, Department of Otolaryngology, University of Colorado School of Medicine

Collaborators: Jess Mace, MPH; John D. Rice, PhD; Timothy Smith, MD, MPH; Zachary Soler, MD, MSc

Background: Despite extensive research into chronic rhinosinusitis (CRS) epidemiology, presentation, and outcomes, there is scant knowledge on sex-specific differences. The objective of this study was to identify differences between male and female CRS patients in baseline disease severity at presentation, choice for surgery versus continued medical treatment, and post-operative response.

Methods: We examined data from a large multicenter CRS outcomes study. Recorded data included demographic and health characteristics, clinical objective disease measures, and sinus-specific and general health patient-reported outcome measures. Comparison of cohort characteristics, baseline and post-operative measures was performed with t-tests, chi-square tests of independence, or Fisher's exact test. Within-subject improvement was compared between males and females and adjusted depending on covariate significance.

Results: Females demonstrated worse quality of life (QOL) on presentation and post-surgery, despite lesser disease on clinical objective measures. Both females and males showed similar overall within-subject improvement after surgery. However, certain quality of life domains and disease measures show sex-specific improvement. Females demonstrated greater within-subject improvement in SF6D-derived health utility, and the SNOT-22 ear & facial, psychologic, and sleep subdomains, although this did not reach standard statistical significance for the overall CRS cohort ($\alpha < 0.05$).

Conclusion: To apply a personalized approach to CRS treatment decision-making, incorporating data on sex-specific differences may be important. The discordance we observe between patient-reported and clinical objective measures has been demonstrated in other pathologies as well and appears to be exaggerated by sex. Biologic and/or psychologic bases for sex-specific differences in CRS disease manifestations is an intriguing topic for further research.

The Roles of Infection Risk and Caretaker Education in Reducing Emergency Department Readmissions Among Pediatric Tracheostomy Patients

Dylan Beams

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Collaborators: Stephen R. Chorney, MD, MPH; Yann-Fuu Kou, MS; Taylor B. Teplitzky, MD; Erin Wynings, MD

Objectives: To determine factors associated with frequent emergency department (ED) visits and hospitalizations among pediatric tracheostomy patients.

Methods: A longitudinal cohort of children with tracheostomies were followed for the first 24 months after index discharge. Multiple logistic regression analyses identified associated factors for frequent health care utilization (> 4 visits in 24 months).

Results: 239 children requiring 1285 total visits to the ED or hospital after index discharge were included, with 112 children (46.7%) having four or more visits. Respiratory-related illness was the most common indication (N=699 visits, 54%), followed by gastrostomy tube issues (N = 119, 9.3%). Variables predicting frequent utilization on regression analysis included Black race (OR = 2.01, 95% CI = 1.18 – 3.70), mechanical ventilation (OR = 2.74, 95% CI = 1.35 – 5.59), and Spanish language (OR = 3.86, 95% CI = 1.47 – 10.11). There were no predictors of visits for tracheostomy-related complications, which accounted for 4.8% of all encounters. A sub-analysis showed that Hispanic race and gestational age predicted visits for respiratory failure.

Conclusion: 47% of pediatric tracheostomy patients necessitate frequent ED and hospital utilization in the first two years after placement. Strategies related to reducing respiratory- and gastrostomy-related admissions may have the most impact given their high frequency. The significance of primary Spanish language and mechanical ventilation may emphasize the importance of quality caretaker education prior to patient discharge.

The Association between Activities and Speech Perception Outcomes in Adult Cochlear Implant Patients

Julia Casazza

Mentor: Jacob Hunter, MD, Department of Otolaryngology

Collaborator: Kristin Yancey, MD

Introduction: Shorter duration of deafness and younger age are associated with better cochlear implantation (CI) outcomes, but little is known about the influence of patient activities. We surveyed patients to determine whether perceived social support or participation in specific activities correlate with post-CI speech perception outcomes.

Methods: We emailed adult CI patients implanted after January 2019, inviting them to complete the Functional Social Support Questionnaire (FSSQ) and a modified version of the Victoria Lifestyle Study-Activities Lifestyle Questionnaire (VLS-ALQ). We assessed how patient demographics, FSSQ score, and individual activities correlated with speech perception (AzBio) scores.

Results: Of 154 patients emailed, 53 (34%) completed the survey, of whom 24 had > 6 months follow-up with sufficient speech perception testing. Our cohort was 75.0% white, 70.8% male, and had an average age of 69.0. AzBio testing showed improvement in the implanted ear from a pre-operative average of 25.4% to 68.5% post-operatively ($p < 0.005$) and binaurally from 40.4% to 79.1% ($p = 0.006$). Functional social support did not correlate with either implanted ear or binaural post-operative AzBio scores. AzBio scores in the implanted ear correlated positively with length of follow-up (Pearson's $R = 0.445$, $p = 0.029$), participation in organized social activities ($R = 0.472$, $p = 0.020$), and correlated negatively with travel abroad ($R = -0.417$, $p = 0.043$). With regression analysis, social activities ($B = 10.165$, $p < 0.001$) and knowledge games ($B = 3.988$, $p = 0.24$) positively predicted AzBio scores in the implanted ear, whereas participation in photography ($B = -6.698$, $p = 0.01$) negatively predicted AzBio scores. Binaural AzBio scores correlated negatively with on-the-job training ($R = -0.655$, $p = 0.011$), informal social interactions ($R = -0.658$, $p = 0.011$), jigsaw puzzles ($R = -0.792$, $p = 0.001$), and practicing a foreign language ($R = -0.659$, $p = 0.010$). Attendance at church/synagogue services positively predicted ($B = 10.629$, $p < 0.001$), whereas jigsaw puzzles ($B = -17.640$, $p < 0.001$), math ($B = -6.321$, $p = 0.001$), card games ($B = -1.457$, $p = 0.014$), and eating at restaurants (-3.775 , $p = 0.027$) negatively predicted binaural AzBio scores.

Conclusion: Participation in organized social activities is positively associated with, whereas solitary recreation is negatively associated with, speech perception scores.

Evaluating Recovery Following Spinal Cord Injury After High Voltage Electric Burns

Keerthana Chakka

Mentor: Karen Kowalske, MD, Department of Physical Medicine and Rehabilitation

Collaborator: Audra Clark, MD

Background: Delayed spinal cord injury (SCI) is a relatively rare consequence of high voltage electrical burns, but it holds significant implications for patient quality of life. Due to the uncommon nature of delayed SCI and variable time of onset following injury, providers are currently unable to provide a prognosis for functional recovery and optimize a therapy process tailored to treat this patient populace.

Methods: In this study, we aim to better map the pattern of recovery in these patients to accurately inform future rehabilitation practices. A retrospective chart review of 5 patients who experienced delayed spinal cord injury secondary to an electrical burn was conducted. Data collected consists of patient demographics, medical history, total body surface area of burn (TBSA), TBSA full thickness, mechanism of injury, date and onset of weakness, and Functional Independence Measures (FIM) and ASIA motor scores at one month, three month, six month, and twelve month time points.

Results: The majority of patients displayed an upward trajectory in motor function following acute hospitalization and inpatient rehabilitation, with 4 of the 5 patients able to achieve complete motor strength in multiple extremities. Additionally, rehabilitation was shown to have a noticeable impact in improving functional independence in tasks related to nursing.

Conclusions: In conclusion, the clinical and functional outcomes of these delayed SCI patients point to the need for multidisciplinary management following injury and highlight the importance of early rehabilitation in regaining function. Additionally, emphasizing safe practices, especially among electricity workers and people who work near power lines, is another important factor in preventing injury. In future studies, greater demographic diversity and more comprehensive data collection may be helpful in facilitating a more representative analysis; however, due to the particularly rare nature of this complication, recruiting such a cohort may be difficult.

The Ratio of Hs-cTnI/Hs-cTnT in Patients with Myocardial Injury is Associated with Different Clinical Phenotypes

Ishwar Chuckaree

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Collaborators: Samuel McDonald, MD; Deborah Diercks, MD;
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Introduction: Hs-cTnI and hs-cTnT concentrations are poorly correlated with a non-linear relationship. The purpose of this study is to determine whether patients with different ratios of hs-cTnI and hs-cTnT are phenotypically distinct.

Methods: The study included a consecutive patient cohort that presented to a single academic institution between June and July 2020. Only the first admission and the first corresponding pair of troponin values obtained was analyzed. Patients with both TropT and TropI \geq 99th percentile URL (\geq 28 ng/L for hs-cTnI and \geq 19 ng/L for hs-cTnT) were categorized based on their TropI/TropT ratio (I/T ratio). Patient demographic, clinical characteristics, and adjudicated final diagnosis were compared among tertiles of I/T ratio.

Results: Of the 809 unique patient encounters, 137 patients had both hs-cTnI and hs-cTnT \geq 99% URL. Patients in the lowest I/T tertile were more likely to be male, Black, and have diabetes, hypertension, CKD and CAD. The prevalence of myocardial infarction was 5% with the remaining elevated values secondary to acute or chronic non-ischemic myocardial injury. The adjudicated etiology of cardiac injury was more likely to be chronic non-ischemic myocardial injury in the lowest I/T tertile and more likely to be acute non-ischemic myocardial injury in the middle and highest tertile.

Conclusions: In this small, single center study, patients with myocardial injury and lower I/T ratio were more likely to have medical comorbidities and chronic myocardial injury as opposed to the highest I/T tertile. This suggests that important phenotypic differences exist among patients with abnormal hs-cTnI and T levels.

Outcomes of Trainee-Performed Minimally Invasive Glaucoma Surgeries at Parkland Memorial Hospital

Joseph Da

Mentor: Niraj Nathan, MD, Department of Ophthalmology

Collaborator: Matthew Gillings, MD

This study assesses the efficacy of microinvasive glaucoma surgery (MIGS) with cataract extraction in the hands of Parkland ophthalmology residents and fellows in a sample of 157 Kahook Dual Blade goniotomy (KDB) and 137 endocyclophotocoagulation (ECP) cases. The mean reductions in IOP at post-operation month 12 compared to pre-operation were 1.71 ± 6.91 mmHg ($3.8 \pm 41.4\%$) for KDB and 2.74 ± 5.22 mmHg ($12.8 \pm 26.1\%$) for ECP in cases with post-operation month 12 data (80/157 and 96/137 cases respectively). The mean IOP across all post-operative time points in KDB and in ECP had statistically significant differences with the pre-operation mean IOP. The comparison of mean reduction in IOP of KDB vs. ECP did not reach statistical significance at any of the time points. For both MIGS procedures, the pre-operative mean number of medications was not significantly different from the post-operative mean number of medications at month 12. Visual acuity (VA) remained stable or improved by post-operation month 12 in 65/73 (89%) of KDB cases and 71/80 (89%) of ECP cases (cases with pre-operative VA worse than 20/400 or without post-operation month 12 data were excluded). Future research directions include investigating the large variability in post-operative IOP, and what factors may be identified pre-operatively that can predict poor IOP outcomes after MIGS surgery done by an ophthalmology resident/fellow.

Supportive Care Needs Among Head and Neck Cancer Patients Prior to Oncologic Treatment: A Prospective, Nested Cross-Sectional Qualitative Analysis

Thomas Emmet

Mentor: Andrew Day, MD, MPH, Department of Otolaryngology-Head & Neck Surgery

Collaborators: Anubha Sood, PhD; Rebecca Eary, MD; Courtney Prestwood, BS; Jordan Salley, BS; Alexandra Huffman, LCSW, MSSW; Jacqueline Doenges, LCSW, MSSW; Elizabeth Mayfield Arnold, PhD; Jasmin Tiro, PhD; Simon Craddock Lee, PhD

Objectives: To qualitatively characterize pretreatment head and neck cancer (HNC) patients' supportive care (SC) needs, attitudes towards SC, and barriers to SC utilization.

Materials and Methods: A prospective, nested, bi-institutional, cross-sectional pilot study design was employed. Participants were sub-selected from a representative sample of 50 patients newly diagnosed with mucosal or salivary gland HNC or sarcoma of the head and neck. Eligibility criteria included reporting ≥ 2 unmet needs (according to the Supportive Care Needs Survey – Short Form 34) or clinically-significant distress (National Comprehensive Cancer Network Distress Thermometer score ≥ 4). Semi-structured interviews were performed prior to initiation of oncologic treatment. Audio-recorded interviews were transcribed and thematically analyzed using NVivo 12.0 (QSR Australia). Thematic findings and representative quotes were interpreted by the entire research team.

Results: Twenty-seven patients were interviewed. One-third were treated at the county safety-net hospital and the remainder were treated at the university health system. An equal proportion of patients presented with oral cavity, oropharyngeal, and laryngeal or other tumors. Three significant findings were identified on semi-structured interviews. First, patients did not perceive the relevance of SC prior to treatment. Second, anxiety surrounding the HNC diagnosis and impending treatment dominated in the pretreatment phase. Third, sociodemographic and disease characteristics influenced self-reported need for SC services.

Conclusion: Improved HNC patient education about the relevance and importance of SC in the pretreatment setting is needed. Integration of social work or psychological services in HNC clinics is warranted to address patients' cancer-related worry - a discrete, dominant pretreatment SC need.

Key words: head and neck cancer, supportive care, pretreatment, patient preferences, qualitative analysis

Pre-Diagnostic Imaging Suggests Rapid Onset and Progression of Pancreatic Ductal Adenocarcinoma

Sebastian Enrico

Mentor: Matteo Ligorio, MD, PhD, Department of Surgery

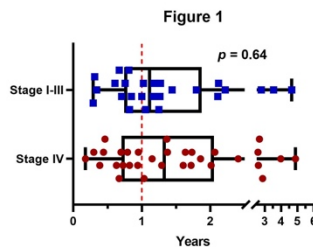
Collaborators: John Karalis, MD; Patricio Polanco, MD; Herbert Zeh, MD;

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Background: The natural history (i.e., onset, progression, and metastasis) of pancreatic ductal adenocarcinoma (PDAC) is inadequately defined. The majority of PDAC patients present with locally advanced or metastatic disease, making PDAC the most lethal solid tumor in adults. It is still unknown whether this is due to a rapid tumor progression or the late onset of symptoms due to its 'hidden' body location. In this study, we tried to fill this knowledge gap by seeking insights into the natural history of PDAC onset and early progression through reviewing pre-diagnostic cross-sectional (CT) abdominal imaging of PDAC patients.

Methods: The Clements University Hospital pancreatic neoplasm registry was retrospectively queried to identify consecutive patients diagnosed with PDAC from 2010-2020. PDAC patients were included if they had CT scans available for unrelated comorbid conditions within 5 years prior to PDAC diagnosis. CT scans were classified into two groups based on the whether the pancreas was radiographically completely normal (Group 1) or had any unrelated radiographic abnormality, e.g., benign cysts (Group 2). Differences in means were calculated using the Mann Whitney U test and overall survival (OS) was estimated using the Kaplan-Meier method and log-rank test.

Results: 87 patients were included in this study. Of these, 67% (58/87) were in Group 1 and the median interval between the comorbidity and diagnostic scans was 406 ± 413 days for stage I-III vs. 485 ± 492 days for stage IV disease ($p = 0.64$; Figure 1).



Conclusion: Our findings intriguingly suggest that PDAC onset and its initial progression is not monolithic. Half of these patients seem to have a more gradual progression, Stage I-III (i.e., resectable disease), resulting in a better OS, while the remainder had a very rapid tumor growth with multiple distant metastases, Stage IV, with a significantly worse outcome ($p=0.03$). This evidence indicates objective difficulties for CT-based screening methods to detect potentially curable PDACs but also points to promising avenues for identifying new molecular features and novel biomarkers to predict PDAC progression.

The Relationship between Pre-Operative Pain Characteristics and Periacetabular Osteotomy Outcomes in Patients with Acetabular Dysplasia

Brandon Everett

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Collaborators: Paul A. Nakonezny, PhD; Edward P. Mulligan, DPT;
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Introduction: Bernese Periacetabular Osteotomy (PAO) is widely performed for patients with acetabular dysplasia, however the relationship between pre-operative pain characteristics and patient-reported outcome measures (PROM) is not well-studied.

Aims: (1) Does maximum severity of pain in a location other than the groin that is greater or equal to that of the groin affect PROM? (2) Does the presence of non-groin pain affect PROM? (3) Does the severity of pain affect PROM? (4) Does the number of pain locations affect PROM?

Methods: We reviewed 52 hips (48 patients) treated with PAO for acetabular dysplasia from February 2017 to July 2020, using modified Harris Hip Score (mHHS), Hip Outcome Score (HOS), and international Hip Outcome Tool (iHOT-12) score, radiographic analysis, and pain location/severity questionnaires. Descriptive statistics, Analysis of Covariance (ANCOVA), and Spearman partial correlation coefficients were implemented.

Results: Twenty-six hips experienced the most severe pre-operative pain in the groin, and 26 hips experienced equal or greater pain in a non-groin location. Outcome scores between these groups were not significantly different (mHHS $P = .59$, HOS $P = .48$, iHOT-12 $P = .99$). Additionally, the presence of pre-operative pain in any non-groin location had no significant relationship with PROM (all P -values $\geq .14$). Furthermore, the maximum severity of pre-operative pain and number of pain locations showed no significant relationship with PROM (maximum severity: mHHS $P = .82$, HOS $P = .99$, iHOT-12 $P = .36$; number of pain locations: mHHS $P = .56$, HOS $P = 0.10$, iHOT-12 $P = 0.62$).

Discussion: Location of most severe pre-operative pain and the presence of non-groin pain in a patient with acetabular dysplasia does not adversely affect PROM. Additionally, increased pain severity and pain locations does not appear to have any significant impact on outcomes. Therefore, a wide array of patients with acetabular dysplasia might expect similar, favorable outcomes from PAO regardless of pre-operative pain characteristics.

Clinical Relevance: This study attempts to fill a current gap in knowledge that could help orthopaedic surgeons better understand the relationship between pain location and hip outcomes for patients following PAO.

D-Mannosuria Levels Measured One Hour After D-Mannose Intake Can Select Out Favorable Responders

Ethan Fan

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Collaborators: Alana L Christie, MS; Jorge Fuentes, MD; Marjan Dahti, PhD; Larry Reitzer, PhD

Background: D-mannose intake is used as a preventive measure against recurrent urinary tract infections (RUTIs). However, response to D-mannose varies, and it is unknown if measuring baseline D-mannosuria can distinguish a group of favorable responders that may be targeted for long-term preventive therapy.

Material and Methods: Following IRB approval, women attending a specialized tertiary care center urology clinic with a history of RUTIs were invited to the study. Participants provided a urine sample (baseline), took their home-dose of D-mannose, and provided a second urine sample one hour later (post). Urine samples were processed according to a D-mannosuria assay technique reported previously by our group. Successful response to D-mannose intake was determined if the D-mannose level in the urine increased by at least 20% after intake compared to at baseline.

Results: From July 2020 to March 2021, 26 patients met study criteria. Thirteen patients had a lower or unchanged ratio of baseline to post D-mannose, whereas 13 had an increase above 20% compared to baseline. In those taking 2 gm, 12 had a low or unchanged trend and 7 had a notable increase after one hour. Comparison of urinary baseline D-mannose/creatinine ratios was significantly different between the responder (mean = 0.337 ± 0.158) and (mean = 0.692 ± 0.444 ; $p = 0.016$) non-responder groups. Urinary post D-mannose/creatinine ratios did not significantly differ between the two groups ($p = 0.46$).

Conclusion: Baseline D-mannosuria was found to be significantly lower in those with an elevation above their baseline level, possibly suggesting an internal regulatory mechanism to add more D-mannose in urine to protect against bacterial invasion when the natural levels are low. Conversely, those with a high D-mannosuria level at baseline presumably did not need to add any more D mannose in their urine and therefore did not mount an added response in their urine upon taking D-mannose orally. These observations on baseline D-mannosuria levels and oral intake urine responders, although still preliminary, can be harnessed to design a prospective study to determine the long-term efficacy of D-mannose intake in reducing RUTI episodes.

Outcomes in HIV-Associated Autonomic Neuropathy

Alex Figueroa

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Collaborators: Patrick Kwon, MD; Steven Lawrence, BS, MS

Background: The autonomic nervous system is an important regulator of organ systems such as the kidneys, the heart, the immune system, and the gastrointestinal system. Autonomic neuropathy (AN) is a consequence that people living with HIV (PLWH) can develop. The composite autonomic severity score (CASS), a score derived from formal autonomic function testing, is associated with predictors of mortality in PLWH. However, longitudinal follow up on patients with HIV associated autonomic neuropathy (HIV-AN[+]) has not been performed. Our hypothesis is that PLWH who have HIV-AN[+] are more likely to develop one of the following adverse outcomes compared to HIV-AN[-]: new diagnosis of end stage renal disease (ESRD) or initiation of hemodialysis, hemorrhagic or ischemic stroke (CVA), cirrhosis, myocardial infarction (MI), coronary artery disease (CAD) requiring surgical intervention, or death. These adverse outcomes were selected based on the criteria used for the Strategies for Management of Antiretroviral Therapy (SMART) study group.

Methods: Our study was performed by conducting a retrospective longitudinal chart review in which 114 HIV participants, seen for autonomic function testing between 2011-2012, as part of a cross sectional study examining the prevalence of HIV-AN, were followed until March 1, 2020. The aforementioned outcomes were extracted from the electronic medical record (EMR) by one of the investigators (AF) and verified by a second (PK). Those with autonomic neuropathy (defined by a Composite Autonomic Severity Score (CASS) greater than or equal to 3 on their 10 point during their baseline autonomic testing visit in 2011) were compared to those with a CASS <3. The cohort included a well distributed proportion of males, females, African Americans, Hispanics/Latinos, and white/other. For statistical analysis, a cox proportional hazards model was performed.

Results: Of the 114 patients in the study, 28 patients were found to have experienced an adverse outcome. Of these 28 patients, 20 had a previous diagnosis of AN. The adverse outcomes found in the 28 patients included: death, cirrhosis, a diagnosis of end stage renal disease, being placed on dialysis, an NSTEMI, ischemic stroke, and CAD w/surgical intervention.

Conclusion: HIV-AN[+] is associated with serious adverse health outcomes, and the CASS is a predictor for poor outcomes. Our hope is that this study helps guide physicians towards a more targeted therapeutic approach for patients with HIV-AN, with the end goal being to help provide a better quality of life to people living with HIV.

Missed Breast Cancers: A Six-Year Analysis

Jordan Franklin

Mentor: Basak Dogan, MD, Department of Radiology

Breast cancer is the second most diagnosed malignancy in women, but mortality has been consistently decreasing, with implementation of screening mammography playing the most important role in this downtrend. False negative (FN) breast cancers, defined as patients who received a BI-RADS-1-3 assessment on imaging studies and were diagnosed with breast cancer in <1 year, are a significant impediment to further reducing mortality. To work toward improving FN rates, we designed a retrospective analysis reviewing common characteristics of breast cancers missed on multimodality screening or diagnostic imaging at a single institution. FN breast imaging studies between January 1, 2014 and January 31, 2020 were reviewed for 20 characteristics. For the control group, a matched cohort based on breast density was created from true positive cancers randomly selected from all 628 cancers biopsied between January 1, 2016 and January 1, 2018. For the control group, cancer was most identified on screening mammography (55.28% [68/123]) followed by diagnostic mammography in (39.02% [48/123]). Contrastingly, the FN cancers were most often missed on screening mammography 57.33% (86/150) and diagnostic mammography 29.33% (44/150) and most often detected on diagnostic mammography 41.94% (52/124), breast MRI 26.61% (33/124) and ultrasound 16.13% (20/124). Between the two groups, there was no significant difference in terms of breast density ($p=0.8733$), age ($p=0.470$) or race ($p=0.415$). In both groups, cancer more commonly recurred in the same breast ($p=0.264$) and was invasive ($p=1$), estrogen receptor positive ($p=0.213$), progesterone receptor positive ($p=0.249$), HER2/neu receptor negative ($p=0.468$) and lymph node negative ($p=0.338$). The number of symptomatic patients ($p=0.0260$), percentage of triple negative cancers ($p=0.160$) and percentage of genetic mutations ($p=0.00119$) were higher in the FN cohort. Tumors tended to be smaller in the FN cancer cohort (FN, 95%CI: 17.50,24.81 mm, Control, 95%CI: 26.82,38.67, $p=0.00140$). Most importantly, there was a significantly increased prevalence of personal history of breast cancer (FN, 39.52% [49/124], Control, 18.70% [23/123], $p=0.000319$), which has not been reported in the literature, and family history of breast cancer (FN, 69.35% [86/124], Control, 50.41% [61/121], $p=0.00248$) in the FN cancer cohort. These findings invite the notion that supplemental screening to detect interval cancers may be useful in patients with a personal history or family history of breast cancer.

Effects of Surgeon Intraoperative Perception Accuracy on Pediatric Brain Tumor Outcomes

Kailee Furtado

Mentor: Bruno P. Braga, MD, Department of Neurological Surgery

Introduction: Pediatric brain tumors are primarily managed by surgical resection. In certain cases, surgeons may have difficulty determining intraoperatively whether they have achieved their objective of a gross total resection. Our goal is to assess the degree of discordance between surgeons' intraoperative impression and postoperative MRI results (surgeon-MRI mismatch) and analyze patient outcomes.

Methods: A retrospective chart review was conducted on patients under age 18 years who underwent a first attempt at surgical resection of a brain tumor between 2010 to 2021. Tumor characteristics, surgical methods, and postoperative outcomes were recorded.

Results: 412 patients met the inclusion criteria. The overall rate of surgeon-MRI mismatch was 27%. Residual tumor was detected postoperatively in 13% of cases where complete resection was declared intraoperatively. There was a significant increase in mismatch among grade 3 and 4 tumors compared to grade 1 and 2 ($p=0.004$). There was no significant difference in mismatch amongst usage of different intraoperative auxiliary devices (stereotactic navigation, ultrasound, or operating microscope).

The rate of occurrence of any postoperative complication (CSF leak, infection, stroke, hemorrhage, or neurologic deficit) was 31%. There was no significant difference in complication rates in cases of mismatch compared to match, although complete resection (either surgeon's impression or confirmed postoperative MRI results) had significantly lower complication rates than subtotal resection ($p<0.001$ for surgeon's impression, $p=0.028$ for MRI). Among cases of surgeon-MRI mismatch, 18% of patients required a reoperation on the same lesion within 1 year, compared to 8% of patients in cases of match ($p=0.006$).

Conclusions: Our results demonstrate a substantial rate of surgeon-MRI mismatch in pediatric brain tumor operations, which may lead to increased rates of early reoperations. Imaging auxiliary devices did not have an impact on surgeon-MRI mismatch rates, although intraoperative MRI was not used in this study. Complication rates were lower when complete resection was attempted (surgeon's impression) or achieved (postoperative MRI results).

Cesarean Section and Risk of Adenomyosis: A Retrospective Study

Lauren Ford

Mentor: Lisa Chao, MD, Department of Obstetrics & Gynecology
Collaborators: Regan Allen, MD; Emily Sendukas, MD; Ava Wilson;
Heather Xiao

Background: History of uterine surgery, most notably a history of dilation and curettage (D&C), has been shown to be a risk factor for the development of adenomyosis. The association between prior cesarean sections (CS) and adenomyosis remains unclear.

Objective: The primary aim of this study is to determine if there is an association between adenomyosis and history of uterine surgery, including CS, D&C, and myomectomy. We also examine if repeat uterine surgery increases the risk of adenomyosis development.

Study design: In this retrospective case control study we collected data from the electronic medical records of all women who underwent hysterectomy for benign indications at Parkland Hospital between January 2014 and December 2018. We then compared patients with and without adenomyosis on surgical pathology regarding history of uterine surgery, including CS, myomectomy and D&C.

Results: 2,911 patients were included in final analysis. History of any uterine surgery was associated with an increased risk of adenomyosis. Patients with a history of D&C were significantly more likely to have adenomyosis on surgical pathology (OR 1.57, 95% CI 1.30-1.90). There was also risk associated with repeat D&C (OR 1.31, 95% CI 1.01-1.72). The association between history of prior CS was not statistically significant (OR 1.12, 95% CI 1.00-1.37). A history of prior myomectomy was also not significantly associated with adenomyosis (OR 0.95, 95% CI 0.59-1.54).

Conclusion: Of the risk factors explored, history of any uterine surgery, D&C and repeat D&C were associated with an increased risk of adenomyosis, which is consistent with prior studies. There was not an association between history of CS or increasing numbers of repeat cesareans with adenomyosis development. This contradicts the theory that disruption of uterine endometrium and the trauma of cesarean section predisposes individuals to developing adenomyosis. This is the largest retrospective case control study to date investigating this association, and with the results found, it can be concluded that CS individually do not increase the risk of adenomyosis.

Evolutions in Complex Hernia Repair: A Retrospective Review of 12-year Experience at a Large Tertiary Referral Center and Lessons Learned

Priyanka Garigipati

Mentor: Daniel Scott, MD, Department of Surgery

Collaborator: Madhuri Nagaraj, MD

Complex ventral hernias, defined by size, location and reoperation, lead to significant morbidity and reduction in quality of life. Despite the many repair options – with variations in type of mesh, components separation, and staging operations - there remains no consensus on operative standards. Thus, we aimed to describe the experience of a single surgeon at a tertiary referral center with complex hernia repairs. We performed a retrospective analysis of complex hernia repairs from 2009-2021 using ICD codes for incisional or ventral hernias with/without obstruction and gangrene, as well as muscle separation-nontraumatic. We excluded all inguinal hernias, primary repairs, or small mesh repairs (<7cm). We analyzed a total of 86 patients with characteristics in median [interquartile range] as follows: age 60 years [54-69], initial clinic BMI 31.1 kg/m² [27.2-34.8], and immediate preoperative BMI 30.0 kg/m² [26.5-32.8]. Past medical history demonstrated 27.9% prior smokers, 26.7% diabetics, 7.0% active use of blood thinners, and 2.4% active use of immunosuppression. Past surgical history identified 31.8% had a previous hernia repair, 96.6% of those with mesh. Median hernia defect size was 51.4 cm² [19.3-105.1]. Hernias were located 39.5% central abdomen, 24.4% suprapubic, 18.6% flank, 16.3% subxiphoid, and 7.0% parastomal; 51.2% of patients had multiple fascial defects. Staged repairs accounted for 9.3% of cases. Regarding operative technique, the majority were 39.5% Stoppa, 23.3% Stoppa + anterior component separation (ACS), 14.0% Stoppa + transversus abdominus release (TAR), and 11.6% intraperitoneal repairs. Joint faculty cases comprised 65.1% (80.4% plastic surgery, 17.9% urology, 1.8% gynecology). Regarding mesh type: 66.3% was polypropylene, 22.1% biologic, and 10.5% synthetic absorbable with median mesh dimension 26 cm length [20-35] by 20 cm width [15-27]. Fixation was performed with 17 [14-19] sutures.

Follow-up care demonstrated a post-operative complication rate of 51.2% (16.3% wound infections, 8.1% recurrence, 8.1% ileus, and 7.0% skin necrosis). Mesh infection, UTI, dehiscence requiring reoperation, pneumothoraces, transfusion requirements, blood clots, and fistulas were rare at 0-2.3%. Length of stay was 6 [5-7] days and clinic follow-up extended to 176 [48.5-467.5] days post-operatively. Despite the lack of complex hernia repair standards, we identified personal practice standards with low complication rates that may serve to guide the hernia community. These include retrorectus mesh placement with components separation, joint operations, wide bony overlap, and adequate post-operative follow-up.

Evaluating Current Practices in Preventing Recurrent Fragility Fractures in a University Academic Setting

Priyanka Garigipati

Mentor: Alexandra Callan, MD; Megan Sorich, DO,
Department of Orthopaedic Surgery

Less than 20% of fragility fracture patients receive proper follow-up care or education for osteoporosis and fracture prevention. Literature demonstrates that efforts such as bone health liaison programs would prevent recurrent fragility fractures in at-risk patients by using preventative measures to reduce readmissions. We hypothesize that bone health education, follow-up, and treatment is inadequate at a single institution without a formal bone health education program. We studied 119 patients from January 2018 to December 2019 who underwent surgical management for a fragility fracture of the hip, no patients were excluded. Patient information regarding co-morbidities, smoking behavior, alcohol use, pharmacotherapy for bone health, bone density scans, bone health referral, fall prevention education, and other lab values were compiled. Descriptive statistics were performed. ANOVA and Chi-Square tests were used for patients given a bone health referral within 1 year of surgery for the fragility fracture vs. no referral placed. Of the 119 patients, 58.9% were female, with an average age of 73.9 years, 76.5% White, 10.9% African-American, 10.1% Hispanic. 26.1% had a prior fragility fracture, 47.1% smokers, and 67.2% were on bone health medications (i.e. calcium, vitamin D, bisphosphonates, or biologics). The 119 patients were divided into two groups: Group A were 26.1% patients with bone health referrals after the fragility fracture and, Group B were 73.9% patients without bone health referrals after the fragility fracture. Group A has 90.3% (28) patient that were taking bone health medication prior to surgery vs. Group B with 59.1% (52) only ($p=0.001$). Additionally, rate of DEXA scan referrals placed within 3 months of surgery was 54.8% (17) in Group A vs. 14.8% (13) in Group B ($p=0.00001$). Of those referred, 64.7% (11) of patients in Group A had a DEXA scan scheduled within 3 months of surgery vs. 38.5% (5) in Group B ($p=0.15$). Only 26.1% of our patients are getting an in-hospital bone health referral after a fragility fracture, similar to national averages. Among patients with referrals, prior bone health medication, rate of DEXA scan referral within three months, and follow up with DEXA scan was higher than those without referrals probably due to increased adherence to preventative recommendation and close monitoring by bone health specialists. Thus, patient education, lifestyle modification, and timely follow-ups after initial corrective surgery are crucial to prevent recurrence. Next steps include implementing a formal bone health education program our institution for fragility fractures.

Evaluating the Participation and Effectiveness of Synchronous, Virtual Delivery of the Get Up & Go Community Intervention for Childhood Obesity

Priyanka Garigipati

Mentor: Sarah Barlow, MD, Department of Pediatrics

Collaborators: Ron Huang, MS; Anna Lorenzi, MPH; Alexsei Reid, MBA

Get Up & Go is a community group program for children 6-14 years with BMI \geq 85th%ile and their families that provides fun learning about healthy nutrition, physical activity, and behavior change. This program has demonstrated improvement in BMIp95, reported healthy lifestyle, and physical endurance. The aim of this study is to evaluate the participation and effect of a virtual delivery offered starting winter 2021.

In this 10-week program, classes of 5-12 families are held in- person at a YMCA or via synchronous virtual delivery. Weekly lessons in healthy eating habits, physical activity, and behavior change techniques last 90 minutes. Data include demographics and pre- and post- measured weights, heights, and parent-completed behavior assessment questionnaires (BAQ), with score range of 0-100, higher indicating healthier behavior.

Among the registered families, 70 of 116 (60.3%) choosing virtual actually attended vs 84 of 107 (78.5%) choosing in-person ($p=0.03$). Baseline characteristics of attenders did not differ (virtual, then in-person reported): mean age (SD) 11.1 (2.4) vs 10.7 (2.2) years, male 29 (37.1%) vs 23 (46.4%), Spanish speaking 29 (41.4%) vs 19 (22.6%), severe obesity ($\geq 120\%$ BMIp95) in 55 (77.5%) vs 62 (77.5%), and baseline BAQ scores 34.8 (12.7) vs 36.5 (12.5). Virtual participants attended more classes than in-person participants: 6.8 (2.6) vs 6.0 (3.2), $p=0.11$. More virtual participants met graduation criterion of 6 non-orientation classes: 54 (77.1%) vs 55 (65.5%), $p=0.11$. Among those who graduated, mean change in BMIp95 was -3.71 vs - 1.95, $p=0.06$. Mean BAQ increase was 15.9 vs 14.2 $p=0.51$.

The synchronous, group virtual delivery of the Get Up & Go program engaged similar participants, with higher attendance and no difference in BMIp95 and BAQ outcomes than in-person delivery. Continued virtual delivery option could expand the availability of this program without compromising effect.

A Tale of Two Tumors: Antibiotic Use in Lung Cancer and Melanoma Populations in the Immunotherapy Era

Amrit Gonugunta

Mentor: David Gerber, MD, Department of Internal Medicine,
Hematology and Oncology

Collaborators: Mitchell S. Von Itzsein, MD; David Hseichen, MD; Tri Le, MD;
Hui Yang; Christopher Sheby; Carlos Alvarez, PharmD

Introduction: Antibiotic exposure is associated with worse clinical outcomes in patients receiving immune checkpoint inhibitors (ICI). We therefore analyzed antibiotic prescription patterns in two cancer types commonly treated with ICI: lung cancer and melanoma.

Methods: We performed a retrospective cohort study of adults in the United States Veterans Affairs (VA) medical system diagnosed with lung cancer or melanoma 2003-2016. We defined antibiotic exposure as receipt of a prescription for a systemic antibacterial agent between six months before and six months after cancer diagnosis. Demographics, clinical variables, prescriptions, and diagnostic codes were abstracted from the VA Corporate Data Warehouse. Antibiotic exposure was compared using t tests, Chi-square, and multivariate analyses.

Results: A total of 310,321 patients (280,068 lung cancer, 30,253 melanoma) were included in the analysis. Antibiotic exposure was more common among patients with lung cancer (42% versus 29%; $P<0.001$). Among antibiotic-exposed patients, those with lung cancer were more likely to receive prescriptions for multiple antibiotics (47% versus 40%; $P<0.001$). In multivariate analyses, antibiotic exposure was associated with lung cancer diagnosis (HR 1.15; 95% CI, 0.85-0.90), comorbidity score (HR 1.08; 95% CI, 1.08-1.09), non-white race (HR 1.13; 95% CI, 1.08-1.18), and female gender (HR 1.31; 95% CI, 1.25-1.38).

Conclusion: Among cancer patients, antibiotic exposure is more common in certain cancer types and patient populations. Given the negative effect antibiotic exposure has on immunotherapy outcomes, this observation may have clinical implications.

Keywords: antibiotics · Immune checkpoint inhibitor (immunotherapy) · cytotoxic T lymphocyte antigen 4 (CTLA4) · lung cancer · microbiome · programmed death 1 (PD1)

Revisiting Bleeding Complications in Trauma Patients on Systemic Anticoagulation after a Fall

Caleb Graham

Mentor: Caroline Park, MD, MPH, Department of Surgery
Collaborators: S. Loza-Avalos, MPH; L. Thiele, BA; C. Ghafil, MD;
K. Matsushima, MD

Introduction: Anticoagulant-associated hemorrhage remains a significant challenge in trauma patients who require systemic anticoagulation. Newer novel oral anticoagulants (NOACs) have reportedly lower bleeding risks in comparison to vitamin-K antagonists (VKA) as coumadin. However, recent data shows mixed results in complication rates in trauma patients. We reviewed risk factors, indications for anticoagulation, and need for interventions (endovascular and surgical) in patients presenting after a fall while on systemic anticoagulation.

Methods: We conducted a retrospective review of 673 trauma patients presenting at a Level 1 Trauma Center between 2012 and 2020 whom were on systemic anticoagulation at admission. 224 of the 673 patients (33.28%) met inclusion criteria for our review. Exclusion criteria included mechanism of injury, isolated anti-platelet use prior to injury, and outside facility transfers. Patient demographics, including comorbidities, injury severity score (ISS), indication for and type of anticoagulation, and time to restarting anticoagulation were included in our analysis. Endpoints included need for transfusion, endovascular and surgical interventions, length of stay, and mortality. We used Fisher's exact test, one-way analysis of variance (ANOVA) tests, and Kruskal-Wallis one-way analysis of variance tests to determine if differences existed between any variables of interest and the presence of systemic anticoagulation.

Results: Of the 224 patients, 136 (60.7%) presented on coumadin, 8 (3.5%) on lovenox, 37 (16.5%) on apixaban, 35 (15.6%) on rivaroxaban, and 8 (3.5%) on dabigatran. There were no statistically significant differences in any demographics amongst patients. Additionally, there were no statistically significant differences in complications (need for transfusion, endovascular or surgical intervention, length of stay, or mortality). However, there was a statistically significant difference between the anticoagulation groups who were restarted on anticoagulation during admission ($p < 0.0001$).

Conclusion: Previous studies have demonstrated mixed results on bleeding complications and need for surgical interventions in patients on novel anticoagulants.

In this single-center study, we did not find any statistically significant difference in the indication for anticoagulation, need for intervention, mortality, or length of stay amongst trauma patients presenting after fall on several categories of anticoagulation, including NOACs and VKAs.

A Retrospective Cohort Study of Dermatofibrosarcoma Protuberans at a Large Metropolitan Academic Center

Charlotte Greif

Mentor: Rajiv Nihawan, MD, Department of Dermatology

Collaborator: Divya Srivastava, MD

Dermatofibrosarcoma protuberans (DFSP) is a rare, low-grade dermal mesenchymal malignancy commonly presenting as a slow-growing asymptomatic nodule. While metastasis is uncommon, the tumor tends to recur locally after incomplete excision. Several clinicopathologic features have been associated with poor outcomes, including treatment with wide local excision (WLE) rather than Mohs micrographic surgery (MMS). Given the rarity of DFSP, there is limited research characterizing it. We sought to determine the impact of clinicopathologic features on recurrence after treatment.

This is a single institution retrospective study of all biopsy-proven non-metastatic DFSP cases from 2010 to 2020 treated at UTSW. We collected all patient, tumor, and treatment variables and used the two-tailed t, chi square, and multivariate linear regression models for analysis.

We identified 62 patients, all treated for DFSP with either MMS or WLE. Most patients (94%) presented with primary DFSP rather than recurrent, and most lesions were located on the trunk (50%) or extremities (37%). The mean lesion duration prior to presentation was 8 years, and lesions were on average 4.0x2.4 cm. Most lesions were asymptomatic (58%) and slow growing, but 18% demonstrated rapid growth prior to surgery.

Sixty patients had known recurrence data. Fifty-five of these (92%) underwent MMS and five (8%) WLE. Three patients experienced recurrences following treatment, yielding a 5% total recurrence rate. Two of the five patients treated with WLE experienced recurrences, yielding a 40% recurrence rate. One of the fifty-five patients treated with MMS experienced recurrence, yielding a 2% recurrence rate.

We identified several statistically significant associations between clinicopathologic features and recurrence after treatment on univariate analysis. The recurrence rate following WLE was higher than following MMS (40% vs. 2%, p-value=0.00005), consistent with prior studies. Lesions that recurred after treatment at UTSW were more likely to have a history of rapid growth (100% vs. 12%, p-value=0.0003). Patients with recurrent lesions were more likely to have a history of non-DFSP skin cancer (33% vs. 2%, p-value=0.004). We did not find any significant associations between clinicopathologic features and recurrence on multivariate analysis.

From our study, one may consider WLE rather than MMS, history of rapid growth, and non-DFSP skin cancer history as possible risk factors for recurrence, although larger scale studies are needed.

Increased Out-of-Hospital Cardiac Arrest and Death During the COVID-19 Pandemic in Dallas, Texas

Lin Guo

Mentor: Ahmed Idris, MD, Department of Emergency Medicine

Collaborators: Pamela Owens; David Gallegos; Marshal Isaacs, MD;
Tami Kayea; Lu Ann McKee; Purav Mody, MD

Introduction: Since March 2020, up to 18% of weekly excess deaths in Texas have been unattributable to COVID-19 infection as cause of death. Concurrently, increased out-of-hospital cardiac arrest (OHCA) incidence has been reported worldwide and may account for non- COVID-19 excess deaths during the pandemic.

Methods: Using Dallas Fire Rescue (DFR) prehospital reports and data from the Dallas-Fort Worth Center for Resuscitation Research CPR registry, we investigated whether the COVID-19 pandemic affected OHCA incidence and characteristics in Dallas, Texas in the months following March 2020. We compared all non-traumatic, adult OHCA cases treated by Dallas Fire-Rescue (DFR) from March 1 to September 30, 2020 with cases occurring in the same months during non-pandemic years 2017, 2018, and 2019.

Results: OHCA totals were 36% higher in 2020 compared to the 2017-2019 average. Significantly longer EMS response times, increased proportion of non-shockable rhythms at the time of EMS arrival, increased termination of CPR in the field, and decreased survival at ED admission were also seen.

Conclusion: Altogether our findings suggest that the COVID-19 pandemic is associated with increased OHCA incidence and mortality in Dallas. Further study is needed to identify the causes of these increases.

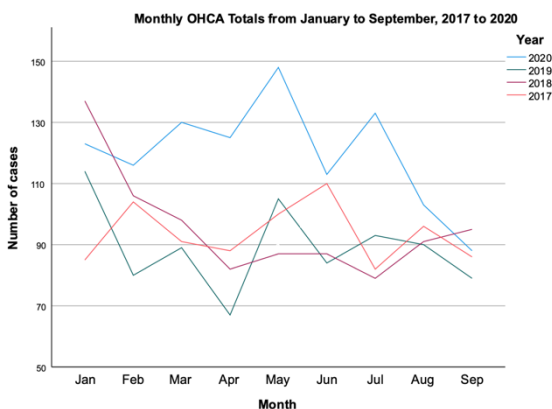


Figure 1. Graph of monthly total out-of-hospital cardiac arrest (OHCA) cases from January to September of 2017, 2018, 2019, and 2020.

Single Plane 3D Isotropic MR Imaging of Shoulder Exhibits Superior Correlations to Surgical Findings than 2D Multiplanar MR Imaging

Shamrez Haider

Mentor: Avneesh Chhabra, MD, MBA, Department of Radiology

Collaborators: Alison Cabrera, MD; Parham Pezeshk, MD;
Bayan Mogharrabi, BS

Purpose: 3D isotropic MR imaging use is increasing in Orthopedics, but shoulder evaluation is routinely limited to 2D imaging. The aim was to obtain correlations of multiplanar 2D MRI versus 3D volume MRI isotropic reconstructions for rotator cuff and labral tears with reference standard of surgical findings.

Methods: An IRB-approved retrospective study of shoulder MRIs over 2 years. 51 patients with 3D MRI and shoulder arthroscopy by a single surgeon were included. Patients underwent 3-Tesla imaging, with conventional three-plane high-resolution 3.0 mm 2D imaging (scan-time= 15 minutes) and a sagittal 3D TSE imaging sequence with 0.7mm isotropic voxels (scan-time= 6-7 minutes). Scapular plane-oriented contiguous 0.7mm MPRs of the 3D images were created by a research student and sent to PACS. MSK fellowship trained radiologists evaluated all cases. Variables including labral tear presence, location, and length, Ellman grading of rotator cuff tear (RCT), thickness and width. Correlation analysis was performed.

Results: 51 pre-operative cases with a mean BMI of 24.87 (SD=4.32) were evaluated in two settings, blinded to 2D vs. 3D MR and surgical findings. Comparison of 2D vs. 3D MRI showed poor agreements for labral and rotator cuff tears (Cohen's Kappa= 0.21, 0.29) while RCT grade, thickness, and labral tear length yielded fair agreements (ICC= 0.43, 0.53, 0.52, respectively). Mean labral tear length on 2D MRI was 8.9mm (range 4mm-32mm) while 3D MRI was 10.20mm (range 3mm- 37mm). 2D vs surgery comparisons of labral tear and RCT yielded poor agreements (Kappa= 0.26, 0.30) and RCT grade yielded fair agreement (ICC =0.43). 3D vs surgery comparisons of labral tear and RCT yielded good agreements (Kappa= 0.65, Kappa= 0.61 respectively) and tear grade yielded excellent agreement (ICC = 0.76).

Conclusion: 3D MRI of the shoulder is time-efficient with superior correlations to surgical findings than 2D MRI. Single volume 3D isotropic MRI can suffice for cost-savings and better imaging interpretations.

Kypho-Scoliosis in Neurofibromatosis Type 1 on Whole Body MRI: Frequency and Association with Intraspinal and Paraspinal Lesions and Tumors

Shamrez Haider

Mentor: Avneesh Chhabra, MD, MBA, Department of Radiology

Collaborators: Lu Le, MD, PhD; Gina Cho, MD; Yin Xi, PhD

Purpose: Scoliosis is a common orthopedic problem in patients with Neurofibromatosis 1 (NF1). Spinal deformities have been reported to be found in 77% of all NF1 cases and 2% of all pediatric scoliosis cases have been attributed to NF1. A proposed etiology of scoliosis in NF1 patients states that paraspinal or intraspinal neurofibromas disrupt the normal orderly development of the spine. This study aimed to use whole-body MR imaging (WBMRI) to screen patients with NF1 for scoliosis and determine its association with locoregional spinal tumors.

Methods and Materials: It was an Institutional Review Board (IRB) approved retrospective review of 122 NF1 patients with WBMRIs isolated from the electronic medical record (EMR). 97 cases that met inclusion criteria were identified. All patients underwent 3-Tesla MR imaging with automated software fusion of the three sets of inversion recovery and 3D T1W coronal images. Frequency of scoliosis and intra- spinal and paraspinal tumors was recorded. Patients with severe- dystrophic type scoliosis were separately identified, and Cobb angles were measured for all such cases. Association analysis was performed. P-value less than 0.05 was considered statistically significant.

Results: 97 patients with NF1 were evaluated. Two had prior spinal surgery and were excluded. The final sample of 95 patients included 33 (35%) males and 62 (65%) females with a mean BMI of 25.82 (+/- 4.96). 43/95 (45.3%) patients had scoliosis and 13/43 (30.2%) of which were severely angled. ICC for Cobb's angles measured 0.99 (CI 0.98,1.0). Fisher's exact test determined no association between scoliosis and presence of either paraspinal or intraspinal tumors ($p=0.485$). There was also no association between the tumors and severe dystrophic scoliosis ($p=1$).

Conclusions: Understanding the etiology of scoliosis in NF1 patients has potential implication for treatment planning, imaging requirements, timely surgical correction, and interventions to prevent deformity at young age. This study contradicts the hypothesized association of the presence of locoregional spinal tumors and scoliosis in NF1 patients. The work adds to the body of knowledge of NF1 literature and infers that the presence of scoliosis in an NF1 patient should not require searching for causative locoregional spinal tumors.

Clinical Relevance/Application: Scoliosis is a common issue in patients with Neurofibromatosis 1 and according to our results, its presence should not mandate an immediate search for intra or paraspinal tumors.

Ingredients in the Visual Perception of Hypomobile Vocal Fold Motion Impairment

Jasper Han

Mentor: Ted Mau, MD, PhD, Department of Otolaryngology

Collaborator: Sachin George, BS

Objectives: The clinical determination of vocal fold (VF) hypomobility based on laryngoscopy is subjective. Previous studies point to VF motion anomaly as the most commonly reported factor in the diagnosis of hypomobility. This study tested the hypotheses that VF angular velocities and angular range of motion (ROM) differ between the two VFs in cases of unilateral VF hypomobility.

Methods: Semi-automated analysis of laryngoscopic videos of 19 patients diagnosed with unilateral VF hypomobility was performed to quantify/compare the VF angular velocity and ROM between the two VFs during /i/-sniff and laugh.

Results: 7 out of 15 (47%) videos with /i/-sniff and 5 out of 8 (63%) with laugh had a statistically significant difference in the angular velocities between the VFs in either abduction or adduction, with large effect sizes (adjusted Cohen's $d \geq 0.8$) for all. For VF ROM, 8 out of 15 (53%) /i/-sniff videos and 4 out of 8 (50%) with laugh had a statistically significant difference between the VFs, with large effect sizes for all except one. Seven of the 19 subjects with unilateral VF hypomobility were diagnosed with selective adductor paresis. Only 1 of these 7 demonstrated a difference in angular velocity during VF adduction and not abduction.

Conclusions: Precise quantification of VF angular velocities from routine clinical laryngoscopy videos is challenging. Clinicians' ability to gauge VF motion goes beyond what can be extracted from frame-by-frame analysis. Visual cues other than VF angular velocity and ROM likely contribute to the perception of unilateral VF hypomobility.

Brain Metastasis Velocity as a Prognostic Metric in Metastatic Renal Cell Carcinoma

Richard Tanner Hardy

Mentor: James Brugarolas, MD, PhD, Department of Internal Medicine

Collaborators: Sunny Lai, MD; William Moore, MD

Introduction: Brain metastases (BM) occur in approximately 2-15% of renal cell carcinoma (RCC) patients and are associated with poor prognosis, leading to routine exclusion of RCC BM patients from large-scale clinical trials. Recent studies have suggested that there is significant heterogeneity in disease severity among RCC BM patients, potentially allowing the inclusion of lower risk patients in future clinical trials and helping guide management. Brain metastasis velocity (BMV) is a prognostic metric recently validated in studies of BM recurrence following stereotactic radiosurgery (SRS). This metric was shown to predict overall survival in cohorts of BM patients with different primary tumors and has the potential to help predict prognosis in RCC BM patients.

Objective: To assess BMV as a predictor of overall survival in RCC BM patients and compare this prediction to previous BMV validation studies.

Method: This was a retrospective study of patients with RCC and BM treated at UT Southwestern Medical Center and Parkland between January 2005 and January 2020. Eighty-five patients with RCC and BM with sufficient records and follow-up imaging to calculate BMV were identified. BMV was calculated by counting the number of new metastases at each follow-up imaging scan (MRI or CT, >95% MRI), totaling the metastases, and dividing by the time from BM diagnosis to last imaging follow-up. The impact of BMV on overall survival was calculated using univariate cox regression analysis. Low, medium, and high risk BMV cut-offs were identified by systematically varying the cut-offs to minimize the log-rank p value in a Kaplan-Meier analysis of overall survival.

Results: Higher BMV was associated with shorter overall survival (HR = 1.10, 95% CI = 1.05-1.14). On minimization of the log-rank p value the cohort was divided into low (BMV ≤ 4), medium (BMV $> 4, \leq 11$), and high (BMV > 11) risk groups ($p < 0.0001$), which matched well with previously published BMV risk-groupings. The median overall survival for the low, medium, and high-risk groups were 45.0 months (95% CI = 29.2–NR), 21.2 months (95% CI = 11.7–NR), and 7.5 months (3.64–NR), respectively. Of the 85 patients, 65 (76%), 15 (18%), and 5 (6%) were sorted to the low, medium, and high-risk groups respectively.

Conclusions: Higher BMV was associated with worse overall survival, supporting the use of BMV as a prognostic metric for RCC BM patients. The BMV risk-groupings determined in our cohort match well with validated BMV risk groups. Our study was limited by cohort size, retrospective design, and referral bias.

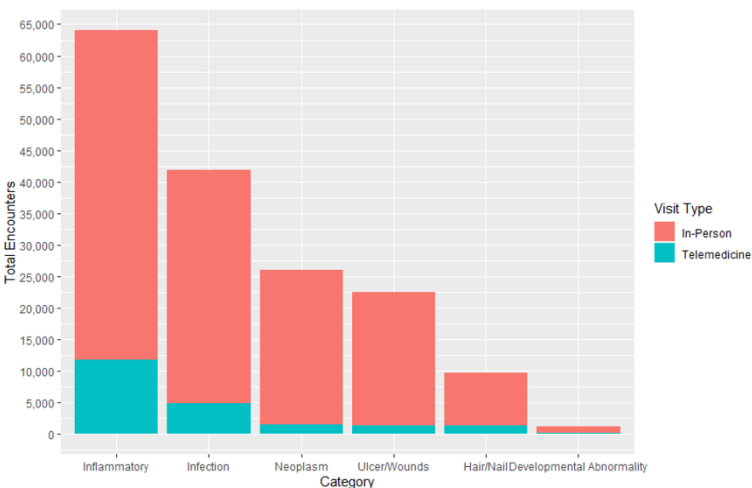
Utilization of Teledermatology Services for Dermatological Diagnoses during the COVID-19 Pandemic

Annie He

Mentor: Khang D. Nguyen, MD, Department of Dermatology
Collaborator: Tongil TI Kim, PhD

Little is known about trends in teledermatology adoption and use for managing dermatologic patients, especially changes in use influenced by the COVID-19 pandemic. In this retrospective cohort study, we analyzed encounter data from the Healthjump dataset (containing electronic health record data from throughout the US) for visits from November 2019 to July 2021 with a primary dermatology-related diagnosis. There was a striking rise in teledermatology use with the onset of the pandemic in February 2020, peaking in April 2020 with 2,178 teledermatology encounters (32.8% of all encounters). Subsequently, teledermatology use waned. Most teledermatology care was delivered via synchronous means with little use of asynchronous or telephone communication. When compared to those with neoplastic skin diseases, patients with inflammatory skin diseases were more likely to be seen via teledermatology (OR 3.30, 95% CI 3.12-3.49). Certain demographic groups were less likely to receive care via teledermatology, such as men (compared with females, OR 0.76, 95% CI 0.74-0.78) and patients 65 and older (compared with those below 65, OR 0.59, 95% CI 0.57-0.62). Our work shows increased adoption of teledermatology at the onset of the COVID-19 pandemic with decreasing use over time. Future efforts are needed to ensure continued and expanded use of a valuable care modality to reach vulnerable populations.

Figure 1. Total Encounters of Teledermatology vs. In-person Visits by Dermatological Diagnosis



Comparison Of Surgical Outcomes: Scleral Buckling Versus Pars Plana Vitrectomy Versus Combined Scleral Buckling/Pars Plana Vitrectomy for Primary Repair of Uncomplicated Rhegmatogenous Retinal Detachment

Stanton Heydinger

Mentor: Angela Wang, MD, Department of Ophthalmology

Purpose: The mainstay of treatment for uncomplicated rhegmatogenous retinal detachment (RRD) has been surgical intervention using various techniques often decided at the level of individual surgeons. While previous research suggests certain approaches may yield better outcomes based upon pre-operative characteristics such as lens status, a superior method has not been elucidated. We performed a retrospective, observational study comparing the outcomes of primary RRD repair using pars plana vitrectomy (PPV), scleral buckling (SB), or combined SB with PPV (SB/PPV).

Methods: 179 patients between 2015-2020 with RRD managed at a large university hospital system were included. Outcome measures included: primary anatomical success rate, improvement in best-corrected visual acuity (BCVA), and functional success rate. Primary success was classified as restored anatomical integrity of the retina following one intervention measured 6 months postoperatively. Functional success was defined as measuring a postoperative BCVA of 20/200 or better. BCVA was converted to logMAR for comparison between groups. Statistical analysis was performed using the chi-square test and ANOVA. We excluded patients with: less than 6 months of follow-up, previous retinal surgery, giant retinal tears, aphakia, secondary forms of RRD, or extensive proliferative vitreoretinopathy.

Results: SB/PPV yielded the best results in each outcome measure. Primary anatomical success was achieved in 147 of the 179 eyes (82.1%), with SB/PPV showing the greatest success rate (90.3%; $p=0.15$) amongst the interventions. Functional success was achieved in 125 of the 179 eyes (69.8%), with SB/PPV showing significantly greater functional success (83.9%; $p=0.02$) than SB (60.0%). SB/PPV showed significantly greater improved mean BCVA (0.87; $p=0.04$) when compared to SB (0.40); this result held in sub-group analysis of phakic eyes.

Conclusions: SB/PPV yielded the best results for primary anatomical success, functional success, and BCVA improvement out of the three interventions studied. SB/PPV showed significantly better functional success rates ($p=0.02$) and mean BCVA improvement ($p=0.04$) when compared to SB. In phakic patients, SB/PPV showed significantly greater BCVA improvement ($p=0.03$) when compared to SB.

Clinical and Demographic Characteristics of COVID-19 in Pediatric Patients in the United States from 2020-2021

Lyndie Ho

Mentor: Christoph U. Lehmann, MD, Department of Pediatrics, Bioinformatics, Population and Data Sciences

Collaborators: Richard Medford, MD; Robert Turer, MD

Introduction: From Dec 2020 to Nov 2021, the number of pediatric COVID-19 patients increased from over 2 million children (12.4% of all cases in the US) to 6.5 million (16.7% of cases) according to the American Academy of Pediatrics. The Delta variant's predominance, the COVID vaccine approval on May 10, 2021, and school re-openings demand a better understanding of risk in the pediatric population.

Methods: Using a national Optum de-identified COVID-19 Electronic Health Record (EHR) dataset, we conducted a descriptive study of pediatric patients (≤ 18 years) tested for COVID-19. We report demographic information (race, ethnicity, age, and region), vaccination status, date of COVID-19 test positivity, and clinical outcomes (death, ventilation, ICU admission, and hospitalization). Our dataset contained 853,768 pediatric patients, who were predominantly Caucasian (68.0%) and non-Hispanic (72.4%). Patients were largely from the Midwest (46.1%), followed by Northeast (23.5%), South (17.2%) and West (9.6%). We used a two-sample z-test of proportions to determine significance.

Results: Of all pediatric patients in the Optum database, 137,124 (16.1%) patients tested positive for COVID-19 with a PCR or antigen test between Mar 13, 2020 and Sep 16, 2021. Compared to patients who tested negative, COVID-19 infections were disproportionately more frequent in infants (< 2 years old), 15-18 year olds, African Americans, Hispanic patients, and patients in the South. Most COVID-positive patients were unvaccinated (94.1% overall and up to 97.2% of those who contracted COVID in Jul-Sep 2021) and the remaining 7,326 patients (with one exception) had received only one shot. Compared to patients who tested negative, infections in July-September 2021 (representing the Delta variant) were disproportionately higher in African Americans, Hispanic patients, and patients in the South. Of COVID positive patients, 28 (0.02%) died, 149 (0.12%) required ventilation, and 1,635 (1.31%) were admitted to intensive care. Of the single dose vaccinated patients, none died (0%), 8 (0.10%) required ventilation, 33 (0.45%) were admitted to intensive care. Infections peaked in October-December 2020 and again in July-September 2021.

Discussion/ Conclusions: A single shot of COVID vaccine was highly protective in our population even during the surge of the Delta variant. However, pediatric patients from racial and ethnic minorities suffered worse outcomes than other patients in the cohort both before and after the rise of the Delta variant. Further research on comorbidities, clinical presentation, and treatment efficacy is needed.

Feasibility and Inter-Device Reliability of Activity Monitoring in Children and Adolescents Using the Fitbit Ace 3 and Fitbit Inspire 2

Aaron Hurd

Mentor: Alexandra Callan, MD, Department of Orthopaedic Surgery

Collaborator: Kathryn Gallaway, BA

Introduction: Return to activity after surgery is an important metric for providers. However, prior studies have demonstrated that patient-reported activity levels are inaccurate. Wearable activity monitors such as Fitbit devices are emerging as valuable tools for medical research. Few studies have used Fitbit devices in pediatric patients, and no studies have validated the concurrent use of the Fitbit Ace 3 and Fitbit Inspire 2 in a pediatric and adolescent population. The aim of this study is to demonstrate the inter-device reliability of the Fitbit Ace 3 and Fitbit Inspire 2 and document patient compliance with device use to assess feasibility of future Fitbit studies in this population. Secondary aims include documenting average daily step count in this population to provide a baseline for future studies and determining whether Fitbit activity notifications influence patient activity level.

Methods: Twelve healthy children and adolescents were enrolled. Participants completed a 5-minute walk while simultaneously wearing the Fitbit Ace 3 and Fitbit Inspire 2 on the same wrist. This data was used to assess inter-device reliability. Participants were then fitted with the Fitbit device appropriate for their age and asked to wear the device continuously for eight weeks. A randomized crossover design was used to observe the effect of notifications on activity level. Intraclass correlation coefficient (ICC) was used to quantify inter-device reliability. Steps per day were extracted from the Fitbit dashboard and compared between age, sex, and notification status.

Results: Single and average measures ICC were shown to be 0.8802 ("good" to "excellent") and 0.9363 ("excellent"), respectively, implying inter-device reliability. Only one patient had perfect compliance and 7 patients stopped syncing data before the end of the study period. Of the 672 participant days, only 395 days of data were recorded, with 57% wear compliance for recorded days. Average daily step count was 6860 steps, with no relationships between age and step count or sex and step count. Notifications significantly increased mean daily step count from 5767 to 8179 steps ($p < 0.05$).

Conclusion: Although compliance is an issue to be considered in future projects, the Fitbit Ace 3 and Fitbit Inspire 2 were equally effective for measuring activity level. Overall, participants in this study did not meet the recommended daily steps per day for their age group. Notably, enabling notifications increased average daily step count by 41.8%. This study validates the concurrent use of the Fitbit Ace 3 and Fitbit Inspire 2 in research involving children and adolescents and highlights challenges that must be addressed in future projects.

On-Treatment Follow-Up in Real-World Studies of Direct Oral Anticoagulants in Atrial Fibrillation: Association with Treatment Effects

David Hutto

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Collaborator: Peter Noseworthy, MD

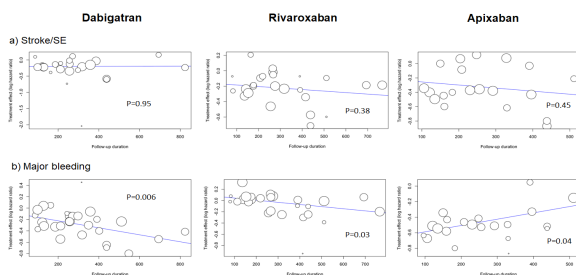
Background: Numerous observational studies support the safety and effectiveness of the direct oral anticoagulants (DOAC) for stroke prevention in atrial fibrillation (AF), but these data are often limited to short duration of follow-up. We aimed to assess the length of on-treatment follow-up in the accumulated real-world evidence and the relationship between follow-up duration and estimates of DOAC effectiveness and safety.

Methods: We searched the literature for observational studies reporting comparative effectiveness and safety outcomes of DOACs versus warfarin. In random-effects meta-analyses, we assessed associations of specific DOACs vs warfarin for stroke/systematic embolism (SE) and major bleeding. In meta-regression analyses, we assessed the correlation between the reported on-treatment follow-up with the effect sizes for stroke/SE and major bleeding outcomes.

Results: In 45 eligible observational studies, the average on-treatment follow-up was <1 year for all DOACs. In meta-analyses, all DOACs showed significantly lower risks of major bleeding, but only dabigatran and apixaban showed lower risks for stroke/SE compared to warfarin. There was no correlation between follow-up duration and magnitude of stroke/SE reduction for any of the DOACs. Longer follow-up correlated with greater major bleeding reduction for dabigatran ($p=0.006$) and rivaroxaban ($p=0.033$) as compared to warfarin, but it correlated with smaller major bleeding reduction for apixaban ($p=0.004$).

Conclusions: The numerous studies of DOAC effectiveness and safety in the routine AF practice pertain to short treatment follow-up. Study follow-up duration correlates significantly with DOAC-specific vs warfarin associations with major bleeding.

Figure 1. Correlation of the Duration of Follow-up with the Effect Size of the Associations for Stroke/Systemic Embolism and Major Bleeding



Single-Agent Rituximab and Ultra-Low-Dose Adaptive Radiotherapy for the Treatment of Indolent Non-Hodgkin Lymphoma

Meredith Jackson

Mentor: Kiran Kumar, MD, MBA, Department of Radiation Oncology

Collaborators: Sean All, MD; Samantha Brocklehurst; Neil B Desai, MD, MHS;
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For indolent non-Hodgkin lymphoma (NHL), ultra-low-dose RT (4 Gy) has excellent long-term local control (70%), though relapse often occurs distally. Systemic therapy in addition to RT has been shown to increase PFS, but is often avoided due to concerns of toxicity. We hypothesize that the combination of single-agent rituximab and ultra-low-dose adaptive RT, with repeat treatment as needed, results in excellent local and systemic control with minimal toxicities.

We conducted an IRB approved, retrospective review of patients with indolent NHL who were treated with both ultra-low-dose RT and single-agent rituximab (4 cycles) either concurrently or within a short interval. 17 treatments from 15 patients were identified. Radiographic studies were used to determine treatment response and disease control.

In our cohort, the PFS and OS at one year was 93% (14/15) and 100% (15/15), respectively. The overall response rate was 94% (16/17). 2 patients initially achieved PR, and then received repeat ultra-low-dose RT to achieve CR. 2 patients experienced mild acute toxicities (diarrhea and dysgeusia), and 1 patient mild long-term toxicity (dry mouth), but had preexisting confounding condition (Sjogren's Syndrome). 9/10 patients with initial presenting symptoms noted relief after treatment.

Combined modality treatment with single-agent rituximab and ultra-low-dose adaptive RT in patients with indolent NHL appears to provide effective palliation and disease control with minimal toxicity.

Aspirin Use is Associated with Reduction in Distant Metastases in Patients with Residual Nodal Disease after Chemotherapy

Christopher Johns

Mentor: Nathan Kim, MD, PhD, Department of Radiation Oncology

Collaborators: Yulun Liu, PhD Biostatistics; M'Kay Cauble, Medical Student

Background: Previous data has suggested that aspirin (ASA) use may be associated with improved outcomes in patients at higher risk for distant metastases after completion of curative therapy. Patients with breast cancer (BC) that do not obtain a pathologic complete response (pCR) to neoadjuvant chemotherapy (NAC) are at higher risk of the development of distant metastases compared to those achieving pCR. Specifically, patients with residual nodal disease (ypN+) portend worse outcomes and is a patient population that is being studied for treatment escalation. To date, there are no reported studies of potential benefit of ASA use within this subset of patients.

Objective: Our hypothesis is that that ASA use can reduce the risk of distant metastases and improve outcome in high-risk patients that despite receiving NAC have residual nodal disease burden.

Methods: Medical records of patients with BC treated with NAC that did not achieve pCR between 2005-2018 at UTSW Medical Center and Parkland Medical Center were reviewed (IRB protocol STU- 052012-019). Pertinent data, including evidence of ASA use, and clinic-pathologic parameters were analyzed. Overall survival (OS), disease free survival (DFS), and distant metastases free survival (DMFS) were obtained using Kaplan Meier analysis. Univariate and multivariate logistic regression models were constructed and analyzed.

Results: 637 patients meeting criteria for analysis were available for review, of which 138 were ASA users. Mean follow-up for the control group was 3.77 years and 3.78 years for the ASA group. In all patients with residual disease, ASA use initiated during remission period was associated with significant improvement in 5-year DFS ($p=.024$) and a numerical improvement trending for 5-year DMFS ($p=.079$) on multivariate analysis. Most importantly, in the highest risk group of ypN+ patients (422 patients), ASA use was associated with significant improvement in 5-year DMFS ($p=.031$) on multivariate analysis.

Conclusions: The high-risk patients that are unable to achieve nodal clearance after NAC appeared to have significant outcome benefits with ASA use initiated during remission period. Significantly improved DMFS was observed in this subset of patients. These hypotheses-generating results suggests that ASA use may provide improvement in outcome for these high-risk BC patients. Prospective clinical trials of augmented ASA use in high-risk BC patients who do not achieve pCR and remain ypN+ should be considered for development.

Impact of COVID-Related Lifestyle Changes on Systemic and Retinal Health Parameters and the Progression of DME - A Retrospective Chart Review

Bryce Johnson

Mentor: Rafael Ufret-Vincenty, MD, Department of Ophthalmology

Diabetic macular edema (DME), a feared complication of diabetic retinopathy (DR), is a leading cause of vision loss in the developed world. The hallmark of DME is alteration of the blood-retinal barrier (BRB), characterized by pericyte loss and endothelial cell-cell junction breakdown. The increased permeability allows leakage and edema into the macula, which leads to macular swelling, thickening, and ultimately distorted vision.

It is paramount to detect early signs of DME in order to control diabetes-associated metabolic abnormalities and preserve visual acuity, which can be accomplished with optical coherence tomography (OCT). The optimal method for preservation of vision in patients with diabetes is prevention of DR and DME. Controlling systemic conditions, including hemoglobin A1c (HbA1c), reduces the rate and progression of DR. Proper management of these risk factors and DME include regular exercise, proper nutrition, and regulate visits to an ophthalmologist. Lifestyle largely influences these risk factors and subsequent development of DME, which the recent and ongoing COVID-19 pandemic has drastically impacted. It is unclear how such lifestyle adaptations altered the various risk factors and progression of DME.

The purpose of this study is to assess changes in systemic health parameters and the progression of DME severity since the onset of the COVID-19 pandemic. This included looking at health parameters such as BMI, blood pressure, and HbA1c, as well as OCT retinal images of 370 patients across 3 time periods (01/2019—2/2020; 03/2020-12/2020; 01/2021-07/2021). The OCT images were analyzed for macular thickness in 3 zones (central, parafoveal, and perifoveal), with thicker maculae corresponding to objectively worsening DME.

We predicted worsening of DME (increased OCT thickness), but across all time periods in all macular sections the thickness significantly decreased throughout the specified time intervals.

	Period 1		Period 2		Period 3	
Thickness (µm)	Mean		Mean	P*	Mean	P†
Central (OD)	329.1193		322.77544	0.18	318.02105	0.38
Central (OS)	329.8807		326.45263	0.53	315.18246	0.07
Parafoveal (OD)	358.57982		350.81959	0.0039§	345.72368	0.08
Parafoveal (OS)	360.86199		356.23684	0.13	350.15819	0.09
Perifoveal (OD)	319.71579		314.25292	0.00036§	310.11696	0.01359§
Perifoveal (OS)	322.99649		319.02193	0.02048§	315.76725	0.11

Table 3. Change in Macular Thickness Throughout COVID-19 Divided into 3 Concentric Sectors (n=285) (Figure 2).

* Difference between Periods 1 and 2.

† Difference between Periods 2 and 3.

‡ Difference between Periods 1 and 3.

§ Statistically significant (P < 0.05)

Antepartum Acute Maternal Infection: Is the Preterm Neonate Protected?

Priyanka Kadari

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Collaborator: Jessica E. Pruszynski, PhD

Objective: One out of every neonates born <29 weeks exhibits some degree of cerebral white matter injury, the etiology of which remains unclear. We hypothesized that systemic maternal inflammation from infection leads to fetal neuroinflammation, resulting in poor short-term and long-term neonatal outcomes. The aim of this study was to examine the relationship between antepartum maternal infection and short-term neonatal outcomes.

Study Design: We conducted a retrospective cohort study of preterm neonates <29 weeks of gestational age born at our institution from 01/2010-12/2020. Maternal data was extracted including co-morbidities, obstetric outcomes and complications, and maternal infections and treatments. Maternal antepartum infection status was categorized as (1) no infection, (2) non-severe acute infection, and (3) severe acute infection. Infant data extracted included short-term outcomes of bronchopulmonary dysplasia, necrotizing enterocolitis, sepsis, intraventricular hemorrhage, pneumothorax, pneumonia, pulmonary hypertension, days ventilated, days on CPAP, and maximum FiO₂. Analyses included χ^2 , Fisher's exact test, one-way analysis of variance, and Kruskal-Wallis test with p <.05 considered significant.

Results: 1121 neonates were born <29 weeks to 983 women; 788 (70.3%) had no infection documented prenatally, 240 (21.4%) an acute non-severe infection, and 93 (8.3%) an acute severe infection. The presence of any acute infection did not correlate with short-term neonatal outcomes.

Conclusion: Acute maternal infection does not correlate with short-term neonatal outcomes regardless of severity. The neonate may be protected from maternal inflammation through placental-mediate mechanisms.

Table 2. Short-term neonatal outcomes by maternal infection status

	Acute infection, severe ^a (N = 93)	Acute infection, not severe ^a (N = 240)	No infection (N = 788)	P-value
Moderate to severe bronchopulmonary dysplasia	25 (29)	55 (24)	160 (21)	0.229
Necrotizing enterocolitis	9 (10)	17 (7)	53 (7)	0.526
Culture-proven sepsis	17 (20)	36 (15)	132 (17)	0.649
Grade 3 or 4 intraventricular hemorrhage	9 (10)	21 (9)	81 (10)	0.784
Cong Pneumonia	5 (6)	10 (4)	31 (4)	0.772
Pneumothorax	3 (3)	18 (8)	56 (7)	0.371
Pulmonary hypertension	6 (7)	17 (7)	56 (7)	0.985
Pulmonary hemorrhage	3 (3)	11 (5)	56 (7)	0.170
Pulmonary interstitial emphysema	14 (16)	59 (25)	165 (22)	0.187
Persistent ductus arteriosus	25 (29)	55 (24)	164 (22)	0.312
Day on ventilator	3 (1, 24)	5 (1, 17)	5 (1, 16)	0.896
Days on CPAP	30 (12, 45)	25 (11, 39)	24 (10, 38)	0.131
Max FiO ₂	100 (50, 100)	100 (50, 100)	100 (48, 100)	0.135

Mean \pm standard deviation reported for normally distributed continuous variables; medians and interquartile ranges for non-normally distributed continuous variables; frequencies and percentages for categorical variables.

Brace Treatment Does Not Improve Acetabular Coverage or Reduce the Rate of Secondary Surgery Following Closed Reduction of Developmental Dysplasia of the Hip

Arnav Kak

Mentor: Harry Kim, MD, MS, Department of Orthopaedic Surgery

Collaborators: William Z Morris, MD; Laura Mayfield, MPH

Abduction bracing is commonly used to treat developmental dysplasia of the hip (DDH) following closed reduction and spica casting. There is little evidence to support or refute this practice that imposes daily restriction and burden to parents and patients to maintain use of the brace. The purpose of this study was to determine the efficacy of abduction bracing after closed reduction in improving the hip development by measuring the acetabular index (AI) and reducing secondary surgery for residual hip dysplasia.

We performed a retrospective review of patients treated with closed reductions for DDH at a single tertiary referral center from 1981 to 2017. Demographic data was obtained including severity of dislocation based on International Hip Dysplasia Institute (IHDI) classification, age at reduction, and casting duration. Patients were prescribed no abduction bracing, part time, or full-time wear. Acetabular index (AI) measurements were obtained immediately upon cast removal and from 2- and 4-year follow-up radiographs. Uni-/multivariate analysis was performed to determine the effect of bracing on acetabular indices and rates of secondary surgery for residual dysplasia. 258 hips underwent closed reduction and 70.5% (182/258) were treated with abduction bracing. There was no difference between those treated with or without bracing with regards to sex ($p=0.92$), age at reduction ($p=0.77$), severity of dislocation ($p=0.21$), or immediate post-casting AI ($p=0.21$). The bracing cohort was casted longer postoperatively than the non-bracing cohort (14.0 ± 3.4 vs 12.8 ± 4.8 weeks, respectively; $p=0.03$). There was no difference in hips treated with or without brace with regards to AI at 2 years post-reduction (32.1 ± 5.7 vs 30.5 ± 6.2 degrees, respectively; $p=0.13$) or 4 years post-reduction (25.8 ± 5.8 vs 25.6 ± 6.9 degrees, respectively; $p=0.96$). When categorized by full-time, part-time, or no bracing, there were similarly no differences in AI at 2 years or 4 years post-reduction ($p=0.28$ and 0.45 , respectively). Multivariate analysis revealed only IHDI grade predicted acetabular index at 2 years post-reduction ($p=0.01$) while abduction bracing demonstrated a non-significant trend towards bracing predicting higher AI ($p=0.06$). There was no difference in rate of secondary surgery for residual dysplasia between hips treated with or without bracing (35% vs 38%, respectively; $p=0.69$). Abduction bracing following closed reduction for DDH is not associated with decreased residual dysplasia at 2-/4-years post-reduction or with decreased secondary surgery. These results indicate that there may be little value in post reduction bracing for DDH, and a prospective study is indicated to provide further guidance.

Single-Sport Athletes Not Experiencing Increase in Secondary Tear Incidence Despite Earlier Clearance

Craig Kemper

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Collaborators: Connor M. Carpenter, BBA¹; K. John Wagner, III, BS¹; David E. Zimmerhanzel, BS¹; Philip L. Wilson, MD^{1,2}

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Background: Multi-sport participation has been encouraged for protection from over-use injury and diversified athletic development. It is unclear whether participation in multiple sports protects against re-injury. The purpose of this study was to compare functional recovery, psychological recovery, and secondary injury between single and multi-sport pediatric athletes after primary ACL reconstruction (ACLR).

Methods: Following IRB approval, prospectively collected data on consecutive patients treated for ACL injury (1/2015-2/2018) in a pediatric sports medicine clinic was reviewed. Patients indicated sports participation on a standardized electronic survey, which allowed for categorization as single- or multi-sport athletes. Patients lacking two year follow-up were contacted via phone and questioned on sports participation, return to primary sport, and any secondary injury. Inclusion required primary ACLR within the study window, participation in sport(s) at the time of injury, age ≤ 19 , a complete Y-balance test 6-9 months after surgery, and at least 2 years post-surgery follow-up. Demographic information, injury characteristics, surgical data, functional clearance data (Y-balance testing), functional and psychological patient reported outcome measures (PROM), return-to-play clearance, and reinjury were reviewed. Categorical variables were compared with a Chi-Square or Fisher's exact test. Continuous variables were compared with a Mann-Whitney test.

Results: 145 patients met inclusion criteria [age: 14.23 ± 2.09 , range: 7-18, 49.66% female]. Single-sport athletes comprised 53.79% of the cohort ($n=78$). Females accounted for 57.69% of single-sport athletes, while males accounted for 58.21% of multi-sport athletes ($n=45$, $n=39$, $p=0.0562$). The largest portion (37.18%) of single-sport athletes listed soccer as primary sport, while the largest portion (38.81%) of multi-sport athletes listed football as primary sport ($n=29$, $n=26$, $p=0.0006$). Single-sport athletes showed higher scores on Pedi-IKDC prior to surgery (51.62 ± 19.20 vs. 43.73 ± 21.77 , $p=0.04$). Single-sport athletes were also cleared fewer days after surgery than multi-sport athletes (271.09 ± 100.08 vs. 313 ± 109.66 , $p=0.02$). Despite single-sport athletes obtaining clearance earlier than multi-sport athletes, there was no difference in incidence of secondary ACL injury within 2 years of surgery ($p=0.84$).

Conclusion: Although single-sport athletes attained clearance in a shorter time than multi-sport athletes, no difference was found in rate of secondary ACL injury within two years of follow-up.

Very Long-Term Efficacy of Self-Start Antibacterial Therapy Post-Electrofulguration Among Women with Uncomplicated Recurrent Urinary Tract Infections

Zara Khan

Mentor: Philippe Zimmern, MD, Department of Urology

Collaborator: Alana L. Christie, MS

Background: Cystoscopy with electrofulguration (CEF) has a high rate of clinical improvement or cure in women with recurrent urinary tract infections (rUTIs)¹. For patients with rUTIs post-CEF, options include antibiotic therapy for culture-proven recurrences, daily antibiotic prophylaxis, repeat CEF, or, in select patients, self-start antibiotic therapy (SST). SST is included in rUTI management guidelines² but is understudied. This study assesses SST efficacy in preventing UTIs post-CEF.

Methods: This IRB-approved study reviewed a prospectively-maintained database of women with uncomplicated rUTI (≥ 3 symptomatic infections/year³). Included women underwent outpatient CEF in 2006-2019 and completed at least one year of follow-up. Primary outcome was number of prior-year UTIs at last office visit, with UTI defined as antibiotic therapy for UTI-like symptoms and/or positive urine culture. Clinical success was defined as no UTIs at last visit; improvement as 1-2 treated infections/year; and failure as ≥ 3 treated infections/year, daily antibiotic prophylaxis, or cystectomy. Regression analyses included variables age, body mass index (BMI), time since CEF, incontinence, and use of hormone replacement therapy (HRT).

Results: Of 239 patients, 36 (15%) used SST to manage UTIs post-CEF, while 152 (63.6%) were treated only for culture-proven symptomatic UTI recurrences, 42 (17.6%) were on daily antibiotic prophylaxis, and 6 (2.5%) had/were seeking cystectomy or had UTIs refractory to daily antibiotic suppression. Median age of SST patients post-CEF was 73.5 years (IQR 65-81), with median follow-up time since latest CEF at 8.5 years (IQR 3-12), similar to patients treated for culture-proven symptomatic UTI (age 75.5, median follow-up 9 years). Regarding prior-year UTIs, 12 SST patients (46%) experienced none (success), 12 (46%) experienced 1-2 (improvement), and 2 (8%) three or more (failure); in comparison, among patients treated for culture-proven symptomatic infections, 74% experienced success, 23% improvement, and 3% failure ($p=0.01$). There were no differences in outcomes among women using SST by age, BMI, time since CEF, incontinence, and HRT.

Conclusions: In this very long-term study of postmenopausal women with rUTIs post-CEF, most women using SST experienced clinical success or improvement as did women treated for culture-proven symptomatic UTI, with a low failure rate in both groups.

References: 1Crivelli et al., International Journal of Urology, 2019; 2Anger et al., The Journal of Urology, 2019; 3Malik et al., FPMRS, 2018

Multivariate Regression Analysis of Demographic and Clinical Factors Contributing to Post-Operative Opioid Usage in Orthopedic Oncology Patients

Daanish Khazi-Syed

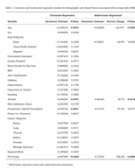
Mentor: Alexandra Callan, MD, Department of Orthopaedic Surgery
Collaborators: Destini Teague, MS; Olatunde Badejo, BA;
Roberto Gonzalez, BA; Kathryn Galloway, BS

Introduction: The objective of this study is to identify demographic and clinical factors associated with post-operative opioid use following intramedullary (IM) nail placement in orthopedic oncology patients.

Methods: A retrospective chart review for all patient encounters for IM nail placement with the intent of stabilizing either an impending or complete pathologic fracture of the femur or humerus was performed. Exclusion criteria included more than one major surgery during admission and no record of exact dose administered via Patient-Controlled Analgesia (PCA) pump. Ninety-nine patients were included in the analysis. Opioid usage was recorded using Morphine Milligram Equivalent Doses (MMED). The total hospital MMED was divided by the length of stay to calculate the average daily MMED. Univariate and multivariate linear regression analysis was performed with log-transformed average daily MMED as the dependent variable. A backwards elimination strategy was used to select which variables to include in the final model.

Results: In univariate linear regression analysis, age, alcohol use, preoperative opioid prescription, and PCA pump utilization were all significantly associated with average daily MMED after surgery. The final multivariate linear regression model included age, Black race, alcohol use, preoperative opioid prescription, and PCA pump utilization. Black race did not reach statistical significance. For every 10-year increase in age, average daily MMED decreased by 22.3%. Alcohol use prior to surgery increased average daily MMED by 58.7%. Preoperative opioid prescription increased average daily MMED by 67.2%. Finally, PCA pump utilization increased average daily MMED by 108.2%.

Conclusion: Age, alcohol use, preoperative opioid prescription, and PCA pump utilization are significantly associated with post-operative opioid use in orthopedic oncology patients undergoing IM nailing for an impending or complete pathologic fracture. Future research should consider patient reported pain assessments as well as prescription opioid use after discharge.



The Human Placental Project: Funded Projects, Imaging Innovation, and Persistent Gaps

Meredith Kim

Mentor: Christina L. Herrera, MD, Department of Obstetrics and Gynecology, Division of Maternal-Fetal Medicine

Collaborators: Quyen N. Do, PhD; David M. Owen, MD, PhD; Baowei Fei, PhD; Ananth J. Madhuranthakam, PhD; Yin Xi, PhD; Matthew A. Lewis, PhD; Diane M. Twickler, MD; Catherine Y. Spong, MD

Objective: The National Institutes of Health's Human Placenta Project (HPP) focuses on understanding placental development and function in real time and development of new tools. Our aim was to analyze funding and publications to identify advances and persisting gaps within imaging.

Study Design: Projects and publications funded by the HPP were identified through the NIH Reporter system. Subcategorization was applied to imaging publications based on modality. We totaled the funding within each category and subcategory and specified if the focus was placental or non-placental. Manuscripts were reviewed to identify major advancements and persistent gaps.

Results: As of December 2020, the HPP distributed \$89.8M among 38 projects, resulting in 282 publications; 138 (49%) focused on the placenta. Specimen collection with omic analysis was a component in 55% whereas imaging comprised 58%. Within the 22 imaging projects, MRI studies received the largest share of funds (Table). Major imaging advances included technical developments and validation of methods for in vivo assessment of placental structure and function (arterial spin labeled MRI, blood oxygen dependent level MRI), disease assessment prediction (uterine artery waveforms and growth restriction), and semi-automation of screening processes (power doppler for blood volume). Gaps include validation of novel technology in diseased populations, automation of techniques, correction of motion artifacts, reliable methods to assess the placenta in any location, and standardized analysis.

Conclusion: HPP has predominantly funded projects focused on specimen collection with omic analysis and imaging. Imaging advances have enhanced understanding placental structure and function, disease assessment, and image quantification. Additional research is needed to meet gaps in the application, automation, standardization, and versatility of imaging modalities.

TABLE. HPP projects, funding, and resultant publications in imaging

Imaging	Number of Projects Funded	Amount Allocated (Millions)	Number of Resultant Publications	Placental Publications	Original Research
MRI	11 (50%)	25.2 (44%)	71 (60%)	36 (51%)	35
MRI + US	2 (9%)	8.3 (14%)	4 (3%)	4 (6%)	4
MRI + US + other	1 (5%)	4.3 (8%)	2 (2%)	2 (3%)	1
MRI + other	1 (5%)	3.2 (6%)	5 (4%)	2 (3%)	2
US	7 (32%)	16.3 (28%)	30 (25%)	21 (30%)	18
US + other			2 (2%)	2 (3%)	2
Other			4 (3%)	3 (4%)	3
Total	22	57.3	118	70	65

The Placenta Accreta Index: Are Additional Ultrasound Variables Additive?

Meredith Kim

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Collaborators: Yin Xi, PhD; Jodi S. Dashe, MD; Diane M. Twickler, MD;
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Objective: The Placenta Accreta Index (PAI) is a prospectively validated tool for the prediction of placenta accreta spectrum (PAS) in a based on a standardized evaluation of ultrasound parameters. The aim of this study was to determine if additional ultrasound variables would enhance prediction and correlate with pregnancy outcome.

Study Design: The PAI was prospectively assigned to women with concern for PAS beginning in September 2019. We analyzed third trimester sonograms through June 2021. PAI variables were as follows: number of prior cesareans, grading of lacunae, sagittal smallest myometrial thickness, placental location, and presence of bridging vessels. Additional variables collected were presence of a placental bulge, number of bridging vessels, length of irregularity of the uterine-bladder interface, and largest dimension of myometrial invasion. Hysterectomy due to placental invasion was the primary outcome. Logistic regression was used to assess contribution from the additional variables to generate odds ratios (OR). Area under the receiver operating characteristic curves (AUC) were determined. $P < .05$ was considered significant. All analyses were done in SAS 9.4 (SAS institute inc., Cary, NC).

Results: 22 (40%) of the 55 patients required hysterectomy. The PAI had an AUC of 0.85 (0.75, 0.95) for hysterectomy. Length of irregularity of the uterine-bladder interface was the only new variable with significant additional contribution ($p = 0.03$, Table). For every 10 mm the odds of hysterectomy increased 35% (OR: 1.35 (0.92, 1.96)). A logistic regression model incorporating irregularity of the uterine-bladder interface and PAI yielded an AUC of 0.89 (0.8, 0.97).

Conclusion: Length of irregularity of the uterine-bladder interface provided significant association with hysterectomy in addition to the PAI.

Table: Contribution of additional variables from multivariable logistic regression

Additional variables	OR ¹	P-value ²	AUC ³
Largest dimension of invasion (per 10 mm)	1.35 (0.92, 1.96)	.12	0.86 (0.76, 0.96)
Length of irregularity of the uterine-bladder interface (per 10 mm)	1.35 (0.92, 1.96)	.03	0.89 (0.8, 0.97)
Placental location	0.97 (0.51, 1.86)	.94	0.85 (0.75, 0.95)
Placental bulge	2.64 (0.41, 17.1)	.31	0.86 (0.76, 0.96)
Bridging vessels	1.49 (0.91, 2.43)	.11	0.88 (0.79, 0.97)

¹Odds ratio from multivariable logistic regression with PAI as a covariate.

²P-value testing null hypothesis of OR=1 with PAI as a covariate.

³Area under the ROC curve from a logistic regression model with the corresponding additional variable + PAI.

Influence of Area Deprivation Index on Cardiovascular Outcomes and Disease Activity in Rheumatoid Arthritis

Joseph Kim

Mentor: E. Blair Solow, MD, Department of Internal Medicine, Rheumatic Diseases

Collaborators: Donglu Xie, PhD; Song Zhang, PhD

Background/Purpose: Rheumatoid arthritis (RA) is associated with increased morbidity and mortality, particularly if RA is poorly controlled. The effects of socioeconomic deprivation have not been well studied in the context of RA disease activity. We analyzed the impact of the Area Deprivation Index (ADI) on cardiovascular disease (CVD) burden and disease activity in RA.

Methods: We conducted a retrospective analysis of RA patients, defined by ICD-10 codes, seen at the UTSW clinic in the past 5 years and are 18-89 years old. We collected age, ethnicity, race, gender, education, insurance plan, primary language, address, RA medications, MyChart engagement, primary care physician presence, ED/Inpatient visits over 5 years, RA disease activity and functional scores (RAPID3, HAQ), Charlson comorbidity index (CCI), and CVD presence. Patients were determined to have CVD by the presence of coronary bypass surgery, percutaneous intervention, CAD, cerebrovascular disease, heart failure, myocardial infarction, or peripheral vascular disease diagnoses in the patient's medical history or problem list. ADI was used as a proxy for socioeconomic deprivation and was assigned using 9-digit zip codes. Patients were divided by the upper ADI quartile vs lower ADI quartiles and matched 2:1 (low:high) by gender, race/ethnicity, age and CCI for propensity score analysis. Two-sample t test and Chi-square test were conducted for final group comparisons.

Results: 2893 patients were initially assessed (80% female, 57% White). Over 90% were seropositive for either rheumatoid factor or anti-CCP antibodies. The median Texas ADI score was 3 (range 1-10), and the median national ADI score was 45 (range 1-100). 1401 patients were examined after 2:1 propensity score matching. Those with high ADI scores (more deprived) had significantly higher RA disease activity scores (RAPID3: 10.9 ± 6.9 vs 13.2 ± 6.9 , $p < 0.001$) and RA functional activity scores (HAQ: 2 ± 2.1 vs 3 ± 2.2 , $p < 0.0001$), lower MyChart utilization ($p < .0001$), and lower jakinib use ($p < .001$) compared to those with low ADI scores (ADI < 69, less deprived). There were also statistically significant differences in insurance type ($p < .0001$) and smoking status ($p < .0001$) between the two groups. CVD burden was not different between the groups.

Conclusion: We found significant differences in RA disease activity and function in patients from more socioeconomically deprived areas. Addressing socioeconomic impacts on healthcare may help reduce RA disease activity and morbidity.

Utility of Pre-Operative Clear Cell Likelihood Scores on MRI for Patients with Solid Renal Masses and Chronic Kidney Disease Being Considered for Extirpative Nephron Sparing Surgery (NSS)

Vineeth Kommid

Mentor: Jessica Dai, MD, Department of Urology

Collaborators: Tara Morgan, MD; Ivan Pedrosa, MD; Jeffrey Cadeddu, MD

Introduction and Objective: NSS is favored for patients with solid renal masses (SRM) and concurrent CKD. Complication rates are higher than average and operating for benign disease is less permissible. We describe complications and benign pathology rates in a cohort of CKD patients undergoing robotic-assisted partial nephrectomy (RAPN) with utilization of MRI and clear cell likelihood scoring (ccLS).

Methods: A retrospective chart review was performed on 70 patients with CKD (eGFR 15-60) and a pre-operative MRI who underwent RAPN between 4/2016 and 2/2020. CcLS scores from 1 to 5 (1-very unlikely, 2-unlikely, 3-equivocal, 4-likely, and 5-very likely) were assigned prospectively pre-operatively in 54 (77.1%), and post-operatively in the remainder by a blinded radiologist. Clinical characteristics were analyzed using SPSS. Wilcoxon signed rank test compared change in post-operative GFR from baseline (IBM, Armonk, NY).

Results: Patient demographics and pre-operative tumor characteristics are in Table 1. The median OR time, blood loss, warm ischemia time and length of stay were 180.5 minutes (IQR 156.0-204.0), 200.0 cc (IQR 100.0-300.0), 23.0 minutes (IQR 18.0-26.0), and 2.0 days (IQR 1.0-3.0), respectively. ccLS scores were 1-5 in 13 (18.6%), 5 (7.1%), 17 (24.3%), 14 (20.0%), and 21 (30.0%), respectively. All patients had a negative margin, and only 4 patients (5.7%) had benign final pathology, outlined in Table 2. One or more complications occurred in 8 patients (11.4%). The median post-operative eGFR (45.0, IQR 33.0-56.0) obtained at a median of 24.9 months (IQR 5.5-51.3) was not significantly lower than baseline (49.0, IQR 36.0-53.0, $p=0.67$).

Conclusions: RAPN in CKD patients requires careful consideration given increased risk of complications and progression to ESRD. MRI with ccLS scoring may decrease the rate of benign or indolent pathology and even obviate the need for renal biopsy or radical nephrectomy in select cases. Further prospective studies are required.

COVID-19 Disease Course of Immunocompetent and Immunocompromised Patients in a Breast Cancer Registry

Shreya Kondle

Mentor: Samira Syed, MD, Department of Hematology and Oncology

The demographics, comorbidities, menopausal status, endocrine therapy, and breast cancer morphology and treatment history of 45 non-stage IV breast cancer patients with COVID-19 were analyzed. Immune status at COVID-19 diagnosis, COVID-19 disease severity and treatment, CBC with differentials at and within 2 weeks of COVID-19 diagnosis, hospital/ICU admission, and mortality were explored in relation to SARS-CoV-2's influence on the mononuclear phagocyte system (via M1/M2 macrophages) and the multimodal influences of menopause, estrogen, immunomodulatory drugs, and endocrine therapy on the immune system as well as gene expression of ACE2, NRP1, and TMPRSS2. Within each ethnicity group, percentages by number of comorbidities and BMI ranges were correlated with disease severity and mortality. In the second analysis, those who had received immunosuppressive chemotherapy within 9 months of COVID-19 diagnosis or were on ongoing immunosuppressive medication were split into an immunocompromised subset. COVID-19 outcomes were then examined with note of menopausal status, endocrine therapy, and receptor positivity. Hispanics had a similar percentage of obese patients as African Americans, the highest percentage of class III obesity (16.67%), and the highest percentage of severe COVID-19 disease (10.57%). Recent studies report reliable laboratory markers such as NLR in a COVID-19 haematocytometric index for severity and mortality. No appreciable changes in CBC differentials were noted due to limited serial CBCs. All immunocompetent breast cancer patients hospitalized for acute hypoxic respiratory failure had a mild COVID-19 disease course and the vast majority displayed absolute eosinopenia; aromatase inhibitors were the known form of endocrine therapy in usage. There was a significantly greater number of postmenopausal patients infected irrespective of immune status. Recording of periodic CBC differentials, immunomodulatory drugs, endocrine therapy, and menopausal status can determine priority groups of care for non-stage IV breast cancer patients during the COVID-19 pandemic.

No-Show Rates and Factors Contributing to Non-Attendance in the Parkland Dermatology Clinic

Christopher Kung

Mentor: Benjamin Chong, MD, MSCS, Department of Dermatology

Collaborators: Melinda Liu, MD; Clare Keum, BS

Background: Access to dermatologists for the underserved population has been limited. Patients who seek this care experience an average new patient wait time of 45 days. Compounding this problem of limited access, these patients exhibit a no-show rate of approximately 30%. This translates to inefficient utilization of already limited dermatologic care. To begin to address this problem, we sought to determine the rate of patient non-attendance and identify patient characteristics associated with non-attendance at the Parkland outpatient dermatology clinic.

Objectives and Methods: Herein, we seek to 1. Identify potentially modifiable risk factors associated with non-attendance at the Parkland dermatology clinic; 2. Quantify no-show rates at the Parkland dermatology clinic. This will be a single-center, retrospective study utilizing Epic visits data from October 2018 through September 2019. Excluded will be patients who are inmates as well as patients who were scheduled for phototherapy, nursing visits, and/or procedures.

Results: Of the 13,857 total visits, 3,857 were missed appointments, for a total non-attendance rate of 28%. Univariate analyses were performed to identify individual factors associated with missed appointments at the Parkland outpatient dermatology clinic. Patients with new appointments ($p<0.001$), longer wait times ($p<0.001$), English speakers ($p<0.001$), younger age ($p<0.001$), physician assistant provider ($p<0.001$), self-pay status ($p<0.001$), and negative history of previously missed appointments ($p<0.001$) were found to be associated with an increased likelihood of missing appointments.

Conclusions: In this study, we quantified no-show rates at the PHHS dermatology clinic (28%) and identified patient factors correlated with non-attendance, such as longer wait times. After performing multivariable analyses to confirm patient factors, we will design interventions aimed towards these at-risk groups to reduce no-show rates and improve utilization of dermatologic resources at PHHS. This will help to increase access to dermatologic care for underserved populations in Dallas County.

Ten Year Experience with Macroplastique in Women with Stress Urinary Incontinence Secondary to Intrinsic Sphincter Deficiency

Sam Kusin

Mentor: Phillippe Zimmern, MD, Department of Urology

Collaborators: Timothy Carroll, MD; Feras Alhalabi

Introduction/Objective: To evaluate the very long-term outcomes of Macroplastique (MPQ) in women with stress urinary incontinence (SUI) secondary to intrinsic sphincter deficiency (ISD) using validated questionnaires and three-dimensional ultrasound (3DUS).

Methods: Following IRB approval, charts of non-neurogenic women with SUI secondary to ISD who underwent MPQ injection were reviewed from a prospectively maintained database (1). ISD was defined as low VLPP and absence of hypermobility on standing voiding cystourethrogram. Excluded were women with follow up <5 years. Baseline data included questionnaire scores (UID-6 question 3 (0-3) following MPQ injection and urodynamic study findings. Patients were followed with repeat questionnaires, patient SUI self-report, and 3DUS evaluating volume/configuration of MPQ. All 3DUS measurements were performed by the same imaging team blinded to clinical outcomes. Success was defined as UDI-6 question 3 score of 0-1, patient self-report of SUI improvement of at least 75% as well as not requiring additional anti-incontinence therapy.

Results: Between 2011 and 2016, 77 of 153 women met study criteria. Average age and BMI at time of injection were 65.7 years and 28 kg/m². Average follow-up time was 6.8 years (range 5-10 years). 53% were “successful” [after one injection (29 %) or more than one injection, 24%]. UDI-6 question 3 average score at most recent visit was 1.4. The average MPQ volume at last ultrasound was 5.7 ml (range 1-12), with an average of 5.8 ml (range 2-12) in the “success” group. In the failure group (15/77, 19%), despite an average MPQ volume of 6.0 ml (range 1-12) 13 women proceeded to an autologous sling at an average of 27 months (range 4-95 months) after last MPQ injection, and two to an artificial urinary sphincter. Of note, 28% of our patients improved sufficiently to not warrant additional SUI procedures.

Conclusion: This long-term study indicates a durable subjective and objective response rate for MPQ in the majority of women with SUI secondary to ISD. Those who failed mostly proceeded to a fascial sling.

1. Carroll et. Al. IBJU 45:989, 2017.

CSF3R T618I Mutated Chronic Myelomonocytic Leukemia: A Proliferative Subtype with a Distinct Mutational Profile

Adelaide Kwon

Mentor: Weina Chen, MD, PhD, Department of Pathology

Collaborators: Ibrahim Ibrahim, MD; Trim Le, MD; Jesse Jaso, MD; Olga Weinberg, MD; Franklin Fuda, DO

Introduction: Chronic myelomonocytic leukemia (CMML) is a myeloid neoplasm characterized by sustained monocytosis, ranging from cytopenia with a dysplastic subtype to leukocytosis with a proliferative subtype, and with a typical mutational profile involving *TET2*, *ASXL1*, and *SRSF2*. Mutation in colony-stimulating factor 3 receptor gene (*CSF3R*) is commonly associated with chronic neutrophilic leukemia (CNL) but is exceedingly rare in CMML, particularly *CSF3R* T618I [with only ~10 cases described, ~30 cases of *CSF3R* non-T618I mutations (such as E835K and M696T)]. We report a case of CMML with *CSF3R* T618I mutation and compare the clinicopathologic features to reported CMML cases with and without *CSF3R* T618I mutations.

Methods: A 27-year-old woman presented for evaluation of leukocytosis, sustained monocytosis, and macrocytic anemia. Peripheral blood (PB) revealed leukocytosis (white cell count $35 \times 10^9/L$), left-shifted and dysplastic neutrophils (myelocytes and metamyelocytes, 5%), marked absolute and relative monocytosis ($7 \times 10^9/L$, 29%), severe anemia (Hgb 4.3 g/dL), and mild thrombocytopenia. Bone marrow aspirate and core biopsy demonstrated a hypercellular marrow with increased myeloblasts (~3%, immunophenotypically aberrant by flow cytometric immunophenotyping), increased myelomonocytic cells, and multilineage dysplasia including ring sideroblasts and hypo/monolobated megakaryocytes. Cytogenetic and molecular studies revealed a normal karyotype and mutations in *CSF3R* T618I, *ASXL1*, *SETBP1*, *BCORL1*, *KRAS*, and *PTPN11*. Despite the presence of a *CSF3R* T618I mutation, a diagnosis of CMML was rendered given marked monocytosis and left-shifted neutrophils in PB, multilineage dysplasia, and immunophenotypically aberrant myeloblasts.

Conclusions: In comparison to reported CMML cases, our case demonstrates the clinicopathological features similar to those of *CSF3R* T618I mutated CMML, i.e., a proliferative subtype and less likely to have co-occurring mutations in *TET2* or *SRSF2*, which is distinct from *CSF3R* non-T618I mutated CMML; the latter often has a dysplastic subtype and mutational profile of frequent *TET2* and *SRSF2* mutation, similar to *CSF3R* unmutated CMML. While additional cases with this unusual mutation need to be studied to arrive at a more definitive conclusion, *CSF3R* T618I mutation seems to define a unique proliferative subtype CMML with a distinct mutational profile.

Placental Pathology in SARS-CoV-2 Infected Pregnancies: The Largest Single-Institution Retrospective Cohort Analysis

Tiffany Le

Mentor: Imran N. Mir, MD, Department of Neonatal-Perinatal Medicine

Collaborators: David Lee, MD; L. Steven Brown, MS; Vinay Kalvacherla, BA; Pollianna Sepulveda, MSN, RN; Lina Chalak, MD

Background: The placenta can sustain direct and indirect consequences of SARS-CoV-2 infection during pregnancy. Postpartum placental histopathologic examination presents an opportunity to study the effects of SARS-CoV-2 on placentas and potentially neonatal outcomes. Our objectives were to determine 1) the incidence of placental pathologic lesions in women who tested positive for SARS-CoV-2 during pregnancy and 2) if placental lesions differed between neonates who tested positive or negative for SARS-CoV-2 in the first 48 hours of life.

Methods: A retrospective cohort analysis of all pregnant mothers who tested positive for SARS-CoV-2 and delivered at Parkland Hospital from March 1, 2020 - June 30, 2021. Placentas from these pregnancies were submitted for gross and histopathologic examination (n = 556). A standardized definition for classification of different placental histopathologic lesions was used.

Results: Placental pathology reports were available from 425 placentas (n = 425/556; 76%). Among them, 380 had at least one histopathologic lesion (n = 380/425; 89%). The predominant lesions were acute histologic chorioamnionitis with or without fetal response (n = 209/380, 55%), multiple vascular malformation (MVM) (n = 180/380; 47%), and other inflammatory lesions (n = 148/380; 39%). Moreover, 54% of placentas from SARS-CoV-2 positive mothers had multiple (i.e., ≥ 2) histopathologic lesions (n = 229/425; 54%), and acute histologic chorioamnionitis and MVM (n = 78/229; 34%) was the predominant combination. In our cohort, 14 (2.5%) infants tested positive for SARS-CoV-2 within the first 48 hours of life. There were no significant differences found in placental histopathology between infants who tested positive vs. those that were negative for SARS-CoV-2. Only one neonate demonstrated evidence for transplacental hematogenous spread of SARS-CoV-2; the rest (n = 13/14) were potentially infected at or after birth. When we compared placental lesions of mothers who tested positive for SARS-CoV-2 during the first vs. second vs. third pregnancy trimesters, there were significant differences in the incidence of placental lesions (n = 9/19, 53% vs. n = 37/98, 49% vs. n = 102/439, 31%, respectively; p < 0.01).

Summary: To our knowledge, this is the largest single center study looking at placental pathology associated with SARS-CoV-2 infection. SARS-CoV-2 is associated with a high incidence of placental histopathology. Vertical transmission of SARS-CoV-2 across the placenta is a rare event. The findings of this study are important in counseling patients who are pregnant and test positive for SARS-CoV-2.

Changes in Short Form-12 Physical and Mental Health Composite Scores During the 2 Years Following Transcatheter Aortic Replacement: A Pilot Study

Happy Le

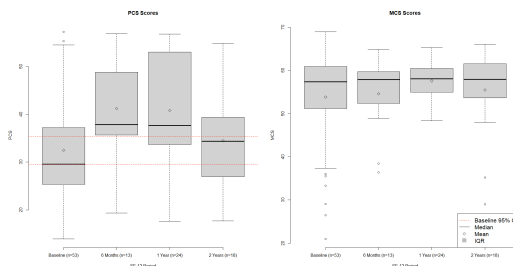
Mentor: Amanda A. Fox, MD, MPH, Department of Anesthesiology

Collaborators: Jackson Barth, MA; Sreekanth Cheruku, MD, MPH; Michael E. Jessen, MD; Dharam J. Kumbhani, MD, SM; Lynn Huffman, MD; Anthony A. Bavry, MD, MPH; Lauren Wehrmann, BS

Background: Studies of quality of life (QoL) after transcatheter aortic valve replacement (TAVR) focused mainly on physical QoL, with mental QoL not well delineated. Most studies use heart failure QoL assessments which may not be relevant to all TAVRs. This pilot study uses the Short Form-12 (SF-12v1) to address the hypothesis that physical and mental QoL improve post-TAVR.

Methods: This IRB approved prospective observational cohort study enrolled 61 TAVR patients (11/23/2016 - 2/19/2020). SF-12v1 questionnaires were administered pre-TAVR and 6 mos, 1 yr and 2 yr post-TAVR. Physical component (PCS) and mental component (MCS) summary scores were calculated. Mixed modelling was used to fit the data, including demographic and procedural variables to reduce model variability. Contrasts were used to compare general pre- to post-TAVR SF-12 scores and to test the exploratory hypothesis that age <80 yrs, associates with significantly increased post-TAVR PCS and MCS scores.

Results: 3 patients did not have any SF-12 data. Fig. 1 shows box plots of SF-12 PCS and MCS scores at each time-point. For patients with any SF-12 data (n=58): mean age 80 +/- SD 8yrs; 64% men. Postoperative PCS scores were significantly greater than pre-TAVR (p= 0.02). Pre-TAVR MCS scores were high and not significantly changed post-TAVR. Age <80 yrs associated with increased post-TAVR PCS scores (p = 0.01). 32 of 61 patients did not have baseline SF-12 or did not have any post-TAVR SF-12 data, and therefore did not affect the analysis of age on increased PCS or MCS score.



Conclusion: In this study SF-12 PCS scores rose during TAVR follow-up with some decline again at 2 yrs. MCS scores were high and unchanged in follow-up. Age <80 yrs associated with increased follow-up PCS scores. Larger studies are warranted to validate findings and to allow multivariable assessment of risk factors impacting post-TAVR QoL.

Cost Comparison of Stage 0 Melanoma Treatment Between Dermatology and Non-Dermatology Specialties at a Single Institution: A Retrospective Cohort Study

Kim Le

Mentor: Rajiv Nijhawan, MD, Department of Dermatology
Collaborators: Kevin Burningham; Annie He; Madeline O'Brian;
Kevin Shi, MD, PhD

Introduction: The standard of care for melanoma *in situ* (MIS) is surgical resection.¹ There are various surgical approaches, done by many surgical specialties, including wide local excision (WLE), staged excision, and Mohs micrographic surgery (MMS).¹ The aim of this study is to assess whether MIS treated by dermatologists is associated with lower total costs than MIS treated by other surgical specialties.

Methods: This is a single institution retrospective study at the University of Texas at Southwestern Medical Center. All patients age 18 and older treated for biopsy-proven MIS by surgical excision from June 2018 through August 2021 were included in this study. Patients with invasive melanoma by initial biopsy were excluded. The charges associated with the treatment of MIS were gathered including professional fees of the surgeons, anesthesiologists, and nursing staff, procedural fees, OR and facility use fees, materials used fees including pharmacy and surgical supplies, and consultation and follow-up fees, as applicable. Estimated costs were calculated from charges billed using average institutional reimbursement data.

Results: 572 patients were included in the final analysis. The mean total cost for MIS treated with WLE by dermatologists was \$1,090 (CI=\$997-1,183) versus all other specialties at \$4,971 (CI=\$2,401-7,541)($p<0.001$). MIS treated with MMS and repaired by dermatology (mean=\$2,320 (CI=\$2,228-2,412) was also less expensive than MIS treated by other specialties with WLE ($p<0.001$). All dermatology patients were treated in outpatient settings under local anesthesia, while 50% of patients seen by other specialties were treated in the OR under general anesthesia and incurred facility costs as well as additional professional costs.

Conclusions: Although low-stage melanoma can be treated by many different surgical specialties, the cost to the health care system can significantly differ depending on the surgeon's specialty. This could be attributed to specialty-specific preferences in performing procedures in outpatient clinic setting versus the operating room. The findings of this study suggest that early-stage melanoma is significantly less costly when treatment is performed by dermatologists/dermatologic surgeons compared to other surgical specialties.

References: 1. Swetter SM, Tsao H, Bichakjian CK, et al. Guidelines of care for the management of primary cutaneous melanoma. *J Am Acad Dermatol*. 2019;80(1):208-250.

Risk Factors Associated with Livedoid Vasculopath

Kim Le

Mentor: Cristina Thomas, MD, Department of Dermatology

Background: Livedoid vasculopathy (LV) is a rare, chronic vascular disorder that is characterized by retiform purpura, ulceration, and porcelain white scars (“atrophie blanche”) on the lower legs. LV can be due to venous stasis or due to systemic disorders, including coagulation disorders, connective tissue disease, and paraproteinemias. Previous studies have reported associations between LV and key mutations (prothrombin, factor V Leiden), protein deficiencies (protein C, antithrombin III), and changes in the level of coagulation factors VIII, IX, XI.¹ These abnormal findings may result in thrombotic occlusion that lead to the associated skin findings. Currently, little is known about the associations between patient demographic, medical history, and clinical presentation with the need for hypercoagulability screening in the diagnosis of thrombophilia-associated LV.

Methods: This study is a multi-institutional retrospective chart review of patients diagnosed with LV between April 2005 and March 2021 at the University of Texas at Southwestern Medical Center and Parkland Health and Hospital System in Dallas. Demographics, past medical history, physical examination findings, hypercoagulability laboratory results, and histopathology information were collected. Patients who were >18 years old with a biopsy-proven diagnosis, classic dermatological exam findings, and a hypercoagulability workup were included in this study.

Results: Of the 28 validated cases, 22 (78.57%) were female and 11 (39.28%) were African American. A total of 17 (60.71%) patients had at least one abnormal hypercoagulability lab value and 4 (14.28%) had >3 abnormal lab values. The most common abnormal hypercoagulability labs were anti phosphatidylserine antibody (n=7, 25%) and beta-2 glycoprotein antibody (n=5, 17.85%). Patients with hypercoagulability had a mean age of onset of 47, a mean BMI of 31.26, and 4 (28.57%) had a history of miscarriage. Patients without hypercoagulability had a mean age of onset of 55.18, a mean BMI of 32.66, and 1 patient (12.5%) had a history of miscarriage.

Conclusions: This preliminary data points to gender, age, and history of miscarriage as potential markers of hypercoagulability-associated LV. According to the Medicare fee schedule, the total cost of the hypercoagulability work up included in this study is \$334.27.² To optimize patient resources and avoid potentially expensive testing, the findings of this study may help identify which patients would benefit from full hypercoagulability testing in the workup of LV.

Association Between Neighborhood Characteristics and E-cigarette, or Vaping, Product Use-Associated Lung Injury in Adolescents: An Ecological Study

Harin Lee

Mentor: Devika Rao, MD, Department of Pediatrics- Pulmonary and Sleep

Collaborators: Sitara Weerakoon, MPH; Bayan Abdallah, MD; Sarah Messiah, PhD, MPH

Background: In 2019, an acute form of lung injury known as e-cigarette, or vaping, product use-associated lung injury (EVALI) was described. It has been shown that increased socioeconomic status (SES) and advertising efforts are associated with e-cigarette use. However, no study to date has explored neighborhood-level characteristics as potential predictors for EVALI. This study identified neighborhood-level characteristics associated with EVALI and hypothesized that EVALI cases are associated with neighborhoods that have a greater density of vape shops and higher SES due to increased vaping literacy.

Methods: Adolescents under 19 years hospitalized for treatment of EVALI at Children's Medical Center Dallas from December 2018-June 2021 and corresponding ZIP codes were retrospectively identified from electronic health records. ZIP codes containing no EVALI cases were identified through the American Community Survey (ACS) 2019 data and matched to the EVALI case ZIP codes 2:1 using population size and age distribution. SES-related characteristics were selected from the ACS 2019 data and mapped at ZIP code level using ESRI ArcMap geospatial processing software. Chi-square test of independence was used to assess differences by ZIP code group (EVALI/no EVALI).

Results: Compared to ZIP codes without EVALI cases, ZIP codes containing EVALI cases had a lower percent of the population with a high school diploma or higher (80% vs. 86%), private health insurance (60% vs. 67%), and access to a broadband internet subscription (81% vs. 86%), and they had a greater percent of the population with no health insurance (20% vs. 16%, $p < 0.05$ for all). No significant difference in vape shop density was found between the ZIP codes with and without EVALI cases (0.24 shops/mi² vs. 0.30 shops/mi², $p = 0.98$).

Conclusions: Our findings show that EVALI cases are associated with lower SES ZIP codes but not associated with vape shop-dense ZIP codes, suggesting that interventions should not be focused on regulating vape shops alone. This lack of association may be due to decreased vape shop accessibility during the COVID-19 pandemic and/or the origin of e-cigarettes mainly from informal sources. Further studies should investigate the utility of neighborhood-level characteristics in predicting EVALI risk to implement targeted prevention programs in at-risk neighborhoods to mitigate the impact of this new epidemic.

Using Dipstick Urinalysis to Predict Development of AKI in Patients with COVID-19

Michael Li

Mentor: Susan Hedayati, MD, Department of Nephrology

Collaborators: Meredith McAdams, MD; Pin Xu, PhD; L. Parker Gregg, MD, MSCS; Jiten Patel, MD; Duwayne L. Willett, MD; Ferdinand Velasco, MD; Christoph U. Lehmann, MD

Background: Acute kidney injury (AKI) is a common complication in patients hospitalized with COVID-19. Dipstick urinalysis is frequently obtained, but data regarding the prognostic value of hematuria and proteinuria for kidney outcomes is scarce.

Methods: Patients with positive severe acute respiratory syndrome- coronavirus 2 (SARS-CoV2) PCR and an admission urinalysis were included. Nested models that contained degree of hematuria and proteinuria were used to predict AKI and RRT during admission. Presence of Chronic Kidney Disease (CKD) and baseline serum creatinine were then added to test improvement in model fit.

Results: Of 5,980 individuals, 829 (13.9%) developed AKI during admission and 149 (18.0%) of those with AKI received renal replacement therapy (RRT). All degrees of proteinuria and hematuria were associated with an increased risk of AKI and with RRT. The degree of proteinuria and hematuria were significantly increased as AKI severity increased ($P<0.001$). In AKI predictive models, adding the presence of CKD improved area under the curve (AUC) (95% confidence interval) to 0.73 (0.71, 0.75), $P<0.001$, and adding baseline creatinine improved the AUC to 0.85 (0.83, 0.86), $P<0.001$, when compared to the base model with proteinuria and hematuria, AUC=0.64 (0.62, 0.67). In RRT predictive models, adding CKD status improved the AUC to 0.78 (0.75, 0.82), $P<0.001$, and adding baseline creatinine improved the AUC to 0.84 (0.80, 0.88), $P<0.001$, when compared to the base model, AUC=0.72 (0.68, 0.76). There was no significant improvement in model discrimination when both CKD and baseline serum creatinine were included.

Conclusions: Routinely available dipstick proteinuria and hematuria, along with CKD or baseline creatinine, can be utilized to predict AKI and RRT in hospitalized patients with COVID-19. We derived formulas that can be used for prognosticating kidney outcomes in these patients.

Missed Opportunities for HIV Prevention at Parkland Health

Melanie Lopez

Mentor: Helen King, MD, Department of Infectious Diseases

Collaborator: Kristin Alvarez, PharmD

Introduction: Pre-exposure Prophylaxis (PrEP) is a daily prophylactic drug shown to be up to 99% effective in reducing risk of HIV transmission. Despite the effectiveness of PrEP, prescription rates remain low and HIV incidence remains stable. Patients who are diagnosed with a single sexually transmitted infection (STI) (i.e. gonorrhea, chlamydia, syphilis) are at risk for all STIs, including HIV, and they should be counseled on or offered a PrEP prescription for HIV prevention. In this study, we aimed to identify missed opportunities for PrEP prescription and HIV prevention at Parkland Health (PH).

Methods: We conducted a retrospective chart review of patients diagnosed with a new HIV infection at PH from January 1, 2015 to June 30, 2021 to analyze the characteristics of their interactions with the healthcare system prior to HIV acquisition and to identify any missed opportunities where PrEP could have been prescribed. We assessed how newly diagnosed HIV positive patients had previously interacted with the healthcare system in the five years prior to their diagnosis, what they presented for, and what proportion of patients were previously tested and treated for gonorrhea, chlamydia, and syphilis. For our primary outcome, we investigated what proportion of the patients had an indication for, were offered, and were prescribed PrEP as defined by the CDC and USPSTF guidelines for PrEP indication.

Results: We identified 457 patients who were diagnosed with HIV during the study period and had previously interacted with PH. Only 5 patients were counseled on PrEP. Of the new HIV diagnoses, 46 (9.8%) patients had presented with a bacterial STI prior to their HIV diagnosis and 3 received counseling for PrEP, 50 (10.9%) patients had previously reported inconsistent condom use, and 38 (8.3%) patients had previously reported current intravenous drug use (IVDU).

Conclusions: Despite PrEP's effectiveness, PrEP prescription rates remain low and leaving patients at risk for contracting HIV. A prior bacterial STI is a grade A recommendation for PrEP and should trigger a conversation about HIV prevention, however low rates of counseling occurred. Provider education programs about PrEP eligibility and prescription may help improve PrEP prescription rates and HIV prevention services at Parkland Health. Also more intentional outreach by dedicated teams should increase patient awareness of PrEP programs.

Comparison of Non-Invasive Measurements of Cerebral Blood Flow in Healthy Adults

Marilyn Lu

Mentor: Rong Zhang, PhD, Department of Neurology

Collaborator: Tsubasa Tomoto, PhD

Background: Measurement of cerebral blood flow (CBF) is critical for assessment of age- and disease-related changes in cerebrovascular function. CBF has been measured using various non-invasive imaging modalities including magnetic resonance imaging (MRI), ultrasonography, and transcranial Doppler (TCD). Although understanding their agreements is important when comparing studies using different modalities; the previous studies are limited to a small number of subjects and head-to-head comparisons.

Objectives: The purpose of the study was to investigate the agreements of estimated CBF among MRI, ultrasonography, and TCD with a relatively larger sample size of 185 subjects.

Methods: Healthy men and women (age: 21-80 years) without major cardio- and cerebrovascular diseases underwent assessments of CBF. Total CBF (mL/min) was calculated from volumetric blood flow at internal carotid and vertebral arteries using color-coded duplex ultrasonography (CDUS) and phase-contrast MRI (PC-MRI). The total CBF was normalized by brain tissue mass (mL/100 g/min) measured by MRI to compare with CBF velocity (cm/sec) at the middle cerebral artery using TCD and global CBF perfusion (mL/100 g/min) using arterial spin labeling (ASL) in MRI.

Results: Total CBF measured by CDUS was similar (CDUS: 570 vs. PC-MRI: 574 mL/min, $p = 0.471$) and correlated with PC-MRI ($R^2 = 0.40$, $p < 0.001$) despite the presence of large individual differences. Estimated CBF using CDUS, PC-MRI, ASL, and TCD were weak to moderately correlated (Table 1).

Table 1: Pearson's product-moment correlation coefficients and (p-values) illustrating the associations between modalities.				
	CDUS	PC-MRI	ASL	TCD
CDUS		0.565	0.427	0.503
PC-MRI	(<0.001)		0.637	0.515
ASL	(<0.001)	(<0.001)		0.311
TCD	(<0.001)	(<0.001)	(<0.001)	

Conclusion: These results suggest that estimated CBF with ultrasonography, MRI, and TCD are correlated but there are large individual differences and residuals. Therefore, caution is warranted when comparing studies using different modalities. Besides, these findings may facilitate data interpretation in CBF measurements.

Radiation Oncology Treatment Planning in Breast Cancer Patients Undergoing Lumpectomy with and without Oncoplastic Reconstruction

Brian Lue

Mentor: Prasanna Alluri, MD, PhD, Department of Radiation Oncology

Collaborator: Ev Kakadiaris, BS

Background: Breast conserving surgery (BCS) followed by whole breast irradiation with a tumor bed boost is a common approach for locoregional treatment of patients with breast cancer. While tumor bed boost improves local control, it is also associated with increased risk of fibrosis and fat necrosis. Oncoplastic reconstruction is being increasingly employed to improve cosmesis and symmetry with the contralateral breast following partial mastectomy. The extensive rearrangement of breast tissue during oncoplastic reconstruction has the potential to increase tumor bed volume, thereby increasing the volume of breast receiving a higher dose of radiation. In this study, we aimed to elucidate the current rise in use of oncoplastic reconstruction following breast-conserving surgery in patients with breast cancer and its impact on the volume of tumor bed as contoured by attending radiation oncologists at the time of radiation treatment planning.

Methods: A retrospective chart review of 331 women, who underwent breast conserving surgery at our institution between Jan 2020 and March 2021 for treatment of breast cancer was conducted. Patient demographics and tumor characteristics, including clinical and pathological staging, tumor receptor status, and tumor histology were recorded. Treatment-related information such as type of oncoplastic reconstruction where applicable, receipt of systemic therapy, dose and fractionation of radiation therapy, treatment technique and volume of tumor bed defined at the time of radiation treatment planning were collected.

Results: The median age of the cohort was 61, and 54.7% of patients received oncoplastic reconstruction. A plastic surgeon was involved in reconstruction in 22.8% of patients. Complex tissue advancement closure was the most common oncoplastic reconstruction employed in this cohort. A two-tailed T-test assuming unequal variances demonstrated that oncoplastic reconstruction was associated with a contoured tumor bed that was on average almost 10 mL larger (35.5 vs. 26.6 mL, $p < 0.02$).

Conclusion: Over half of patients receiving breast conserving surgery at our institution underwent oncoplastic reconstruction. The rate of oncoplastic reconstruction in this cohort was significantly higher than historic rates reported in the literature, likely reflecting an exponential growth in adoption of this approach in the United States. Use of oncoplastic reconstruction was associated with larger tumor bed volume at the time of radiation treatment. Although tumor bed boost improves local control, it also increases risk of fibrosis and fat necrosis. Therefore, further studies are needed to determine if larger volume of tumor bed irradiated in patients receiving oncoplastic reconstruction is associated with decline in long term cosmetic outcomes due to fibrosis and fat necrosis. Increased multi-disciplinary communication and collaboration between surgical oncologists, reconstructive surgeons and radiation oncologists is necessary to address the competing interests between breast reconstruction and irradiation following breast conserving surgery in patients undergoing breast conserving surgery for treatment of breast cancer.

Do Sex-Specific Endocrine States Affect the Cytokine-Mediated Joint Inflammatory Response to Abnormal Biomechanical Stress?

Michelle Mao

Mentor: Yasin Dhafer, PhD, Department of Physical Medicine and Rehabilitation

Collaborator: Conner Hutcherson

Osteoarthritis (OA) is a degenerative disease of the joints that affects millions of people worldwide. Of note, female patients experience OA at higher rates with poorer outcomes, but the specific mechanisms behind these sex disparities are unclear. One possible clue may be found in proteins, such as cartilage oligomeric matrix protein (COMP), a biomarker for cartilage damage, that mediate the tissue inflammation and destruction that drive degenerative disease states such as OA. This study tests the hypothesis that the application of abnormal biomechanical loading on lower body joints will initiate expression of COMP and subsequent inflammation. Healthy male participants walked on a treadmill for one hour – first on a flat plane, and then a cross-tilted plane. Blood was drawn in intervals before, during, and after exercise. Subject serum was analyzed using Luminex Immunoassay and statistical analysis was performed on nine inflammatory biomarkers to examine joint cartilage degradation and inflammatory changes. VO₂ and heart rate data was collected to measure energy production and respiratory metabolism. Serum concentrations of COMP significantly increased throughout the exercise period ($p < 0.042$). One-way ANOVA showed significant differences in mean energy expenditure between resting and both walking phases ($p < 0.05$); however, there was a non-significant difference between flat and tilt walking ($p = 0.0823$). The experimental paradigm of flat and tilt walking tested in this study correlated with an increase in COMP in healthy young adult males, suggesting that the cross-tilting paradigm introduced an isolated mechanical stress on the lower body joints that led to a breakdown of cartilage. The energy expenditure analysis shows increased metabolic stress between rest and exercise, but not between flat and tilt walking, implying that observed changes in serum inflammatory biomarker concentrations will be primarily due to the change in walking task complexity, rather than respiratory metabolism. Further data collection will be performed on male and female cohorts to create a model for how female sex hormones modulate the joint inflammatory response. These findings have clinical implications in designing more effective treatment for OA that is tailored to the patient's endocrinology.

Analysis of Comorbidities and Demographic Risk Factors in Patients Presenting to the Parkland Emergency Department with Opioid Overdose

Alec Mason

Mentor: Enas Kandil, MD, MS, Department of Anesthesiology and Pain Management

Collaborator: Paul Nakonezny, PhD

The opioid epidemic has been a leading topic in medical news for years, and the crisis impacts countless lives each day. While the epidemic of opioid abuse affects many countries around the world, the United States consumes the vast majority of the global opioid supply, making it an epicenter of opioid addiction and overdose deaths. Many studies have been conducted to elucidate the factors that drive and perpetuate the opioid epidemic. These studies help inform medical decision making for prescription of opioid medications for pain.

This project studied 757 patient encounters for suspected opioid overdose in the Parkland ED between the years 2012 and 2020. The Parkland Narcan Report was used to identify patients between the ages of 18-65 who received naloxone due to suspicion of overdose. Data on demographics, co-morbidities, medications, and toxicology testing were collected from the electronic medical record. The subjects were split into two groups based on whether or not the subject had a prescription for an opiate prescription (OP) on file when they presented to the ED. This data was then aggregated and analyzed using statistical modeling software to look for patterns of risk factors in the subject pool and differences between the two prescription status groups.

In our data set, the mean age was 39.6 years, and the mean BMI was 27.3 kg/m². Of the 757 patients, 33.69% had an OP on file, 66.58% were male, 65.92% were non-Hispanic white, 46.36% had a documented history of drug abuse, 28.14% had a prior diagnosis of cardiovascular disease, and 22.72% had an antidepressant prescription on file. Statistically significant ($p < 0.05$) variables that were predictive of having an OP on file at the time of encounter are listed in this table:

Variable	Odds Ratio	P-Value
Female Sex	1.867	0.0007
Age 25-44	2.067	0.0257
Age 45-65	3.692	0.0002
Cardiovascular Disease	1.752	0.0055
Benzodiazepine Toxicology Positive	1.983	0.0008
Muscle Relaxant Prescription	3.653	<0.0001
Gabapentinoid Prescription	2.195	0.0008

We conclude that relative to the demographics of Dallas, those who present to the Parkland ED with overdose are more likely to be non-Hispanic white men. Those who overdose with an OP on file also tend to be older with multiple co-morbidities and concurrent prescriptions of muscle relaxants and/or gabapentinoid medications.

Tenosynovitis of Wrist: Does Compartment Distribution Aid in Determining the Etiology of Tenosynovitis?- A Scientific Study.

Joshua Mehr

Mentor: Avneesh Chhabra, MD, Department of Radiology

Collaborators: Raghu Ratakonda MD; Bayan Mogharrabi

Purpose: Wrist pain disorders affect roughly 10% of the general population with tenosynovitis being an important etiopathogenesis for wrist pain and dysfunction. The aim was to conduct a systematic evaluation of wrist MRI scans of a large tertiary care institution to determine the frequency of tenosynovitis, its distribution and correlation with the final clinical diagnosis.

Methods: This was a cross-sectional retrospective auditing and repeat interpretation of wrist MRIs at our institution. A consecutive series of 614 wrist MRIs over years 2015-2020 were audited and two medical students conducted chart reviews for the final clinical diagnoses. The scans were re-evaluated by a senior MSK radiologist and a MSK fellow for confirmation of tenosynovitis and compartment distributions were recorded. The five tendon compartments evaluated were- 1st extensor, 6th extensor, multiple/multifocal extensors, flexor compartments including flexor digitorum profundus/superficialis and flexor carpi radialis, and finally, flexor pollicis longus compartment. The final clinical diagnostic categories included- chronic overuse, Dequervain's tenosynovitis, trauma, infection, inflammation, TFCC injury, and nonspecific (idiopathic). Pairwise comparisons were made using Fisher's exact test and P-values were adjusted using Sidak method for multiple comparisons.

Results: 216/614 (35%) patients demonstrated tenosynovitis (14/216 in both wrists, 112/216 in the right and 90/216 in the left). There were 131 female patients and 85 male patients with ages ranging from 18 to 84 years old. The final diagnoses were chronic overuse (32/216), Dequervain's (22/216), iatrogenic or trauma (72/216), infection (11/216), inflammatory (52/216), TFCC injury (5/216), and non-specific (22/216), respectively. The compartments affected were 1st extensor compartment (51/216), 6th extensor compartment (120/216), multiple/multifocal extensors compartment (34/216), flexor compartments (104/216), and flexor pollicis longus (54/216). 1st extensor compartment was correlated with final diagnosis of Dequervain's tenosynovitis ($p = 0.00$). Flexor compartment tenosynovitis correlated with inflammatory etiologies ($p = 0.048$) (Figure). No significant correlations were found with respect to other compartments or disease categories ($p > .05$).

Conclusion: Wrist tenosynovitis shows a wide spectrum of distribution with a significant association of flexor compartment involvement in inflammatory conditions, and 1st extensor compartment in Dequervain's tenosynovitis. Results from this systematic evaluation can aid in rendering timely and accurate diagnosis by the radiologist based on the pattern of distribution of tenosynovitis and for prompt management.

Prenatal Diagnosis of Circumvallate Placenta and Pregnancy Outcomes

Samantha Mendoza Stanteen

Mentor: Christina L. Herrera, MD, Department of Obstetrics and Gynecology

Collaborators: Tina M. Chu, MD; Elizabeth C. Twichell, BA; Jennifer Cardona, BS; Donald D. McIntire, PhD; Diane M. Twickler, MD; Catherine Y. Spong, MD

Objective: Based on pathologic assessment, circumvallate placenta is associated with adverse pregnancy outcomes (antepartum bleeding, placental abruption, preterm birth, emergency cesarean, small for gestational age, fetal and neonatal death). Due to these associations, additional antenatal surveillance is recommended. To intervene, antenatal diagnosis is required, however whether these risks are observed with prenatal diagnosis is unknown. The aim of this study was to determine if prenatal diagnosis of circumvallate placenta is associated with adverse obstetric and neonatal outcomes.

Study Design: Women with a singleton gestation prenatally diagnosed with circumvallate placenta between January 2012 and March 2021 were identified. Antepartum admissions, obstetric and neonatal outcomes, and pathologic reports were obtained. The rates of adverse obstetric and neonatal outcomes were determined among women with prenatally-diagnosed circumvallate placentas and compared to women without this prenatal diagnosis with a 4:1 control matched group. Women with known fetal anomalies or other placental abnormalities (e.g. previa, placenta accreta spectrum) were excluded. Pathologic diagnosis was confirmed if available. Analysis included Student's t-test and χ^2 with $p < .05$ considered significant.

Results: Prenatal diagnosis of circumvallate placenta was made in 179 (0.2% of all anatomic ultrasound). Diagnosis was made at a mean gestational age of 19.8 ± 2.4 weeks. While a higher rate of antepartum bleeding was observed (14 vs. 8%, OR 1.8 [95% CI 1.1-3.1], $p = .01$), other adverse pregnancy outcomes (abruption, preterm birth, etc.) were not different between groups. There were no neonatal deaths in either group. Pathologic confirmation of circumvallate diagnosis was made in 7 of 39 available cases (18%).

Conclusion: Prenatal diagnosis of circumvallate placenta is associated with antepartum bleeding but was not associated with adverse pregnancy outcomes. Given good prognosis, prenatal diagnosis does not warrant additional surveillance during pregnancy. Furthermore, prenatal diagnosis and pathologic correlation is poor. These findings provide data to change the practice of additional antenatal surveillance for circumvallate placentation.

Health Disparities in Pediatric Surgery: A Scoping Review

Dalia Mitchell

Mentor: Emily F Boss, MD, MPH, Department of Otolaryngology

Collaborators: Angelica Griggs-Demmin, BS; Lauren Claus, BA;

Anne R. Links, MS, MHS; Mary Catherine Beach, MD, MPH

Introduction: Although socioeconomic disparities in access to pediatric surgical care are widely documented, differences in surgical outcomes are less comprehensively known. We conducted a scoping review to understand disparate outcomes in pediatric surgical care.

Methods: We searched the PubMed database using both standard terminology and keywords along with Medical Subject Heading (MeSH) to identify studies that analyzed disparities in outcomes based on sociodemographic factors. We included studies published between 1/2011 and 6/2021. Studies were excluded if not written in the English language, conducted outside of the U.S., conducted without human subjects (e.g., review article), lacked written abstract or full text article, had majority of subjects >18 years, or reported disparities unrelated to sociodemographic factors or surgical outcomes. Two authors individually reviewed titles and abstracts to determine final inclusion.

Results: Of 969 articles identified, 50 (5%) were included. Studies addressed disparities in disease-specific outcomes (N=21, 42%, e.g. persistent sleep apnea), perioperative adverse events (N=15, 30%, e.g. respiratory events after tonsillectomy), short-term postoperative mortality (N=15, 30%) length of stay (N=14, 28%), revisits (N=5, 10%), long-term postoperative mortality (N=4, 8%), and intensity of care (N=3, 6%). Studies reported disparities related to Black race (N=31, 62%), Hispanic ethnicity (N=15, 30%), socioeconomic status (N=15, 30%) or insurance status (N=15, 30%). Seven studies (14%) reported disparities in otolaryngology outcomes, including adenotonsillectomy and cochlear implantation. Although conclusions were broad, common study findings showed that children in racial/ethnic and socioeconomic minorities may have worse postoperative surgical outcomes in all outcome types assessed.

Conclusions: Children with minority race and ethnicity or low socioeconomic status generally experience worse outcomes after surgery. Distinguishing social determinants of disparities in disease-specific outcomes from those resulting from weaknesses in perioperative health systems delivery may improve health equity in pediatric surgical care.

Does Medical Documentation Reflect Communication in Pediatric Surgical Care?

Dalia Mitchell

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Collaborators: Angelica Griggs-Demmin, BS; Lauren Claus, BA;
Anne R. Links, MS, MHS; Mary Catherine Beach, MD, MPH

Introduction: Little is known about how patient/family concerns expressed during clinical encounters are documented. We evaluated how clinical documentation reflects clinician-family communication and shared decision-making in pediatric surgical encounters.

Methods: We evaluated transcripts of audio-recorded communication that occurred during consults for children undergoing evaluation for elective surgery (adenotonsillectomy, circumcision, hernia repair) and compared them to the corresponding EMR visit documentation (notes). Communication transcripts and notes were qualitatively analyzed for elements pertinent to SDM using thematic content analysis. Two independent reviewers coded all data. Four SDM elements were then enumerated, and discrepancies between the encounter transcript and documentation tabulated.

Results: 109 transcript-EMR dyads were analyzed (95 (87%) tonsillectomy). We identified four predominant SDM thematic elements: discussion of risks/benefits, presentation of treatment alternatives, parental preferences, and parental concerns. Discrepancies related to alternatives were most common [documentation of alternative options present in notes but not discussed during encounter; more alternatives documented than actually discussed]. Similar discrepancies related to discussion of risks/benefits [documenting review of more risks than were actually discussed]. Some encounters showed a different preference documented than was expressed in the encounter, or showed a parental preference documented in the note that was never expressed. Additionally, some transcripts showed parents expressing multiple concerns that were not documented by the clinician.

Conclusions: Clinical documentation does not consistently reflect clinician-family communication or SDM in pediatric surgical care. Findings imply opportunities for patient-centered clinical documentation innovations that broadly capture treatment plans discussed and patient/family preferences and concerns.

Endoscopic Versus Microscopic Pediatric Tympanoplasty: Is There a Difference Between Closure Rates and Healing Outcomes?

Tanner Mitton

Mentor: J. Walter Kutz, MD, FACS, Department of Otolaryngology

Collaborators: Daniel Killeen, MD; Zoha Momin, BS

Objective: To compare closure rates and hearing outcomes of microscopic and endoscopic tympanoplasty in pediatric patients.

Study Design: Retrospective chart review.

Setting: Tertiary university medical center.

Patients: Pediatric patients who underwent tympanoplasty surgery by a fellowship-trained neurotologist between 2010-2019 with at least two months of follow-up, a tympanic membrane perforation, and no preoperative cholesteatoma.

Interventions: Transcanal endoscopic tympanoplasty surgery or microscopic tympanoplasty surgery.

Main Outcome Measures: The primary outcome is postoperative closure of the tympanic membrane perforation, assessed using otomicroscopy at the last follow-up appointment. Secondary outcomes include operative time and changes in the air-bone gap (ABG) and pure tone average (PTA).

Results: Two hundred and eleven tympanoplasty surgeries were analyzed—121 in the transcanal endoscopic tympanoplasty (TEES) group and 90 in the microscopic tympanoplasty (MT) group. Tympanic membrane closure rates were no different between the two groups (TEES = 82.6%, MT = 88.9%; $p = 0.24$), and no significant association was found on multivariable analysis (TEES OR = 0.8; $p = 0.61$). Both groups showed improvements in the 4-month PTA and ABG and the 12-month PTA, but the 12-month ABG only improved in the TEES group ($p < 0.01$). The TEES group had a shorter average operative time (109.8 vs 123.5 minutes; $p = 0.03$) and less need for post-auricular incision (0% vs 93.3%; $p < 0.01$).

Conclusions: In pediatric tympanoplasty, TEES gives similar membrane closure and hearing outcomes as the microscopic technique, with less operative time and need for post-auricular incision.

Transcanal Endoscopic Versus Microscopic Tympanoplasty: Is There a Difference in Perforation Closure Rates

Tanner Mitton

Mentor: J. Walter Kutz, MD, FACS, Department of Otolaryngology

Collaborators: Jenny Kim, BA; Daniel Killeen, MD; Jacob Hunter, MD; Brandon Isaacson, MD, FACS

Objective: To compare closure rates of endoscopic and microscopic tympanoplasty as influenced by perforation size, perforation location, and graft position.

Study Design: Retrospective chart review.

Setting: Tertiary university medical center.

Patients: Adult patients who underwent tympanoplasty by a fellowship-trained neurotologist from January 2010 to December 2019, had at least two months of follow-up, and had a tympanic perforation with no cholesteatoma prior to surgery.

Interventions: Transcanal endoscopic tympanoplasty or microscopic tympanoplasty.

Main Outcome Measures: The primary outcome is post-operative closure of the tympanic membrane perforation as assessed using otomicroscopy at the last follow-up appointment.

Results: Two-hundred and eleven patients - 98 in the transcanal endoscopic tympanoplasty (ET) group and 113 in the microscopic tympanoplasty (MT) group - were identified. Tympanic membrane closure rates were not significantly different between the ET and MT groups (79.6% and 84.1% respectively; $p = 0.473$), and further multivariable analysis revealed that closure rates for ET relative to MT had an insignificant odds ratio (0.56; $p = 0.144$). Similar analyses found no significant difference between the two methods in subsets of perforation size (small, large, subtotal/total), perforation location (anterior, posterior, inferior), and graft position (underlay, overlay). The MT group was more likely to have a postauricular incision (94.7% vs 0.0%; $p < 0.001$). Men were more likely to see their perforations closed than women on multivariable analysis (OR 2.46; $p = 0.035$).

Conclusions: Endoscopic tympanoplasty resulted in similar rates of post-operative closure rates compared to the microscopic technique with less need for postauricular incision.

Systemic Immune Parameters Associated with Radiation Therapy in Patients Receiving Immune Checkpoint Inhibitors

Vatsala Mundra

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Collaborators: Mitchell S. von Itzstein, MD; Amrit S. Gonugunta, BS; Raquibul Hannan, MD; Thomas Sheffield, PhD; Farjana Fattah, PhD; Yang Xie, PhD; Jonathan E. Dowell, MD; Jade Homsy, MD; Sawsan Rashdan, MD; Quan-Zhen Li, PhD; Edward K. Wakeland, PhD

Purpose: Observational studies and clinical trials of immune checkpoint inhibitors (ICI) have resulted in heightened interest in the potential for radiation therapy (RT) to augment anti-tumor immunity. However, effects of RT on systemic immune parameters are not known.

Methods and Materials: We retrospectively analyzed individuals who received RT within six months prior to ICI from a cohort enrolled in a prospective biospecimen collection protocol. RT receipt and details were identified from the electronic health record. Pre-ICI (baseline) and post-ICI initiation (six weeks) blood samples were collected. Multiplex panels of 40 cytokines and 124 autoantibodies were performed. We compared cytokine and antibody levels according to receipt of RT using Fisher's exact test. False-discovery rates were calculated using Benjamini-Hochberg procedure.

Results: A total of 79 out of 332 patients (24%) received RT. There was no significant difference in age, gender, race, or type of immunotherapy between patients according to prior RT exposure. Patients who received RT prior to ICI had higher levels of fractalkine/CX3CL1 ($P=0.016$, FDR 0.5) and complement C8 ($P<0.001$, FDR 0.03). We observed time-dependent changes according to RT administration for fractalkine/CXCL1 ($P=0.04$, FDR 0.9), complement C8 ($P=0.001$, FDR=0.07), and M2 ($P=0.04$, FDR 0.9), with the highest levels associated with the most recent RT exposure.

Conclusion: Despite favorable clinical effects of RT on ICI, we observed only modest differences in a minority of systemic immune parameters in patients who received RT. These findings may support short intervals between RT and ICI in combination regimens. Further research to understand biological mechanisms and optimize patient selection for this treatment strategy are needed. Studies of tumor tissue and circulating cellular populations are ongoing.

Hematology and Oncology Pediatric Patients on ECMO(HOPPE): Preliminary Findings of a Multicenter Retrospective Study

Rohit Nair

Mentor: Renee Potera, MD, Department of Pediatrics- Critical Care

Collaborators: Lakshmi Raman, MD; Michael Colin Mowrer, MD

Purpose: Extra-corporeal membrane oxygenation (ECMO) utilization for pediatric hematology and oncology patients is increasing, yet existing data indicates that these patients have higher mortality than the broader pediatric ECMO population. The HOPPE study aims to collect data before, during, and after ECMO support to assess outcomes in this population and identify predictors of patient outcomes that can be utilized by clinicians.

Methods: Data was collected through a multicenter retrospective chart review. The sample was categorized based on diagnosis (oncologic, hemophagocytic lymphohistiocytosis (HLH), and hematopoietic stem cell transplant (HSCT)) and primary ECMO configuration (veno-venous (VV) and veno-arterial (VA)) for comparison of ECMO and hospital survival rates. Oncologic diagnoses were divided into B-cell or T-cell acute lymphoblastic leukemia (ALL), other hematologic cancer, and solid tumors. Components of the pediatric sequential organ failure assessment (P-SOFA) score, vasoactive ionotropic scores, and ventilation requirements prior to ECMO initiation were assessed as potential predictors of survival using multivariate analysis.

Results: A total of 75 patients were identified for preliminary analysis across 6 participating centers. Survival rates to ECMO decannulation and hospital discharge were 59% and 43%, respectively. Patients with an oncologic diagnosis had the highest survival rates (59%, 41%) compared with HLH (55%, 27%) and HSCT (60%, 30%), and within the oncologic group, patients with B-ALL had the highest survival rates (68%, 53%). Patients on VV ECMO had slightly higher survival rates (61%, 47%) in comparison to VA ECMO (57%, 41%). From the selected predictors of outcomes, higher ventilator hours pre-ECMO, lower PaO₂/FiO₂ ratio, and higher vasoactive ionotropic scores were associated with lower likelihood of ECMO survival; however, statistical significance could not be established.

Conclusion: Survival rates for pediatric hematology and oncology patients on ECMO in this sample were higher than previous studies have reported for the study population and comparable to those of the broader pediatric ECMO population. Although this preliminary analysis did not identify variables with significant predictive capability, the potential predictors will be reassessed across the broader sample as multicenter data collection is completed, with the goal of supporting clinical decision making.

Value of Permanent Pathology for Debulk Specimens during Mohs Micrographic Surgery for Cutaneous Squamous Cell Carcinoma: A Retrospective Cohort Study

Michael Nemeh

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Collaborator: Divya Srivastava, MD

Pre-operative biopsies of high-risk cutaneous squamous cell carcinoma (cSCC) often sample only a small portion or superficial aspect of a lesion; therefore, biopsy results may fail to identify high-risk tumor characteristics, resulting in inaccurate staging. The tumor may prove to be more aggressive intra-operatively during Mohs micrographic surgery (MMS). To assess for additional high-risk features in cSCC, the study authors often send the central portion ('debulk specimen') of partially sampled tumors for permanent section pathology when there is concern for high-risk pathology. And while the utility of central debulk analysis has been demonstrated and is considered a standard of care in Mohs for melanoma, there are no uniform guidelines or recommendations for evaluating the central portion of cSCC. Thus, the purpose of this single institution retrospective cohort study was to evaluate the frequency of tumor upstaging with the addition of Mohs debulk analysis with permanent pathology and therefore offer guidance on the utility of central debulk analysis.

Mohs case logs identified cSCC cases treated with MMS between 2015 and 2020; cases were included only if a debulk specimen was sent for permanent section pathology. Relevant patient and tumor characteristics were extracted from the electronic medical record and statistical analysis was done using χ^2 and two-tailed Fisher tests.

Of the 3900 SCCs treated between 2015 and 2020, 78 tumors (2.0%) were sent for debulk analysis. Of these, 18 (23%) were upstaged after permanent pathology. Upstaged tumors were significantly more likely to have large caliber perineural invasion ($p < 0.001$). Furthermore, patients with upstaged tumors were significantly more likely to be referred for adjuvant radiation ($p = 0.012$).

This study supports the use of permanent pathology analysis for select high-risk lesions treated with MMS for accurate staging purposes and to guide management. While the majority of cSCC are low risk and a debulk analysis is likely not beneficial, in select suspected high-risk cases or lesions that intra-operatively prove to be high risk, permanent section pathology should be considered for appropriate staging. Given recent advances in immunotherapies and ongoing clinical trials for novel therapies, accurate staging may improve patient outcomes.

Spinal Anesthesia Dosing and Fetal Acid-Base Balance During Intrapartum Cesarean Delivery

Courtney Newman

Mentor: WeiKe Tao, MD, Department of Anesthesiology & Pain Management

Collaborators: David Shu; Allison Mootz, MD; Kara Bennett, MD

Typically, options for intrapartum cesarean delivery anesthesia include extending an existing epidural or placing a new spinal. Fetal acidemia is an outcome of prolonged maternal hypotension that can be approximated by umbilical cord arterial (UA) pH. The purpose of this retrospective analysis was to determine if UA pH differed between neuraxial anesthesia types and to determine a “least harmful” dose of spinal anesthetic if there were no suitable anesthetic alternatives. As part of a larger study, 1001 cases were screened from September 2019 through February 2021 and 634 cases were included in this analysis (568 epidural cases and 66 new spinal cases). Statistical analysis included Mann-Whitney U test, Student’s t-test for independent groups, Fisher’s exact test, chi-square, and Spearman’s correlation test. The median UA pHs of the epidural and new spinal groups were statistically different ($p=0.0045$), with the new spinal group having a more acidic pH (7.25 and 7.23, respectively). Additionally, no correlations were found between pH and spinal dose, lowest systolic blood pressure, or the cumulative effect of spinal anesthesia on maternal systemic blood pressure (AUC) ($p=0.8499$, $p=0.3964$, $p=0.0893$, respectively) or between spinal dose amount and AUC or vasopressor use ($p=0.6431$ and $p=0.8591$, respectively) in the new spinal cases. These results indicate that an existing epidural should be extended if possible but, if a new spinal must be placed, doses from 0.8 to 1.6 mL of bupivacaine have similar effects on maternal hypotension. In other words, a reduced spinal dose does not reduce fetal acidemia.

Clinical Significance of Immunological Cell Counts and Indices in Cancer Cachexia Incidence and Survival

Santiago Olaechea

Mentor: Puneeth Iyengar, MD, PhD, Department of Radiation Oncology

Collaborators: Naveen Premnath, MD; Christian Alvarez, BS;
Anne Gilmore, PhD

Background: Cachexia is understood to be a primarily inflammatory process responsible for involuntary weight loss, muscle and adipose wasting, and anorexia in the setting of virtually every cancer type. Neutrophil, platelet, and lymphocyte levels fluctuate predictably in states of systemic inflammation. Although many studies have begun to unravel the various inflammatory pathways through which tumors manipulate cell signaling to induce cachexia, progress in the clinical front has been limited. We hope that interpreting the variations of these measures and their effects on patient outcomes across cachectic and non-cachectic groups can determine their utility in cachexia prognosis and provide further insight into the mechanisms of cancer cachexia manifestation.

Methods: The cohort of this study was comprised of 852 patients diagnosed with gastrointestinal and lung cancer from 2005-2013. Median cell count values per patient from routinely obtained CBCs surrounding time of cancer diagnosis (before treatment intervention) were used to determine: absolute neutrophil counts (ANC), neutrophil to lymphocyte ratios (NLR), platelet to lymphocyte ratios (PLR), and systemic immune-inflammation indices (SII). Median values for these measures were used as cutpoints in statistical analyses. The association of these measures with cachexia incidence and survival were evaluated through univariate, multivariate, and Kaplan-Meier analysis.

Results: Patients with high ANC, NLR, PLR, and SII demonstrated significant relative increases of 28.79%, 32.41%, 46.08%, and 53.54% in cachexia at cancer diagnosis compared to their respective low value groups. Out of the studied cell indices, only high SII status predicted for cachexia status in multivariate analysis with an odds ratio of 1.815 (1.028, 3.203; $p=.0397$). Our survival analyses stratified into 4 groups based on high/low SII and +/- cachexia status found patients without cachexia at diagnosis and low SII values to have 3 times the median survival time of patients with cachexia and high SII. SII demonstrated its greatest relevance in predicting survival within the non-cachectic group.

Conclusion: Our findings highlight the importance of addressing systemic inflammation in cancer cachexia and suggest a practical contribution of cell index measures towards physician gestalt and cachexia management guidelines. Although understudied in cachexia literature, this study found greatest prognostic efficacy with SII, which is consistent with the supported mechanistic understanding of cachexia.

Socioeconomic Factors as Strong Determinants of Cachexia Incidence and Outcomes in a Retrospective Cohort of Gastrointestinal Cancer Patients

Santiago Olaechea

Mentor: Rodney Infante, MD, PhD, Department of Clinical Nutrition

Collaborators: Christian Alvarez, BS; Anne Gilmore, PhD

Background: Cancer cachexia is a syndrome of unintentional adipose and muscle tissue wasting, not attributed to the effects of treatment interventions. Cachexia is estimated to develop in almost half of patients with cancer. Unfortunately, proper treatment interventions and prognostic factors for cachexia are not fully understood, therefore, detection of predictive factors for this condition is crucial in improving targeted cancer therapy. The relationship between socioeconomic factors including race, ethnicity, and location on cachexia incidence and outcomes is not well understood. This study aims to determine the extent to which socioeconomic disadvantages affect cachexia incidence at cancer diagnosis and survival across a retrospective cohort of gastroesophageal and colorectal cancer patients.

Methods: Through retrospective chart review and data extraction from a prospective tumor registry, 952 patients diagnosed with primary gastroesophageal or colorectal cancer between November 1, 2005 and December 31, 2013 were identified. Zip code income data was provided by US Census data from 2009-2013. Patient race, ethnicity, average income by zip code, and primary payer at diagnosis were used as socioeconomic variables of interest when available and were statistically evaluated for association with cachexia incidence.

Results: Patient status as Black or Hispanic was associated with a 62% relative increase (Black: 59%, Hispanic: 65%) in cachexia incidence at cancer diagnosis compared to non- Black or Hispanic patients. Median income by zip code across this cohort was determined to be \$65,291 when adjusted for inflation. Relative to patients from higher earning regions, patients from zip codes with average household incomes below the median value had a 47% greater incidence of cachexia. Patients without insurance or who exclusively relied on government provided coverage (Medicaid, Medicare, Tricare) had a 40% greater incidence of cachexia relative to patients with private insurance at the time of cancer diagnosis. All aforementioned findings are supported by a significance level of $P < .05$.

Conclusion: Through the evaluation of socioeconomic determinants, cachexia affects populations disproportionately based on financial, racial, and ethnic status. Identifying obstacles of healthcare access and availability contributing to this disparity is paramount in achieving the broader goal of improving cachexia detection, treatment, and prevention.

Surgical Implications of Soft Tissue Depth of the Hip in Primary Total Hip Arthroplasty

Blaine Oldham

Mentor: Michael Huo, MD, Department of Orthopaedic Surgery

Collaborator: Dustin Rinehart, MD

Background: Morbid obesity, as measured by Body Mass Index (BMI), has been identified as a risk factor for complications in total hip replacement (THR). However, there exists no literature on the effect of adipose distribution near the surgical site. In this study we aimed to (1) characterize the complication rates associated with varying soft tissue depth around the operative hip as measured on plain films and (2) identify a depth of soft tissue that may correlate with increased complication rates in higher BMI (>35) individuals. We hypothesized that the depth of the soft tissue of the operative hip, as measured based upon common anatomic landmarks, could predict postoperative complications in patients with BMI >35.

Methods: We retrospectively evaluated all primary THRs (n = 825) performed at our institution from 2009 to 2020. Inclusion criteria were patients over age 18 with BMI >35, >90 days follow-up, and no prior ipsilateral hip surgery. Patient demographics and reason for reoperation were recorded, and the patients were separated into two cohorts: those who required reoperation and those who did not. The reoperation cohort included 13 patients while the non-reoperation cohort included 48 patients. Four standardized measurements were taken: (1) laterally from the superolateral aspect of the acetabulum to the edge of soft tissue, (2) laterally from the superior aspect of the greater trochanter to the edge of soft tissue, (3) thigh soft tissue width at a distance 2 cm distal from the superior aspect of the lesser trochanter (4) thigh soft tissue width measured from the ipsilateral pubic symphysis to the lateral soft tissue edge.

Results: There was no statistical difference between cohorts in age or BMI ($p = 0.315$, $p = 0.662$). For the reoperation cohort, there was no significant increase in measurements 1, 2, 3, or 4 ($p = 0.248$, $p = 0.278$, $p = 0.349$, $p = 0.260$) over the non-reoperation cohort. However, a subgroup analysis of patients with BMI >40 revealed that individuals in the reoperation group had a higher value of measurements 3 and 4 ($p = 0.041$, $p = 0.015$). In this subgroup, measurements 1 and 2 were not statistically significant ($p = 0.054$, $p = 0.086$).

Conclusion: A standardized measurement of thigh width on plain films of the pelvis may help surgeons identify obese patients (BMI >40) at even higher risk for reoperation in primary THR.

Role of Flexible Cystoscopy and Voiding Cystourethrogram in Evaluating Women with Recurrent Urinary Tract Infections

Janett Ordonez

Mentor: Philippe Zimmern, MD, Department of Urology

Collaborator: Alana L Christie, MS

This study reports the findings of office flexible cystoscopy and voiding cystourethrogram (VCUG) in the evaluation of women with recurrent urinary tract infections (RUTIs).

An IRB-approved, prospectively maintained database of women evaluated for RUTIs was retrospectively reviewed for findings of flexible cystoscopy and VCUG by an investigator not involved in their care. Demographic data reported from a tertiary care patient population included parity, gravity, BMI, age, ethnicity, race, smoking history, UTI history, history of diabetes, hormone replacement therapy (HRT), prior urological surgeries, sexual activity, coital antibiotic prophylaxis use, urine culture findings, antibiotic resistance/allergies, cystoscopy, VCUG findings, and treatment plan prior to statistical analyzation.

Between 2017 and 2019, 113 women underwent VCUG and flexible office cystoscopy. The patient population was mostly Caucasian (94%) and post-menopausal. Eighty-eight women (78%) had abnormal VCUG findings while 84 (74%) women had abnormal cystoscopy findings. The rate of overall abnormal findings on cystoscopy increased yearly, including findings of trigonitis. Other abnormal cystoscopy and VCUG findings, as well as post-evaluation treatment plans, remained relatively constant over time. Trigonitis was the most common (67%) finding on cystoscopy, while urethral narrowing was the most common (49%) finding on VCUG. The primary post-evaluation treatment plans were mesh removal (53%), electrofulguration of chronic cystitis areas (50%), and prolapse repair (27%).

VCUG and flexible cystoscopy are low risk diagnostic procedures that can provide valuable information of underlying etiology of RUTI thereby allowing for resolution of RUTIs when used in conjunction with antibiotic therapies.

Comparison of Periacetabular Osteotomy (PAO) and Total Hip Arthroplasty (THA) Outcomes in Hip Dysplasia Patients with Pre-Selected Surgical Preferences

Bhagyashri Pandey & Madhuri Gottam

Mentor: Joel Wells, MD, MPH, Department of Orthopaedic Surgery
Collaborators: Avneesh Chhabra, MD; Edward Mulligan, PT, DPT; Yin Xi

Introduction: In this retrospective cohort study, patients equally qualified for THA or PAO for managing hip dysplasia who selected an intervention through shared decision-making showed no significant difference in post-operative outcomes.

Methods: We performed a retrospective chart review on patients who underwent surgical intervention for hip dysplasia since 2017 at one institution and finalized THA and PAO groups after implementing an exclusion protocol. Pre- and post-operative hip questionnaires were used to extract outcomes of interest: percentage of normal functionality, UCLA activity scores, modified Harrison Hip Score (mHHS), and International Hip Outcome Tool-12 (iHOT-12).

Results: Pre-operative demographics were similar except for age and hip range of motion (Table 1); the PAO group was significantly younger ($p = 0.002$) and had increased degree of hip flexion ($p = 0.034$). The pre- and post-operative scores of interest and corresponding p-values are displayed in Table 2. Post-operative outcomes between cohorts were not significantly different.

	Pre-operative			Post-operative		
	THA	PAO	p-value	THA	PAO	p-value
mHHS	59.6 ± 10.0	64.3 ± 9.3	0.131	97.3 ± 5.0	95.3 ± 7.3	0.29
Activity Score	4.5 ± 1.9	4.8 ± 1.6	0.558	5.9 ± 2.4	6.3 ± 2.3	0.61
iHOT-12	32.6 ± 19.2	29.2 ± 14.3	0.57	75.1 ± 25.4	68.2 ± 21.4	0.395
Percentage of normal functionality	48.8 ± 22.5	47.1 ± 21.1	0.842	83.0 ± 18.8	79.8 ± 20.3	0.662

Table 2: Pre- and post-operative outcomes of THA and PAO groups

Conclusion: There was significant clinical improvement within cohorts following pre-selected surgical intervention; however, there was no significant difference in outcomes between THA and PAO groups. The study clarifies indications for either intervention and suggests that patients may choose the intervention – PAO or THA – that best suits their postoperative expectations without sacrificing survivorship.

Characterizing the MPNST Patient Population in Texas and Identifying Poor Prognostic Indicators

Bhagyashri Pandey & Tanooha Veeramachaneni

Mentor: Alexandra Callan, MD, Department of Orthopaedic Surgery

Collaborators: Kathryn Gallaway, MD

Background: Malignant peripheral nerve sheath tumors (MPNST) make up 5-10% of soft tissue sarcomas but are poorly understood. Neurofibromatosis type 1 (NF-1) patients carry a 1000-fold greater risk of MPNST and comprise half of all MPNST cases. The aim of this study is to describe the incidence and distribution of MPNST in Texas, characterize the Texas MPNST population, and identify risk factors associated with mortality.

Patients and Methods: De-identified patient data with a histologic diagnosis of MPNST between 1995 and 2018 was retrieved from the Texas Cancer Registry® (TCR). 73 patients who died of other or unknown causes were excluded; 443 patients were identified.

Results: The cumulative incidence of MPNST in Texas between 2000 and 2018 was 2.8 per 100,000 individuals. Compared to the overall Texas population, Black patients appear to be overrepresented (20.5% vs 12.9%) and Hispanic patients appear to be underrepresented (29.8% vs 39.7%). One third of the cohort lives in a high poverty area (defined as >20% living below the poverty line). Age at diagnosis and tumor size were plotted against survival in months for patients who died of disease. A weak negative correlation between tumor size and survival was seen ($r = -0.24$) however there was no correlation between age at diagnosis and survival ($r = 0.03$).

Conclusion: Identified Texas counties have a 5.1 to 8.8-fold higher incidence of MPNST than the national rate. These hotspots may represent areas with an unusually large number of NF-1 patients. Additional resources as well as patient and provider education are needed in these counties to help identify and screen at-risk individuals. One-third of MPNST patients in Texas live in a high poverty area (defined as >20% of households living in poverty). While there was no statistically significant association between poverty and tumor size or survival, there appears to be a trend towards larger tumor size at presentation in high poverty areas. These patients may seek care at a later stage due to limited access to health insurance and other challenges. Hispanic and African American patients who died of disease had larger tumors at presentation and shorter survival times. Further research is indicated to understand what environmental or biological factors account for these racial and ethnic differences.

Treatment of Chlamydia Patients and their Partners in an OB/GYN Emergency Services (OGES) Safety-Net Hospital: An Observational Study

Kelsey Eunsol Park

Mentor: Kristin S Alvarez, PharmD, BCPS, Department of Internal Medicine
Collaborators: William Griffith, MD; Courtney Johnson, DNP; Michael Harms MS;
Peace Nwaeke, PharmD Candidate

Background: Sexually Transmitted Infections (STIs) have been on the rise in the U.S. Preventing the spread of STI requires timely testing and treatment for both patients and their sexual partners. In October 2019, Parkland Hospital's OGES unit implemented a nurse navigator-led process for follow-up on pending STI cultures following patient discharge.

Methods: This retrospective cohort study aimed to evaluate the effectiveness of the program on Chlamydial treatment. OGES patient discharges from Jan 2019 to Dec 2020 over 15 years with a positive test for *C. trachomatis* were included.

Results: 1,356 patients tested positive for Chlamydia and 1218 (89.8%) were given antibiotics by 30 days. Many were treated empirically before the test results were confirmed 432(31.9%), but the majority required contact post-discharge to receive treatment 786 (64.4%). The avg turnaround time from collection to results was 1.25 days. Ten percent remained untreated by 30 days post-discharge. ORs for several factors were significant when compared to receiving timely treatment. Patients without an electronic patient portal were 2.77 times less likely to receive timely treatment. Those with a history of syphilis or unknown syphilis status were 4.48 times and 2.94 times less likely to receive timely treatment compared to no history of syphilis. Patients with concurrent Chlamydial and gonorrheal infections were 2.24 times less likely to receive timely treatment. Those without health insurance were 1.84 times less likely to be treated within 30 days compared to patients with commercial health insurance. Patients with Medicaid were similarly likely to receive timely treatment compared to patients with commercial insurance. There were no significant differences between the percentage of patients treated in 2019 versus 2020. During the study period, the standard of care treatment in Parkland OGES for Chlamydia was Azithromycin (1 gm single oral dose) and was the most prescribed antibiotic. A minority of patients were prescribed doxycycline (100 mg twice daily for 7 days). One patient was prescribed Amoxicillin (500 mg three times daily for 10 days). Of the 1,337 patients 219 were ineligible for EPT due to one of three criteria: (1) patient concurrently infected with Gonorrhea (2) patient HIV-positive or (3) patient a victim of sexual assault. Of the eligible 1,137 patients, half were offered EPT. 370 (33%) patients were given a referral to Dallas County Health and Human Services (DCHHS) for their partners to be tested instead of being offered EPT. Fourteen percent were neither offered EPT or a partner referral, mostly due to patients being loss to follow-up.

Conclusion: While most patients with Chlamydial infections discharged from the OGES unit were treated, 1 out of 10 did not receive treatment. Risk factors for not receiving timely patient treatment included not utilizing patient electronic medical record portals, those with previous syphilis or concurrent gonorrhea infections, and those with no insurance. Expedited partner therapy is underutilized as a tool to decrease the spread of *C. trachomatis* despite being supported by the CDC and Texas State laws. In the future, laboratory solutions that incorporate faster turnaround times for lab results should be considered and further efforts to prescribe EPT should be implemented.

Complications after the Sistrunk Procedure in the Pediatric Patients: Our Ten-Year Experience

Shyon Parsa

Mentor: Erin M. Wynings, MD, Department of Otolaryngology- Head and Neck Surgery

Collaborators: Cynthia S. Wang, MD; Romaine F. Johnson, MD, MPH, FACS; Christopher C. Liu, MD

Objectives/Hypothesis: Thyroglossal duct cyst (TGDC) is the most common congenital neck mass in children. The Sistrunk procedure is the standard method of excision and is associated with low rates of recurrence. This study aims to review our institution's experience with the Sistrunk procedure, specifically the rate of wound complications and cyst recurrence and the effect of preoperative infection, surgeon specialty, and drain placement on outcomes.

Study Design: Retrospective case series

Methods: Patients age <18 who underwent the Sistrunk procedure from 2009 to 2021 were included. Covariates included patient demographics, comorbidities, and pre-, intra-, and postoperative variables. Outcomes included cyst recurrence and surgical wound complications.

Results: A total of 319 cases met inclusion criteria. Patients were predominately male (51%) and white (67%), with a mean age of 7.7 years at surgery. The overall recurrence rate was 11.0%. The overall wound complication rate was 21.3%, and seroma and surgical site infections (SSIs) were the most common. Preoperative cyst infection significantly increased the risk of recurrence ($P<.001$) and complications ($P=.001$). Increased weight and younger age were associated with higher risk of wound complications. Rates of complications and recurrence did not differ significantly by surgeon specialty or drain placement.

Conclusion: Preoperative cyst infection is associated with a significant increase in postoperative wound complications and cyst recurrence. Surgeon specialty and drain did not significantly affect complication and recurrence rates.

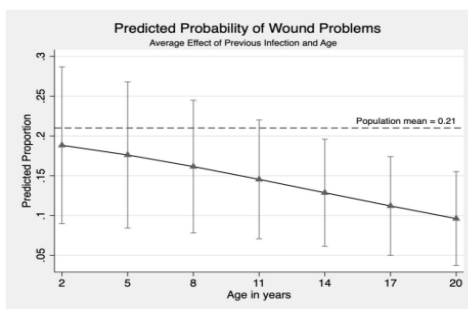


Figure 1. Predicted probability of postoperative wound problems based on patient age and history of previous infection.

Saccadic Eye Movements in Children Following Dense Unilateral Cataract Extraction

Prem Patel

Mentor: Krista Kelly, PhD, Department of Ophthalmology

Purpose: Amblyopia due to dense unilateral cataract impairs visual processing in children during the critical period of development. Very little data exists on the voluntary eye movements in these children, specifically the saccade latency, velocity, and accuracy. Here, we investigate how visual deprivation due to pediatric cataracts affects these saccadic eye movements.

Methods: Six children 4-15 years of age with a history of dense unilateral cataract (affected eye visual acuity, logMAR, mean \pm SD = 0.6 ± 0.1) and twenty age-similar control children participated. All subjects completed 40 trials of a saccade task during binocular viewing. Participants first fixated a cross, which disappeared, following the appearance of a small white dot in one of 4 horizontal positions (± 5 , ± 10) relative to the center of the screen. Eye movements were recorded using the EyeLink 1000 binocular eye tracker. Primary outcome measures were primary saccade onset latency, saccade amplitude, and peak eye velocity. Data from both eyes was collected in all participants.

Results: There were no significant inter-eye differences in saccadic parameters in either group. Saccadic latency did not significantly differ in cataract patients (mean \pm SD = 225.85 ± 60.91 ms) and controls (207.60 ± 38.92 ms; $t = -0.69$, $p = 0.51$). There was no significant difference in primary saccade peak velocity between groups (231.89 ± 93.37 deg/s [cataract] vs 298 ± 33.01 deg/s [control]; $t = 1.73$, $p = 0.14$), or in primary saccade amplitude (0.75 ± 0.31 of total amplitude [cataract] vs 0.95 ± 0.05 of total amplitude [control]; $t = 1.58$, $p = 0.17$). Cataract patients and control children performed corrective saccades at a similar frequency ($p = 0.52$).

Conclusion: Our preliminary data suggest that children treated for cataract have similar saccadic parameters to age-similar peers. While these findings may not indicate any significant impairment of afferent sensory or efferent oculomotor control of saccades in cataract patients, our sample size was small and the pattern of results may be different with more participants. Children with deprivation amblyopia exhibit poor fixation and vergence stability, which may play a role in the pathogenesis of vision.

Evaluating Severe Hypercholesterolemia in an Uninsured, Vulnerable Population Receiving Care at a Community Clinic

Josh Peedikayil

Mentor: Zahid Ahmad, MD, Department of Internal Medicine- Endocrinology

Collaborators: Clark Measom; Brianna Wilson; Whitney Stuard; Angel Valencia; Ashlyn Lafferty; Reena Jasani; Cat Davis Ahmed; Marcus Hurt; Amit Khera, MD, MSc; Nora Gimpel, MD

Background: Individuals with LDL-C 3190 mg/dL require treatment with high-intensity statins and should be assessed for Familial Hypercholesterolemia (FH). The characteristics of patients with LDL-C 3190 mg/dL has been reported in healthcare systems, but limited data exists about such individuals in underserved communities.

Objectives: To examine the scope of LDL-C 3190 mg/dL and FH in an underserved community.

Methods: Patients with LDL-C levels 3190 mg/dL at North Dallas Shared Ministries, a charity, community clinic in Dallas, TX, were identified via query of the EHR, and data was extracted from their medical charts. Patients were then interviewed to obtain family history and assess cholesterol knowledge.

Results: Among 662 patients with LDL-C measured over 4 years, 27 had LDL-C 3190 mg/dL (67% female, 78% Hispanic, mean age 52 years). Median pretreatment LDL-C levels were 210.5 mg/dL. Almost all (93%) were prescribed a statin, but only 33% were prescribed high-intensity statin. Treated LDL-C levels were 141 mg/dL. No patients had an ICD-10 diagnosis of FH, and only 31% had laboratory tests for secondary causes of hypercholesterolemia. Only 15% had documentation of family history of hypercholesterolemia and/or ASCVD. After interviewing, we discovered that 54% had previously unknown family history of hypercholesterolemia and 31% had family history of ASCVD. Not all knew they had hypercholesterolemia and only 31% currently took a statin. The terms LDL-C and HDL-C were known by only 54%.

Conclusions: Among the medically underserved community with LDL-C \geq 190 mg/dL in a charity community clinic, we found use of high-intensity statins was suboptimal and most patients were not evaluated for causes of severe hypercholesterolemia. Future efforts to improve care and education are warranted to improve care for severe hypercholesterolemia patients in this vulnerable population.

Viability and Efficacy of Pre-pectoral Smooth and Textured Tissue Expanders for Breast Reconstruction: A Comparison of Perioperative Outcomes

Kevin Perez

Mentor: Nicholas Haddock, MD, Department of Plastic Surgery
Collaborators: Pope Rodnoi, BS; Yulun Liu, PhD; Y. Edward Wen, BA;
Sumeet Teotia, MD

Introduction: Textured tissue expanders (TE) had previously gained popularity due to minimizing expander migration, rotation, and capsule migration. Recent studies though have revealed increased risk of anaplastic large-cell lymphoma associated with certain macro-textured implants, prompting surgeons at our institution to switch to smooth TEs – evaluation thus is required for specific viability and similarity of outcomes of smooth TEs. Our study aims to evaluate perioperative complications in pre-pectoral placement of smooth versus textured TEs.

Methods: Our retrospective study evaluated perioperative outcomes of patients who underwent bilateral pre-pectoral TE placement, with either smooth or textured TE, at an academic institution between 2017 – 2021 performed by two reconstructive surgeons. The perioperative period was defined as the interval between expander placement until conversion to flap/implant or removal of TE due to complications. Our primary outcomes included hematoma, seroma, wounds, infection, unspecified redness, total number of complications, and returns to OR secondary to complications. Secondary outcomes included time to drain removal, total number of expansions, hospital length of stay, length of time until next breast reconstruction procedure, next breast reconstruction procedure, and number of expansions.

Results: 222 patients were evaluated in our study (141 textured, 81 smooth). After propensity matching, our univariate logistic regression showed no significant difference in perioperative complications between smooth and textured expanders (17.1% vs. 21.1%; $p = 0.396$) or complications that required a return to the OR (10.0% vs. 9.2%; $p = 0.809$). No significant differences were noted for hematoma, seroma, infections, unspecified redness or wounds between both groups. A significant difference was noted in days to drain out (18.57 ± 8.17 vs. 20.13 ± 0.07 , $p = 0.001$) and type of next breast reconstruction procedure ($p < 0.001$). Our multivariate regression showed that breast surgeon, hypertension, smoking status, and mastectomy weight were significant for increased risk for complications (Table 3B).

Conclusion: Our study demonstrates similar rates and effectiveness of smooth versus textured TE when used for pre-pectoral placement, making smooth TEs a valuable alternative for breast reconstruction due to their decreased risk of anaplastic large-cell lymphoma.

Exploring the Modulatory Role of Female Sex Hormones on Spinal Motor Circuitry

Navoda Perikala

Mentor: Yasin Dhaher, PhD, Department of Physical Medicine & Rehabilitation

Collaborator: Yu-Chen Chung, PhD

Background: Both animal models and human studies demonstrate a bias favoring females in motor recovery following spinal cord injury (SCI). These findings may partially be due to the role that estradiol (E2) plays in neuro-inflammatory processes and neurophysiological function of spinal circuits post injury. The latter role has not been well studied. Thus, the purpose of this study is to examine the influence of E2 level on the neurophysiology of spinal motor circuits in humans.

Methods: A trans-spinal magnetic stimulation (TMS) paradigm paired with H reflex was employed to assess E2 effect on the influence of descending motor tracts on the spinal motor neurons. We delivered TMS at T12 to condition the H reflex, varying TMS intensity and inter-stimulus intervals (ISIs). Due to this paradigm's novelty, we sought to establish test-retest reliability in eight young males tested twice. We evaluated the reliability in males using the intraclass correlation coefficient (ICC). Five young females were also tested at menses and peri-ovulation to examine the E2 effect.

Results: We found that the conditioned H reflex in most ISIs was smaller than the unconditioned reflex, suggesting that the descending influence on spinal motor neurons using TMS is predominantly inhibitory. The ICCs in males ranged from 0.14 to 0.98, indicating poor to excellent reliability of the novel paradigm. The preliminary results from females showed larger inhibitory influence from descending tracts on motor neuron excitability at peri-ovulation compared to menses.

Conclusions: These unprecedented findings indicate that E2 can act as a neuromodulator at the spinal motor circuits, highlighting the neurophysiological role of E2 in addition to the classical neuroprotective effect. These findings may have clinical implications to the management of patients following SCI, such as in harnessing endogenous hormones like E2 for the modulation of spinal function.

Leg Length Discrepancy Following Limb Sparing Surgery in Pediatric and Adolescent Lower Extremity Bone

Camille Powers

Mentor: Alexandra Callan, MD, Department of Orthopaedic Surgery

Collaborators: Angela W. Zhang, BS; Kathryn E. Gallaway, BA

Background: Leg length discrepancy (LLD) is a potential long-term complication in skeletally immature patients with lower extremity bone tumors undergoing limb salvage surgery. Surgical reconstruction violates the epiphyseal plates around the knee, limiting growth of the operative limb. Growing endoprosthetics and expandable intramedullary nails attempt to address this problem. However, long-term outcomes of reconstruction options are underreported due to the rare incidence of these tumors.

Aim: The aim of this study is to describe long-term LLD and clinical outcomes after limb sparing surgery for lower extremity bone sarcomas.

Methods: This is a retrospective chart review of 26 skeletally immature sarcoma patients who underwent limb sparing surgery for a lower extremity bone sarcoma between March 2014 and July 2021. Fourteen patients did not receive leg-length studies during the follow up time and were excluded. Demographics, oncologic history, and outcomes were extracted for the remaining 12 patients. Tibia, femur, and total leg lengths of the operative and non-operative limbs were measured on leg-length radiographs taken at 6 months (+/- 1 month) and at each postoperative anniversary (+/- 4 months) up to 5 years after surgery.

Results: Twelve patients had at least one postoperative leg-length study available for analysis. Eight had a diagnosis of osteosarcoma and 4 had a diagnosis of Ewing's sarcoma. The majority (83%) were male and age at surgery ranged from 6 to 13 years. Follow-up time ranged from 5 to 59 months. Seven patients (58.3%) experienced at least one postoperative complication. The most common complication was wound dehiscence or SSI (41.7%). One patient developed a periprosthetic fracture, one patient experienced hardware failure, one patient required reoperation for arthrofibrosis, and one patient had persistent foot drop after surgery. LLD increased over time. (Figures 1- 3) Both the femur and tibia of the operative limb showed delayed growth compared to the contralateral limb.

Conclusion: This retrospective case series demonstrates persistently delayed femur and tibia growth in the first five years after limb sparing surgery for lower extremity bone sarcomas in skeletally immature patients. Further research is needed to increase sample size and standardize follow up times. A prospective study is planned to investigate the impacts of surgical modality, chemotherapy, and skeletal age at diagnosis on final LLD in this population.

Distance to an Orthopedic Oncologist in Texas and its Impact on Presentation and Outcomes

Kevin Prabhu

Mentor: Alexandra K. Callan, MD, Department of Orthopaedic Surgery

Collaborators: Priya Garigipati, BA; Kathryn Gallaway, BA

Distance to consult with an orthopedic oncologist presents a substantial burden for many patients, especially in rural communities of Texas. Delays in diagnosis and initiation of treatment may negatively impact long-term prognosis. The aim of this project is to examine the landscape of access to orthopedic oncology in Texas and to determine whether proximity to specialty care has an impact on their long-term outcomes.

Patients who were diagnosed with a bone or soft tissue sarcoma in 2017 were extracted from the Texas Cancer Registry. Distance from each patient to the closest orthopedic oncologist was calculated. Time to treatment initiation (TTI), tumor staging, survival time were extracted for analysis. Nonparametric tests and linear regressions were performed for statistical analysis.

1655 patients were diagnosed with a bone or soft tissue sarcoma in Texas in 2017. Texas has 23 orthopedic oncologists, with the majority working in Dallas (11) followed by Houston (8). Distance for all sarcoma patients to their nearest orthopedic oncologist ranged from 2.79 – 267.21 miles, with a median distance of 19.56 miles (IQR 10.42 – 67.84). Patients in the Panhandle and Rio Grande Valley region are more than 200 miles from the nearest orthopedic oncologist. These regions saw 146 sarcoma cases in 2017. For all patients, the median TTI was 0.4 months. TTI for patients who live more than 50 miles from the nearest orthopedic oncologist was 0.7 months and more than 100 miles was 0.8 months. Average survival for all patients was 22.2 months. Survival for patients more than 50 miles was 23.1 months, and more than 100 miles was 20.3 months. There is not a significant association between distance to nearest orthopedic oncologist and stage at diagnosis ($R^2 = 0.0008$) or survival time ($R^2 = 0.0004$). There is also no significant association between TTI and survival time ($R^2 = 0.0002$).

Distance to orthopedic oncology services is a concern for patients in the rural Texas Panhandle and Rio Grande Valley regions. Preliminary data shows an increased time to initiation of treatment in patients who live more than 50 and 100 miles from the nearest orthopedic oncologist. Further analysis is planned to examine size at tumor resection to determine whether patients who live in rural areas present with more advanced disease.

A Retrospective Review of Unreimbursed Medical Care Provided through Electronic Patient Portals in Dermatologic Surgery

Courtney Prestwood

Mentor: Rajiv Nijhawan, MD, Department of Dermatology

Introduction: Patient portals through electronic medical records(EMR) allow patients to view medical records and securely message their practitioners. The purpose of this study is to determine the growth of patient portal messaging compared to clinic visit and determine the number of billable encounters through the patient messaging portal.

Methods: This study quantified EMR patient portal messaging in a single academic institution's dermatologic surgery clinic from 2016 through 2020 and 500 messages were retrospectively reviewed for content from November and December 2020.

Results: The ratio of patient portal messages per clinic visit rose each year with the number of messages per patient visit 0.31 in 2016, 0.42 in 2018, and 1.20 in 2020. Total number of patient clinic encounters also rose during the same period until 2020 (declined due to COVID19 pandemic). Of the 500 messages reviewed, 293(58.6%) were from male patients with a median age of 65 years old[SD=14.1]. 316(63.2%) were automated messages including medical history questionnaires, appointment changes, and lab results. The most common patient-initiated medical advice encounters(184;36.8%) are subcategorized as a medical need for problem(86;46.7%), medical need for appointment(41;22.2%), and medical need for management(28;15.2%). Seventy-two(39.1%) of the 184 encounters had direct physician response to the messages, and 87(47.3%) total encounters had direct and/or indirect physician involvement.

Due to the nature of dermatologic surgery, a portion[47/184(25.5%)] of the messages were sent within the surgery global period. However, in a two-physician dermatologic surgery practice, 32.1% of patient-initiated encounters would be considered billable encounters outside the global period. These encounters consisted of a medical professional either making medical diagnoses, managing patients' problems, and suggesting alternate courses of treatment. While these encounters were not billed for at the time of service, they may involve an equivalent amount of clinical decision making and liability.

Conclusion: This study provides support for expansion of current telehealth reimbursement, including for the ability to bill for messages.

A Deception Study to Avoid Recall Bias Confirms Similar Scores for 3 Validated Questionnaires in the Office or Over the Phone for Women with and without Urinary Incontinence

Meghana Reddy

Mentor: Philippe Zimmern, MD, Department of Urology

Collaborators: Samuel Kusin, BS; Alana Cristie, MS

Background: With medical practices increasingly using telehealth technology as a modality for care, confirming the validity of non-office administration of questionnaires intended for office use only is increasingly important. We studied three validated questionnaires: Urinary Distress Inventory 6 – Short Form (UDI-6), International Incontinence 7- Short Form (IIQ-7), and one Quality of Life Survey (QoL) and used a deception model to avoid recall bias.

Methods: Following IRB approval, these 3 questionnaires were prospectively administered in women with and without incontinence over the telephone and then again in person at an FPMRS clinic visit about 2 weeks later. A deception protocol was followed where participants were not fully informed of the intent of the study over the phone and then were consented for the study during their office visit after both the phone and in-person questionnaire scores were obtained to minimize any potential recall biases. For incontinent patients, a urinary analysis was obtained to exclude patients with an underlying UTI. Non-English speakers, those with impaired mental competency or on fluid diets were excluded. The study was powered at 80% to detect a difference between responses at the 0.05 significance level. The telephone and in-person questionnaire scores were compared using a paired T-test analysis.

Results: From June to September 2021, 86 women, including 40 incontinent (30-85) and 46 control (30-85), with similar demographic parameters, met all study criteria. Of the 14 questions studied, only two questions, UDI6: Q1 ($p = 0.033$) and IIQ-7: Q6 ($p = 0.036$) showed significant differences in responses in patients overall. When only responses from patients with incontinence were compared, only the IIQ-7: Q6 ($p = 0.012$) showed a significant difference in responses.

Conclusions: The three questionnaire scores were comparable when obtained over the phone or during office visit given that the total scores remained similar and there were minimal differences in responses to individual questions. Women with incontinence, who may otherwise be lost to follow-up or only reachable by telehealth calls, can benefit from the remote administration of these 3 questionnaires.

Patient Reported Outcomes Are Better for Those Undergoing THA with Higher Pre-arthroplasty Activity Levels

Seth Reine

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Collaborator: Yin Xi, PhD

Aims: Evaluate the effect of preoperative activity level on patient reported clinical outcomes and magnitude of postoperative improvement following THA.

Patients and Methods: A consecutive series of 364 hips from 335 patients who underwent THA with a minimum of 180 days (mean 533 ± 271 days) completed both a preoperative and a postoperative survey containing UCLA activity score, 12-item Short-Form, EuroQol Visual Analog Scale, Hip disability and Osteoarthritis Outcome Score, iHOT-12 questionnaire, Hip Outcome Score, Harris Hip Score, and Visual Analog Pain Scale. Patients were divided into inactive, mildly active, and active groups based on preoperative UCLA activity scores of ≤ 3 , 4 through 7, and ≥ 8 , respectively. Differences among groups for each postoperative outcome were evaluated using ANCOVA controlling for preoperative patient reported measures, age, sex, BMI, and follow-up time with subsequent Tukey-Kramer post-hoc pairwise comparisons between activity groups.

Results: Mildly active patients ($n=208$, 73 M, 135 F, age 64.0 ± 14.2 years, BMI 28.2 ± 5.6) displayed significantly better postoperative outcomes than the inactive group ($n=110$, 40 M, 70 F, age 63.0 ± 18.3 years, BMI 28.2 ± 6.2) for EQVAS, HOS, SF-12 Physical Aggregate, VAS Average Pain, VAS Pain Now, and VAS Pain Worst (p-values of <0.001 , <0.001 , <0.001 , 0.002 , <0.001 , and 0.001 , respectively). Active patients ($n=46$, 32 M, 14 F, age 62.0 ± 10.1 years, BMI 27.6 ± 4.4) also displayed significantly better postoperative outcomes than the inactive group for EQVAS, HOS, SF-12 Physical Aggregate, VAS Pain Now, and VAS Pain Worst (p-values of 0.014 , <0.001 , <0.001 , 0.031 , and 0.010 , respectively). There were no differences in postoperative outcomes between the active and mildly active groups. Inactive patients displayed greater improvement in outcome measures than mildly active patients for HHS, HOOS, HOS, and iHOT-12 (p-values of <0.001 , 0.023 , 0.047 , and 0.002 , respectively) and active patients for EQVAS, HOOS, HOS, iHOT-12, and SF-12 Physical Aggregate (p-values of 0.001 , 0.030 , 0.004 , 0.016 , and 0.005 , respectively).

Conclusions: Inactive patients achieve the greatest magnitude of outcome measurement improvement following THA. Active patients achieve better outcomes than inactive patients; however, increasing activity levels do not incrementally improve PROMs.

Clinical Relevance: Encouragement of inactive patients toward active lifestyle decisions, especially more attainable moderate changes, before THA may improve outcomes.

Personality and Psychiatric Disorders among Employees of New York City Workplaces Affected by the 9/11 Attacks on the World Trade Center

Maria Reynolds

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Collaborators: Josh Raitt, MTS, STM; Ala Üstyol, MD; Rachel Zettl, MD; C. Robert Cloninger, MD, PhD

Objective: Personality is associated with psychopathology after disasters, but its association with the portion of postdisaster psychopathology that is incident remains unclear. It is also unclear whether any particular attributes of personality are associated with resistance to the persistence or recurrence of pre-existing psychopathology after disasters. This exploratory study of employees of workplaces affected by the September 11, 2001, attacks on the World Trade Center in New York City examined the specific relationships of personality variables (specifically, novelty seeking, harm avoidance, reward dependence, persistence, self-directedness, cooperativeness, and self-transcendence) to incident postdisaster psychiatric disorders and resistance to the persistence/recurrence of preexisting psychiatric disorders after the disaster.

Methods: Approximately 3 years after the 9/11 attacks, 379 employees were recruited from 8 selected affected workplaces (3 in the World Trade Center towers, 5 at varied distances in the geographic area). Lifetime predisaster and postdisaster psychiatric disorders were assessed retrospectively with the Diagnostic Interview Schedule for DSM-IV, disaster experience details were collected with the Disaster Supplement, and personality was assessed with the Temperament and Character Inventory.

Results: Underdeveloped executive functioning (low self-directedness and/or low cooperativeness) was associated with incident postdisaster psychopathology, and components of resilience (low harm avoidance, high self-directedness, and high persistence) were associated with postdisaster resistance to persistence/recurrence of pre-existing psychiatric illness.

Conclusions: Personality is related to both incident and persistent/recurrent portions of postdisaster psychopathology, not clearly distinguished in previous research. Personality variables related to executive functioning and resilience may aid in assessing risk and developing treatments to prevent disaster-related psychopathology.

Lateral Tarsal Strip Procedure Vs. Fascia Support in the Treatment of Lower Eyelid Ectropion in Facial Paralysis Patients

Cristina Sanchez

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Collaborators: Roshni Thachil, BS; Dalia Mitchell, BS

Background: Facial nerve paralysis patients are at a higher risk for corneal injury in-part due to paralytic ectropion. Increased corneal exposure combined with a defective lacrimal pump and paralytic lagophthalmos leads to corneal irritation, ulceration, and in severe cases, blindness. While a lateral tarsal strip provides corneal coverage through supero-lateral pull of the lid, the unopposed lateral force may result in lateralization of the lower eyelid punctum and cause asymmetry compared to the healthy side. This study compares two lower lid suspension techniques, the lateral tarsal strip (LTS) and tensor fascia lata (TFL) sling, and assesses whether the TFL technique provides increased vertical suspension while decreasing lateral forces, overcoming the shortfalls of the tarsal strip.

Methods: A retrospective chart review was performed on facial paralysis patients who underwent either a lateral tarsal strip or tensor fascia lata sling with no previous history of lower lid suspension procedures. Only those with pre-operative and post-operative static images were included. Objective eye parameters were measured using Emotrics (Massachusetts Eye and Ear Infirmary, Boston, MA) and ImageJ (Rasband, W.S., ImageJ, U.S. National Institutes of Health, Bethesda, MD).

Results: Out of a total of 449 facial paralysis patients, 76 met inclusion criteria. Fifty-seven patients obtained an LTS and nineteen patients obtained a TFL. Statistical analysis showed that lower medial scleral show was improved by both, LTS (mean difference=10.92mm², $P<0.0001$) and TFL (mean difference=14.35mm², $P=0.001$). The LTS group showed improved lower lateral scleral show (mean difference= 8.265mm², $P=0.0007$) but a worsened horizontal lower punctum deviation (23.18mm to 23.55mm, $P=0.01$) while the TFL group didn't show a statistical difference in lower lateral scleral show ($P=0.06$) nor worsening lower punctum lateralization ($P=0.3$). Furthermore, the LTS group failed to achieve symmetry while the TFL group achieved symmetry across all measured parameters.

Conclusions: In facial paralysis patients suffering from ectropion of the eye, the TFL provides similar outcomes to the LTS with added advantages of symmetry without lateralization of the lower punctum.

Infantile Spasms in Perinatal Pediatric Stroke

Teja Sebastian

Mentor: Rana Said, MD, Department of Pediatric Neurology

Collaborators: Linda Hynan PhD, Michael Dowling MD

Aim 1: To determine whether patients who presented with infantile spasms secondary to neonatal hemorrhagic stroke and neonatal ischemic stroke have different epilepsy outcomes.

Aim 2: To determine whether gestational complications increase the risk of developing epilepsy

Aim 3: To determine the risk factors associated with a response to treatment.

Method: Data were collected using a retrospective chart review of the Children's Medical Center Electronic Medical Record. Patients who demonstrated hypsarrhythmia on EEG and a stroke on MRI were included.

Results: Thirty-one patients were enrolled in the study, of which 14 (55%) were diagnosed with ischemic stroke and 17 (55%) were diagnosed with hemorrhagic stroke. No hypsarrhythmia on EEG, male sex, and non-premature birth were found to be factors that predicted an increase in the number of epilepsy medications the patient was taking at follow up. Female patients and neonates with a Caesarian section delivery were more likely to show an electroclinical response to infantile spasms treatment. In this sample, patients with ischemic and hemorrhagic strokes were found to have no significant difference in the development of epilepsy or the number of medications needed to control their epilepsy.

Conclusion: Female patients are fourteen times more likely to show EEG response to infantile spasms treatment and neonates with a Caesarian section delivery were more than seven times more likely. In this sample, patients with infantile spasms secondary to ischemic and hemorrhagic stroke had similar outcomes.

Association between Adiponectin Levels and Cognitive Function and Brain Imaging Phenotypes in The Dallas Heart Study

Omar Shaikh

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Introduction: Adiponectin's association with neurocognitive outcomes has been inconsistent. Therefore, we sought to characterize the association between adiponectin and subclinical markers of both neurocognitive impairment and neuroimaging phenotypes.

Methods: We included 1,199 participants (mean age of 43.4 , 62.6 % non-white, 56.5 % female) from the Dallas Heart Study, a longitudinal, multiethnic cohort study. Adiponectin was measured at exam 1 (2000-2002) and both Montreal Cognitive Assessment (MoCA) test scores and brain MRI (3T, Philips) were measured at exam 2 (2007-2009) providing measures of total brain volume, hippocampal volume, and white matter hyperintensity volume (WMH). Baseline characteristics were compared across race- and sex-specific quintiles of adiponectin. The association between adiponectin, MoCA, and brain MRI outcomes were evaluated using regression models adjusted for age, race, sex, education, body mass index, systolic blood pressure, fasting glucose, and abdominal fat.

Results: Adiponectin levels were higher in women (8.9 $\mu\text{g/mL}$) than men (6.37 $\mu\text{g/mL}$) and in whites (9.15 $\mu\text{g/mL}$) than non-whites (6.99 $\mu\text{g/mL}$). Higher levels of adiponectin were associated with more favorable metabolic profiles. Although there was no association between adiponectin and the reported outcomes when analyzed as a continuous variable (per SD), we observed a consistent, non-linear association between adiponectin and MoCA (Table 1) and brain volume (Table 1) and hippocampal volume (Table 1), with the highest MoCA score and brain volume measure in quintile 3 (vs. quintile 1). In contrast, we observed no consistent association between adiponectin and WMH when adiponectin was analyzed as a continuous (per SD) or as an ordinal variable.

Conclusion: We observed a non-linear association between adiponectin and both MoCA scores and brain volumes in a cohort of middle-aged adults. Further research is needed to understand how intermediate values of adiponectin might promote more favorable neurocognitive outcomes.

	MoCA Score		Total Brain Volume		Hippocampal Volume		White Matter Hyperintensities	
	B (95% CI)	p value	B (95% CI)	p value	B (95% CI)	p value	B (95% CI)	p value
Adiponectin (per SD)	0.0164 (-0.0373 to 0.0702)	0.549	0.0026 (-0.0477 to 0.0529)	0.9182	0.0272 (-0.0320 to 0.0864)	0.3676	-0.0139 (-0.0723 to 0.0444)	0.6391
Adiponectin (Quintile 1)	Referent		Referent		Referent		Referent	
Adiponectin (Quintile 2)	-0.0170 (-0.1663 to 0.1323)	0.8232	0.047 (-0.0923 to 0.1863)	0.5084	0.0387 (-0.1255 to 0.2029)	0.6434	0.0595 (-0.1026 to 0.2219)	0.4707
Adiponectin (Quintile 3)	-0.1512 (0.0002 to 0.3022)	0.0498	0.2166 (0.0755 to 0.3577)	0.0027	0.2410 (0.0747 to 0.4073)	0.0045	-0.0089 (-0.1741 to 0.1544)	0.9059
Adiponectin (Quintile 4)	-0.0003 (-0.1525 to 0.1519)	0.9968	0.0470 (-0.0852 to 0.1892)	0.5167	0.1207 (-0.0469 to 0.2883)	0.1579	-0.0505 (-0.2161 to 0.1150)	0.5493
Adiponectin (Quintile 5)	0.0989 (-0.0552 to 0.2549)	0.2066	0.0542 (-0.0907 to 0.1990)	0.4631	0.1254 (-0.0453 to 0.2962)	0.1498	0.0080 (-0.1607 to 0.1768)	0.9260

Surgical Site Infection in Multifetal Cesarean Delivery

Sofia Shirley

Mentors: Joseph Fixler, MD; Catherine Spong, MD, Department of Maternal Fetal Medicine

Collaborator: Emily H. Adhikari, MD

Objective: The relationship between multifetal cesarean delivery and surgical site infection (SSI) is unclear. If SSI is more common in multifetal cesareans, adjustment of practices such as antibiotic dosing may be warranted. Our objective was to evaluate whether patients undergoing multifetal cesarean delivery are more likely to experience SSI than those undergoing singleton cesarean delivery.

Methods: This was a retrospective cohort study including all cesarean deliveries at a tertiary hospital from 10/1/2009 to 12/28/2018. SSI was defined as deep and superficial incisional infections according to 2021 CDC criteria. The primary outcome was rate of SSI in women after multifetal cesarean delivery as compared to those who underwent singleton cesarean delivery. Univariable analysis and multivariable logistic regression were used to assess independent clinical factors associated with SSI in multifetal cesarean deliveries.

Results: During the study period, 34,340 women underwent cesarean delivery, including 33,211(96.7%) singletons and 1,129(3.3%) multifetal gestations. There was no difference in the rate of SSI in multifetal gestations (15/1,129, 1.3%) as compared to singletons (493/33,211, 1.5%) ($p=0.67$, OR 0.90 [95%CI 0.54, 1.90], aOR 1.06 [95%CI 0.62, 1.80]). Using both univariable analysis and multivariable logistic regression of documented independent risk factors for postcesarean SSI, only severe preeclampsia ($p<0.001$, OR 2.21 [95%CI 1.92, 2.54], aOR 1.51 [95%CI 1.20, 1.89]) and unscheduled cesarean ($p<0.001$, OR 1.52 [95%CI 1.35, 1.72], aOR 1.75 [95%CI 1.36, 2.24]) were more common in multiple cesarean deliveries. Limiting analysis to multifetal deliveries, prolonged rupture of membranes ($p<0.004$, OR 5.43 [95%CI 1.49, 19.88], aOR 5.42 [1.38, 21.33]) and labor augmentation ($p<0.001$, OR 15.84 [95%CI 1.74, 144.53]) were more common in women with SSI.

Conclusion: SSI is not increased in multifetal as compared to singleton cesarean delivery. In multifetal cesareans, prolonged rupture of membranes and labor augmentation were associated with increased odds of SSI.

Impact of Coronavirus Disease (COVID-19) on Elective, Outpatient Spine and Other Musculoskeletal Procedure Delays and Telehealth Utilization

Corey Snyder

Mentor: Kavita Trivedi, DO, Department of Physical Medicine & Rehabilitation
Collaborators: Lichen Du, MS; Kristen Hall, BS

Objective: The aims of this study are to obtain a more accurate depiction of the COVID-19 pandemic's effect on the incidence of delays in elective, outpatient spine and other musculoskeletal procedures, if the average length of those delays was changed by the pandemic, and if telehealth utilization changed.

Design: All consecutive patients who underwent an elective, outpatient spine or other musculoskeletal procedure between January 2019 and February 2021 at an institution in Texas were split into a "Pre-COVID" group (January 2019-March 2020) and a "Post-COVID" group (April 2020-February 2021). Statistical analysis was used to compare the incidence of procedure delay, average length of delays, and telehealth utilization for pre-procedure clinic visits between the two groups.

Results: The analyses compared 961 patients in the "Pre-COVID" group and 647 patients in the "Post-COVID" group and found that delays and telehealth utilization were higher in the "Post-COVID" group (Pre: 35.9% vs Post: 49.15%, $p < 0.001$ and Pre: 0% vs Post: 12.36%, $p < 0.001$, respectively). Additionally, the average length of delay was longer in the "Post-COVID" group (Pre: 23.1 days vs Post: 28.35 days, $p = 0.03$).

Conclusions: In Texas, the COVID-19 pandemic was associated with increased delays, longer delays on average, and increased telehealth utilization in patients receiving elective, outpatient spine or other musculoskeletal procedures.

Impact of Delays on Lower Back Procedures in Patient Outcomes

Corey Snyder

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Collaborators: Lichen Du, MS; Kristen Hall, BS

Objective: To evaluate the association between delays in lower back procedures like spinal and nerve block injections with patient outcomes. We hypothesized that delays in these procedures are associated with worse patient outcomes.

Design: Patients collected from a spine center registry from a single institution between January 2019 and February 2021. Patient data were retrospectively reviewed using their electronic medical record (EMR).

Patients (or Participants): Patients excluded if- researchers could not access their EMR, their EMR missed any of the main outcome measurements, or their procedure was not one of the three mentioned above. Out of 1608 patients initially provided from the spine center registry, only 556 met all inclusion criteria.

Main Outcome Measure(s): Five separate pain scores measured using questionnaires given before a patient's procedure and at a 3-month follow-up visit. The mean difference between each pain score's baseline and 3-month score was compared between "Short Delay" (14-30 days) and "Long Delay" (31+ days) versus "No Delay" (0-13 days) groups.

Results: No significant difference in pain scores between varying degrees of delay was noted (all $p > 0.05$) except in the mean Oswestry Back Disability score difference between "No Delay" (5.299) and "Short Delay" (9.825) (Mean difference in "No Delay" – "Short Delay" = -4.525, 95% Confidence Interval: -8.338 to -0.715, $p = 0.016$).

Conclusions: Delays in lower back procedures mentioned above are not associated with worse patient outcomes. In the event of an unavoidable delay in these procedures, clinicians can reassure patients that their procedure should not be less effective. Multiple institution studies with larger samples sizes, patients with longer delays, and longer follow-ups should be performed to further support these findings.

Low-Value Interventions to De-implement: Systematic Review of Low Back Pain Clinical Practice Guidelines

Daniel Tai

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Collaborators: Eunyeop Kim; Alejandro Rodriguez; Timothy Olivier, MD

Objective: Low back pain (LBP) clinical practice guidelines (CPG) that resulted from a systematic review (SR) were analyzed to identify treatment recommendations that were recommended against. These consolidated recommendations were considered low-value care practices that are appropriate for de-implementation.

Literature Review: LBP (sub-acute or chronic) CPGs in English (symptom-based, governmental or professional society created, between January 1990 and May 2020) were found using MEDLINE, EMBASE, CINAHL, Ortho Guidelines, CPG Infobase, ECRI, Guidelines International Network, NICE, and SIGN. CPGs used in this analysis resulted from an SR and were quality appraised as previously described.

Methodology: Full-text review of all 21 CPGs were conducted and de-implementation recommendations were organized into three categories (recommend strongly against, recommend weakly against, inconclusive/insufficient evidence) with the aid of the Grading of Recommendations Assessment, Development, and Evaluation (GRADE) approach.

Results: 135 low-value recommendations spanning 8 treatment categories were identified: orthotics/support, traction, physical modalities, pharmacological interventions, injections, surgery, bed rest, and miscellaneous. Traction, transcutaneous electrical nerve stimulation, therapeutic ultrasound, and selective serotonin reuptake inhibitors had the most CPGs recommend strongly against their usage. Four CPGs strongly recommended against opioids. No significant differences ($p>0.05$) were found between the quality of CPG and a specific de-implementation recommendation and in the number of strongly against, weakly against, and inconclusive/insufficient evidence recommendations between higher-quality and lower-quality CPGs.

Conclusion: We recommend clinicians to apply de-implementation recommendations based on their practice and patient needs.

The Effect of Regional Pain Block on Post-Operative Opioid Use Following Intramedullary Nailing in Oncology Patients

Destini Teague

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Collaborators: Daanish Khazi-Syed, BS; Olatunde Badejo, BA;
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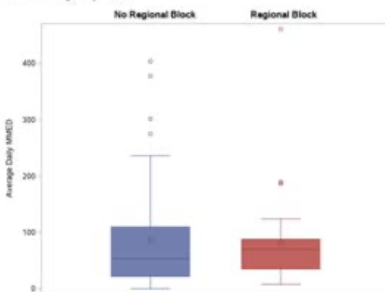
Introduction: The aim of this study is to determine whether regional pain blocks are associated with decreased postoperative opioid use after intramedullary (IM) nailing for impending or complete pathologic fracture in metastatic bone disease and multiple myeloma.

Methods: A retrospective chart review of all patients receiving an IM nail for impending or complete pathologic fracture of the femur or humerus at a large academic medical center between 2009 and 2019 was performed. All patients had a diagnosis of metastatic carcinoma or multiple myeloma. Exclusion criteria included more than one major surgery within the admission period and no record of dose administered by patient-controlled analgesia pump. Ninety-nine patients were included in this study. Postoperative opioid use was standardized and summated using morphine milligram equivalent dosing (MMED). Average daily MMED was calculated by dividing the total hospitalization MMED by the length of stay. A Wilcoxon rank-sum test was used to compare average daily MMED between patients who did and did not receive a regional pain block.

Results: There was no significant difference in average MMED per day with respect to regional pain block use (Figure 1, $p = 0.5805$). A multivariate regression analysis controlling for age, sex, BMI, ASA classification, surgical site, and primary cancer type did not reveal a latent association with MMED per day and block use (Table 1, $p = 0.5164$).

Conclusion: The use of a regional pain block did not decrease postoperative opioid use in patients with impending or complete pathologic fractures in the setting of metastatic bone disease or multiple myeloma.

Figure 1: Side-by-side box plots comparing average daily MMED in patients who did and did not receive a regional pain block.



Variable	Parameter Estimate	Std. Error	p-value
Intercept	5.605	1.018	<.0001
Age	-0.032	0.010	0.0023
Sex	0.023	0.276	0.934
BMI	0.010	0.017	0.5682
ASA Classification	0.121	0.206	0.5384
Surgical Site	-0.137	0.238	0.5965
Diagnosis:			
Breast	-0.325	0.376	0.372
Lung	-0.039	0.376	0.9173
Thyroid	-0.172	0.683	0.8021
Kidney	-0.391	0.378	0.3035
Prostate	0.569	0.589	0.3369
Multiple Myeloma	-0.617	0.336	0.0692
Regional Pain Block	0.153	0.324	0.5164

The dependent variable (MMED per day) is log-transformed due to heavily right skewed data

Does Surgical Intervention Change Pelvic Tilt? An Investigation in FAIS, Dysplasia, and Osteoarthritis Patients

Abhinav Thummala

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Collaborators: Brandon Everett, BS; Jason Lin, BA; Amisha Mehta, BA; Rebisi Owghonda, BS; Paul Gudmusson, BS

Introduction: In femoroacetabular impingement syndrome (FAIS), pelvic tilt is thought to impact disease progression and symptomology by influencing impingement free range of motion, with similar associations observed in hip dysplasia through modification of acetabular coverage and osteoarthritis via modification of joint movements. While the apparent role of pelvic tilt in hip pathology is evident, the exact effects of many therapeutic interventions on pelvic tilt are unknown. The primary purpose of this study is to investigate the role of surgical intervention on pelvic tilt in FAIS, dysplasia, and osteoarthritis patients.

Methods: A prospective hip preservation registry of demographic, radiographic, and outcomes data for all patients operated on by the senior author [J.W] between October 2016 and January 2020 were queried, and all patients who underwent surgery with a primary diagnosis of FAIS, hip dysplasia, or osteoarthritis were considered for inclusion. Pelvic tilt was assessed in the standing position on the AP radiograph with the PS-SI distance both pre and postoperatively, and outcomes were assessed with the HOS, iHOT-12, and HHS.

Results: The cohort altogether had an average preoperative PS-SI distance of 73.9 ± 22.9 mm and an average postoperative PS-SI distance of 64.9 ± 25.5 mm on the standing AP radiograph. The results from the linear regression revealed a significant negative predictive association between standing preoperative PS-SI distance and standing postoperative PS-SI distance for all 3 cohorts of patients ($p < 0.0001$ for all groups). All 3 outcome variables demonstrated significant improvement pre to postoperatively ($p < 0.05$).

Conclusions: In all included surgical groups, surgical intervention was significantly associated with pre to postoperative change in PS-SI distance. In each group, increased preoperative PS-SI distance was associated with increased postoperative PS-SI distance. In addition, PS-SI distance decreased pre to postoperatively in each group. These results establish the importance of hip surgery on pelvic tilt in FAIS, dysplasia, and OA patients. Better understanding the implications of surgery on peri-operative patients informs therapeutic decision making and treatment goals. This study is an important early investigation into the role of surgery on pelvic tilt and demonstrates the need for further research on the clinical implications of hip biomechanics.

Bone Health Outcomes Post-Lung Transplantation in Cystic Fibrosis Patients

Triet Vincent Tran

Mentor: Naim Maalouf, MD, Department of Internal Medicine

Collaborator: Xilong Li, PHD

Introduction: Osteoporosis is a common comorbidity in patients with cystic fibrosis (CF); malabsorption, chronic glucocorticoid use, and chronic inflammation all contribute to increased bone resorption and decreased bone formation. Although lung transplantation (LTx) improves quality of life and short- and long-term outcomes of CF patients, there is little research examining long-term bone health outcomes following LTx in these patients.

Methods: We collected demographic and clinical data on a total of 59 patients who underwent LTx at UT Southwestern between 2006-2019, including 30 with CF and 29 without CF. We compared baseline characteristics, long-term bone mineral density (BMD) trends, and fracture incidence between the two patient populations. We also examined factors associated with post-LTx fractures in CF patients.

Results: Compared with non-CF patients, patients with CF were significantly younger, had lower body mass index, and significantly lower baseline BMD Z-scores at the lumbar spine, femoral neck, and total hip (all $p < 0.001$). BMD at all three sites declined significantly in both groups in the first year post-LTx. In subsequent years, CF patients exhibited better BMD recovery relative to pre-transplantation, but continued to have lower BMD post-LTx. Post-transplant fractures were relatively common, occurring in 30% and 34% of CF and non-CF patients, respectively. CF patients who developed fractures after LTx were more likely to have lower baseline BMD T-scores at multiple sites, and lower pre-transplantation percent predicted forced expiratory volume in 1 second (FEV1%) ($p = 0.042$).

Conclusions: Compared with their non-CF counterparts, CF patients undergoing lung transplantation start with significantly lower BMD pre-LTx but exhibit better BMD recovery post-LTx. Despite their younger age at transplantation, CF patients experience a similarly high rate of post-LTx fractures. In CF patients, lower BMD and worse FEV1% pre-LTx are associated with development of post-LTx fractures. These findings highlight the unique contribution of the CF disease process to bone health, as well as a clear need for better prevention and treatment of osteoporosis in CF patients before and after LTx.

Limb Infection and Ischemia Trends at Parkland Memorial Hospital: A Single-Center Retrospective Analysis of Severe Wound Care Management at a Level 1 Trauma Center

Robert Trevino

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Department of Surgery

Collaborators: Sandra Loza-Avalos; Leo Cho

Introduction: As of 2013 it was recorded a total of 2.1 million amputees were living in U.S with an estimated 3.6 million amputees living in the U.S by the year 2050^{1,2}. A research study conducted between 1988 and 1996 measured 133,735 hospital discharges for amputation per year in the United States, and since then several attempts have been made to create effective diagnostic protocols that can lead to successful patient outcomes^{3,4}. This retrospective single center study was conducted at a large metropolitan country hospital to identify trends in wound care management that can be utilized to create evidence based diagnostic guidelines.

Background: Peripheral vascular disease is multi-factorial, including atherosclerosis from smoking and microvascular disease secondary to diabetes. This causes decreased flow to the foot and toes with possible neuropathy, tissue ischemia and possible infection. Patients are diagnosed with a thorough physical examination and initial work-up including laboratory studies, x-rays and arterial-brachial indices. Pressure volume recording, arterial duplexes, computed tomography angiography are non-invasive, diagnostic studies to assess inflow.

Methods: Retrospective study between 2018-2020 at a county hospital. Patients with lower extremity infections were included for a total of 245 patient encounters. Demographics, insurance status, comorbidities, interventions and outcomes were evaluated.

Results: The median age of the patient population was 61 years old with the majority self-identifying as Latinx (41.6%) and male (79.2 %). Only 4.5% of the patient identified did not have any insurance coverage, while 33.1% of the patients had at least partial Medicare coverage. Below the knee amputations were the most common procedure conducted in 48% of patient encounters. Once admitted, 60.3 % patients required a second surgery or intervention in order to ensure complete removal of the affected tissue.

Conclusions: The patient population on average had elevated HbA1c, fasting blood glucose, white blood cells, and C-reactive protein upon initial encounter which supports findings of a meta-analysis study of 101 publications that identified these values as predictors of major amputation risk⁵. The majority of patients required a second surgery or procedure giving evidence that the disease requires close monitoring to ensure the extremity infection clears. Further analysis is required at multiple healthcare settings and regions to find patterns in clinical practice that lead to improved diagnostic and treatment guidelines.

The True Benefit of Process Analysis and Efficiency Research: An Immediate and Sustained Decrease in Morbidity and Operative Time

John Tycher

Mentor: Nicholas Haddock, MD; Sumeet Teotia, MD, Department of Plastic Surgery
Collaborator: Edward Wen, BA

Background: Deep inferior epigastric perforator (DIEP) flaps are nuanced, multi-step procedures and it can be difficult for surgeons to focus on where to direct their research. Recent studies have hinted that operational flow can be a sensitive barometer for safety, efficiency and aesthetic outcomes. Here we critically assess the utility of Process Mapping and Analysis as a research tool in the context of morbidity and operative time.

Methods: Co-surgeons at a university hospital implemented two, prospectiv, process analysis studies to carefully define and evaluate critical steps in DIEP flap reconstruction. During the 9-month period (June 2018 to February 2019), they assessed eight steps of flap harvest and microsurgery. During the 8-month period (January 2020 to August 2020), they expanded their analysis to encompass the entire operation. To evaluate the immediate and sustained impact of process analysis, we took advantage of a historical control and divided 375 bilateral DIEP flaps into eight, consecutive 9-month intervals completed before, during and after the two studies (April 2015 to May 2021). Using risk-adjusted multivariate regressions with a Helmert contrast, we compared morbidity and operative time between timing intervals.

Results: Timing intervals completed prior to the 1st study had comparable morbidity and operative time. During the 1st study, there is an immediate 63.4% (P=.006) decrease in morbidity. The following 27-months show a sustained decrease in morbidity and operative time between each consecutive timing interval. The most significant decrease in operative time occurs during the 2nd study (Table 1).

Conclusions: Process Analysis is a powerful research tool capable of generating immediate and sustained decreases in morbidity and operative time.

Table 1: Risk-Adjusted Multivariate Regression Analysis				
9-Month Time Intervals	Any Overall Complication*		Procedure Time ≤ 5 Hours**	
	Odds Ratio (95% Confidence Interval)	P-value	Odds Ratio (95% Confidence Interval)	P-value
8 (newest)	0.463 (0.258-0.829)	0.01	12.802 (5.488-29.867)	<.001
7 (2020 study)	0.378 (0.193-0.738)	0.004	18.157 (7.756-42.502)	<.001
6	0.46 (0.231-0.916)	0.027	6.455 (2.855-14.596)	<.001
5 (2018 study)	0.366 (0.18-0.746)	0.006	1.206 (0.383-3.8)	0.749
4	0.716 (0.357-1.438)	0.348	1.356 (0.427-4.307)	0.606
3	0.754 (0.323-1.763)	0.515	2.497 (0.62-10.056)	0.198
2	1.146 (0.418-3.138)	0.792	6.674 (0.761-58.552)	0.087
1 (oldest)***	Helmert		Helmert	
*Any Overall complications include flap, donor-site, DVT, PE, PTX and blood transfusion. Flap complications include breast- (fat necrosis, unspecified redness, hematoma, seroma, wound, infection) and flap compromise and loss. Donor-site complications include abdominal- (necrosis, unspecified redness, hematoma, seroma, wound, infection) and umbilical- (seroma, wound, infection). **5 hours chosen as a cut-off time due to the significantly increased risk for morbidity in operations > 5 hours. ***Timing Interval 1 only serves as a reference for Timing Interval 2 due to Helmert Contrast. A Helmert Contrast, where the most recent interval is compared to the collective mean of the previous intervals, allows us to truly evaluate for a sustained change from year-to-year. Bold is P < .05.				

An International Study of Safety Profiles and Turnover Rates of Sugammadex versus Neostigmine: A Meta-Analysis

Jonathan Vachon

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Collaborator: Dylan Buitran

Background: For many years, neostigmine, an acetylcholinesterase inhibitor, was the drug of choice for reversing neuromuscular blockades in the operating room. However, there are disadvantages to using neostigmine including autonomic dysfunction like bradycardia and post-operative nausea & vomiting (PONV), and the necessity to administer the drug at the correct time due to its lag time in effect. Recent studies have been performed on sugammadex, a new reversal agent, which does not have a “lag time effect.” Although it is considered safer, some studies cite harmful effects. Given its rapid rise in usage, a more comprehensive characterization of the clinical and practical aspects of sugammadex compared to the standard of neostigmine is needed.

Methods: In accordance with the PRISMA guidelines, a systematic review of PubMed and Scopus databases was performed in search of publications that compared the efficacy and safety of sugammadex versus neostigmine. All publications that included either endpoints were included irrespective of date of publication, country of origin, language, age range of patients, type of surgical procedure, or ASA grade. Data were analyzed using Microsoft Excel.

Results: 57 articles totaling $n = 66157$ patients met inclusion criteria for this meta-analysis. Compared to neostigmine, sugammadex showed a significant reduction in extubation time (mean difference [MD] = -2.77 min, 95% CI ($-3.95, -1.59$)), Recovery to TOF >0.9 time (MD = -11.27 min, 95% CI ($-12.7, -9.89$)), OR discharge time (MD = -3.74 min, 95% CI ($-4.77, -2.71$)), and PACU discharge time (MD = -8.51 min, 95% CI ($-14.9, -2.07$)). Sugammadex shows a significant reduction in pneumonia (RR = 0.593 , 95% CI ($0.361, 0.671$)) and bradycardia (RR = 0.535 , 95% CI ($0.424, 0.675$)), and a significant increase in PONV (RR = 1.21 , 95% CI ($1.05, 1.39$)). No significant difference was found for atelectasis (RR = 0.964 , 95% CI ($0.853, 1.09$)).

Conclusion: This study supports that administration of sugammadex as a reversal agent for neuromuscular blockade facilitates faster OR turnover time, extubation time, and PACU discharge time. Sugammadex is associated with lower risk of bradycardia and pneumonia, but higher risk of PONV. In an ongoing study, we are investigating the shorter times of sugammadex in the context of a cost-benefit analysis. These results serve as a strong basis for future work on neuromuscular blockage reversal agents, with large implications in improving the quality of patient care, bolstering the efficiency of the surgery and anesthesiology services, as well as improving healthcare costs of surgery and anesthesia.

Moderate Weightbearing Restrictions are Associated with Worse Depressive Symptoms and Anxiety in Children Aged 5 to 7 Years with Perthes Disease

Angel Valencia

Mentor: Harry KW Kim, MD, Department of Orthopaedic Surgery & Scottish Rite for Children

Collaborators: Dang-Huy Do, MD; Chan-Hee Jo, PhD

Objectives: Legg-Calve-Perthes disease (LCPD) most commonly affects children 5 to 7 years old, and nonoperative management, such as weightbearing/activity restrictions, is generally recommended. Children in this age group are beginning school and organized sports while developing meaningful social relationships for the first time. The purpose of this study was to determine if weightbearing/activity restrictions are associated with worse mental, social, or physical health in this age group, evaluated with 7 PROMIS measures: depressive symptoms, anxiety, anger, peer relationships, mobility, pain interference, and fatigue.

Methods: Data were collected from 92 patients in the active stage of LCPD (Stage I to III) who were 5 to 7 years of age at the time of PROMIS survey with English-speaking parent(s). These patients were recommended weightbearing/activity restrictions because of worsening pain, poor ROM, femoral head deformity, substantial femoral head involvement on MRI, or as a postoperative regimen. Based on their weightbearing/activity restriction, patients were categorized into one of 4 activity restriction groups: No restriction (n=21), Mild (n=21), Moderate (n=28), or Severe Restriction (n=22). ANOVA was used to compare differences between the mean PROMIS T-scores. Multivariable analysis was used to compare the association of different weightbearing regimens and 7 PROMIS measures.

Results: After controlling for confounding variables, we found that moderate activity restriction was associated with worse depressive symptoms ($p = 0.04$) and anxiety ($p = 0.02$) T-scores than no restriction. Mild ($p = 0.02$), moderate ($p < 0.001$) and severe ($p < 0.001$) restriction groups had worse mobility T-scores than no restriction group. Weightbearing/activity restrictions were not associated with anger, peer relationships, pain interference, and fatigue measures. Waldenstrom Stage II disease was associated with worse pain interference than Stage III ($p = 0.04$). A history of major surgery was associated with worse anger scores ($p = 0.02$). The child's gender and age of diagnosis had no association with any of the PROMIS measures.

Conclusion: Moderate weightbearing/activity restrictions are associated with worse depressive symptoms and anxiety in patients with LCPD aged 5 to 7 years. Given this finding, we recommend discussing with parents the potential for mental health changes with moderate weightbearing restrictions and monitoring for worsening mental health symptoms at each visit.

Femoral Head Deformity Correlates with Physical and Mental Health Measures in Healed Stage Legg-Calve-Perthes Disease

Angel Valencia

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Collaborator: Chan-Hee Jo, PhD

Objective: Legg-Calve-Perthes disease (LCPD) is a childhood ischemic osteonecrosis that can produce variable amount of femoral head deformity and progression from active to healed stage of the disease. Little is known about how the severity of deformity correlates with patient-reported quality of life measures at the healed stage of LCPD. The purpose of this study was to determine if the severity of femoral head deformity correlates with the PROMIS Physical, Mental, and Social health measures at the healed stage.

Methods: We retrospectively analyzed 62 patients (45 male, 17 female) from a single institution who met the following eligibility criteria: unilateral LCPD in the healed stage, age >11 (i.e. adolescent or older), and completion of 6 PROMIS Pediatric Short Form v2.0 measures: Mobility 8a, Pain Interference 8a, Fatigue 10a, Anxiety 8a, Depressive Symptoms 8a, and Peer Relationships 8a. We excluded patients who had surgery within 2 years of the survey. We used a continuous femoral head deformity score called Spherical Deviation Score (SDS) to assess the deformity on X-rays. Statistical analyses included Spearman's Correlation to assess the relationship between the deformity and the PROMIS measures, and sub-analysis for age, gender, BMI, and history of surgery. ICC for intra-rater reliability of SDS measurements was also performed.

Results: 62 patients had a mean age at time of diagnosis of 7.9 ± 2.7 years (range 2-14.4) and a mean age at the time of survey of 14.4 ± 2.3 years (range 11-21). We observed significant correlation between the deformity (SDS) and patient-reported mobility ($r=-0.4$ $p=0.002$), pain interference ($r=0.3$ $p=0.009$), fatigue ($r=0.3$ $p=0.01$), anxiety ($r=0.5$ $p<0.001$), and depressive symptoms ($r=0.4$ $p<0.001$). No significant correlation was observed between the deformity and peer relationships ($p=0.3$). SDS measurements showed excellent intra-rater reliability (ICC=0.92).

Conclusions: Femoral head deformity correlated significantly with PROMIS physical (mobility, fatigue, pain interference) and mental health (anxiety, depressive symptoms) measures but not social health measure (peer relationships). These findings are clinically relevant as the severity of femoral head deformity is associated with patient-reported anxiety and depressive symptoms in LCPD.

Evaluating Access to Dermatologic Services at a Safety Net Outpatient Dermatology Clinic Among Patients with Hidradenitis Suppurativa

Jesus Valencia

Mentor: Rebecca Vasquez, MD, Department of Dermatology

Hidradenitis suppurativa (HS) is a chronic inflammatory disease characterized by recurring abscesses and sinus tracts. Delays in diagnosis and lack of consistently effective therapies for patients with HS have contributed to suffering, despair and reluctance to seek healthcare. Accessing specialists with expertise in HS is a frequently reported barrier by patients living with HS.

Access to timely treatment, resources, and expertise can make a difference in patients with HS where advanced disease has also been associated with lower socioeconomic status. We sought to evaluate how many patients diagnosed with HS at a safety net hospital accessed the outpatient dermatologic services supported by the same hospital.

This retrospective study enrolled patients diagnosed with HS (diagnosis code L73.2) at a single, safety net hospital from 2010 to 2020. We defined access to dermatologic services as a completed outpatient dermatology appointment for a diagnosis of HS.

Between 2010 and 2020, 2401 patients with HS were diagnosed. The study sampled included: 1386 (58%) Black non-Hispanic, 669 (29%) Hispanic, 279 (12%) White non-Hispanic, 34 (1%) Other (American Indian, n=5; Asian, n=26; Other Pacific Islander, n=3) and 33 (1%) Unknown. Most patients were Black non-Hispanic (58%) and female (74%).

Of the 2401 patients diagnosed with HS, a total of 1048 (44%) had been scheduled for an outpatient dermatology visit supported by the safety net hospital. The number of completed outpatient dermatology visits for a diagnosis of HS was 624 (26%).

Like prior studies, most patients diagnosed at our safety net hospital were female and Black non-Hispanic. 26% of patients diagnosed with HS accessed outpatient dermatologic services for their HS diagnosis. Reasons patients with HS may not access a dermatologist could include mild disease managed by their primary care provider, loss of financial assistance, lack of health literacy, or reluctance to seek care given prior lived experiences with other providers. Future studies are warranted to determine barriers to accessing dermatologic services provided by an outpatient dermatology clinic supported by a safety net hospital.

When are Prophylactic Forearm Fasciotomies Needed after Pediatric Upper Extremity Revascularization Surgery?

Tanooha Veeramachaneni

Mentor: Christine Ho, MD, Department of Orthopedics

Collaborator: Courtney Hartman, MS

Purpose: The purpose of this retrospective study was to determine the need for prophylactic forearm fasciotomies after upper extremity revascularization procedures in the pediatric population.

Methods: A retrospective chart review was performed of pediatric patients <19 years old who underwent upper extremity revascularization at a single pediatric tertiary referral center between January 2009 and May 2021. 27 patients were identified using ICD- 9,10 codes and diagnosis search for upper extremity vascular injury and CPT search for upper extremity revascularization.

Results: 27 pediatric patients were identified with a mean age of 8.4 years (range, 1.6-16.4) and 81% male (22/27). 23 had revascularization surgery alone, and 4 had revascularization surgery followed by immediate prophylactic fasciotomy. None of the 23 who did not receive fasciotomies developed Acute Compartment Syndrome (ACS) or required delayed fasciotomy. Blunt injuries (n=12) and penetrating trauma (n=11) were the most common mechanisms of injury followed by crush injuries (n=4). 16 patients required orthopedic intervention for a fracture (n=15) or a dislocation (n=1); 3 of these had prophylactic fasciotomies. 3 patients required blood transfusions. Mean time from injury to revascularization was 9.2 hours (range, 2.5-24.5). Only 1 patient presented with an ischemic, pulseless arm; the rest were pink, perfused, but pulseless. 13 patients presented with neurologic injury; 5 who did not have prophylactic fasciotomies had continued neurologic deficits (but no new deficits) at final follow-up although 3 of them did not follow-up past 53 days. Mean length of follow-up was 194.9 days, range (24-1184 days). All revascularization patients had palpable radial pulses at follow up. 2 patients in the revascularization group and 1 patient in the revascularization with fasciotomy group had limitations in upper extremity motion or contractures at final follow-up. 2 patients developed infection, one a superficial infection, and another, a deep and delayed infection after an open grade IIIC supracondylar humerus fracture. The patient presenting with an ischemic arm for 6 hours received prophylactic fasciotomy and at 355 days follow-up had extrinsic finger flexion contractures with limited elbow, wrist, forearm, and finger motion but regained normal motor function and sensation.

Conclusion: Prophylactic forearm fasciotomies following upper extremity revascularization are not always performed in pediatric patients who remain pink and perfused despite arterial injury. Surgeons may consider close observation of the patient after upper extremity revascularization without ischemia in lieu of prophylactic fasciotomies.

Randomized Pilot Study Comparing VR and Non-VR Distraction to Decrease Preoperative/Procedural Anxiety as a Function of the Modified Yale Preoperative Anxiety Scale (mYPAS)

Diksha Verma

Mentor: Sarah Rebstock, MD, PhD, Department of Anesthesiology

Background: Pre-procedural anxiety is extremely common in the pediatric cancer patient population with 50-70% children experiencing it on day of procedure (1). Pediatric cancer patients undergo routine needle-related invasive procedures necessitating the use of pain control and distraction methods to decrease pre/periprocedural anxiety. Decreasing procedural anxiety is vital in preventing adverse health outcomes related to fear of procedural pain and procedural distress (2).

Objective: This study assessed the use of Virtual Reality technology in decreasing pre/periprocedural anxiety in pediatric oncology patients undergoing port access by utilizing the mYPAS, the gold standard for assessing preoperative anxiety in children (1,3).

Design/Conclusion: This study utilizes a cross-over design where each child is evaluated with and without VR intervention, serving as their own control. Study was conducted by administration of mYPAS in the pediatric cancer patients ages 5-12 at the Children's Hospital CCBP undergoing two or more port-access procedures within a 6-month period. Chi squared analysis and subsequent paired t-test was performed on preliminary data indicating statistically significant difference of 3.5 in mYPAS scores between VR and non-VR groups given stdv=10, power of 0.8, and post-hoc analysis given $n < 77$ at this time. Preliminary data revealed a decrease in pre-operative anxiety during port access with intervention of VR.

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Risk-Adjusted Analysis of 1000 Flaps Reveals that Operative Time is an Independent Predictor of Postoperative Outcomes in Bilateral DIEP Flap Breast Reconstruction

Edward Wen

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Collaborators: John T. Tycher, BS, Kaitlin Jones, BA, Pope Rodnoi, BS, Kevin Perez, MSc, Cyrus Steppe, BA, Valeria Mejia Martinez, BS, Sumeet Teotia, MD

Background: Currently, many regard the deep inferior epigastric perforator (DIEP) flap as the gold standard of autologous post-mastectomy breast reconstruction, with a rapid increase in regularity in recent years. Operative time (OT) as a risk factor for adverse postoperative outcomes in microvascular breast reconstruction has not been thoroughly investigated. This study evaluates the impact of OT on length of stay (LOS), overall morbidity, individual complications, and unplanned reoperation (UR) in DIEP flaps, with a primary objective of identifying a clinically relevant time of decreased risk.

Methods: Patients who underwent only bilateral DIEP flaps from 2010-2021 by two senior surgeons (NTH, SST) with standardized surgical and postoperative protocols were retrospectively reviewed. 1000 flaps (500 patients) were analyzed with multivariate regressions to adjust for potential confounders, including microsurgeon experience. To identify a cutoff, beyond which risk for postoperative complications, extended LOS (eLOS, defined as ≥ 5 days), and UR significantly increases, adverse outcomes were compared amongst OT intervals.

Results: With risk-adjustment, each hour of OT increased morbidity by 22% ($p < 0.001$) and LOS by 4.8 hours ($p < 0.001$). Procedures > 5 hours had 3.9, 4.8, and 2.6-fold increased risk of UR ($p = 0.029$), eLOS ($p = 0.007$), and overall complications ($p < 0.001$, **Table 1**), respectively. Breast fat necrosis, abdominal donor-site morbidity, and medical complications also had significantly higher risk after 5 hours. Lastly, a risk-adjusted linear regression showed that LOS can be calculated from OT: $\text{LOS (days)} = 1.702 + 0.201 \times \text{OT (hours)}$ ($p < 0.001$, $R^2 = 0.369$).

Conclusions: For the first time, operative time is shown as an independent predictor of morbidity, LOS, and UR in DIEP flaps, with significantly greater risk > 5 hours. The findings emphasize the importance of decreasing OT through efficiency models, such as process analysis, team-based protocols, and co-surgery.

Table 1. Risk-adjusted Per-Patient Overall Complication Risk by Operative Time Intervals (Helmert Contrast)

OT Category (hours)	Occurrence, per patient (%)	Odds Ratio (95% Confidence Interval)	P-value
1 (≤ 5)	33.8	0.388 (0.228-0.659)	<0.001
2 (5-7)	59.7	0.564 (0.323-0.983)	0.043
3 (7-9)		0.695 (0.375-1.285)	0.246
4 (≥ 9)		Reference	

Table 1. The 1st OT quartile rounded to the nearest hour (≤ 5 hours) had significantly lower overall morbidity than procedures lasting > 5 hours. Helmert contrast compares each OT interval to the mean of the subsequent levels. **Bold = Statistically Significant.**

Real World Outcomes of Cancer Patients with SARS-Cov-2 Infection Receiving Monoclonal Antibodies

Alexa Wilden

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Collaborators: Aishwarya Sannareddy, MBBS; Hetal Patel, PharmD; Shraddha
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Prapti Patel, MD; Ansh Mehta, MD

Background: SARS-CoV-2 was declared a global pandemic and public health emergency by the WHO in January 2020. Infected cancer patients have more than a 3-fold risk of adverse events including pneumonitis, ARDS, and mortality. The FDA approved two monoclonal antibodies (MAbs), casirivimab/imdevimab and bamlanivimab, for treating mild/moderate COVID-19. In this real-world retrospective study, we aim to evaluate the efficacy of monoclonal antibody therapy in patients with and without a history of malignancy.

Methods: Through retrospective review, we identified patients who received MAbs for COVID-19 at UT Southwestern Medical Center from December 2020 to July 2021. We collected data on patient demographics, oncology history, COVID-19 infection history, vaccination status, type of MAb infused, post-infusion adverse events and hospitalization. We performed univariate analysis with Fishers exact test and multivariate logistic regression analysis of unvaccinated patients to assess the impact of malignancy history along with other factors on hospitalization rates.

Results: A total of 345 unvaccinated patients were allocated to receive MAb infusions. 54% (187) received bamlanivimab, 27% (94) received casirivimab/imdevimab, and 19% (64) elected to not receive the infusion they were allocated. Of the patients who elected to receive MAbs, 44% (124) were female and 56% (157) were male; 70% (198) were white and 14% (38) were Black; 13% (37) identified as Hispanic/Latino; half of the patients were older than age 65 and half were younger than age 65; and 32% (91) had a history of malignancy. We found that patients who received casirivimab/imdevimab had reduced hospitalization at one-month post-infusion (OR 0.18; $p < 0.01$) while patients receiving bamlanivimab had an OR of 0.49 ($p = 0.06$). Interestingly, ethnicity, sex, and age did not impact risk of hospitalization due to COVID-19. History of malignancy (OR 1.1; $p = 0.83$) did not impact the risk of hospitalization post COVID-19 infection.

Conclusions: MAbs proved critical in the management of COVID-19 patients, limiting disease intensity and progression. In our real-world data (RWD), we found significant benefit of reduced hospitalization up to one-month post-infusion, irrespective of patients' history of malignancy. With current data showing hampered antibody response for some immunocompromised patients with malignancy, our RWD provides key information on application of MAb in reducing hospitalization for those at-risk populations.

Angelman and Prader Willi Syndromes: Sister Imprinting Disorders with High Complication Rates Following Spinal Deformity Surgery

Andrew Winsauer

Mentor: Brandon Ramo, MD, Department of Orthopaedic Surgery

Collaborators: David Thornberg, BS; Stephen Rodriguez, MD;
Kiley Poppino, BS

Purpose: Prader-Willi Syndrome (PWS) and Angelman syndrome (AS) are two rare conditions linked by a famous shared inheritance mechanism which both have high rates of spinal deformity. We sought to examine the modern surgical treatment of spinal deformity associated with these sister imprinting disorders, with emphasis on the specific complications encountered in these patient populations.

Methods: 15 patients with PWS and 5 patients with AS who underwent surgical intervention for spinal deformity between 2000 and 2018 were identified. Post-operative complications were classified using the modified Clavien-Dindo-Sink (CDS) system and further categorized into specific subtypes including infection, implant failure, excessive drainage, dehiscence, and delayed wound healing. Peri-operative and final follow-up radiographic data was analyzed.

Results: Mean age at surgery was 12.9 years (4-21) with mean follow-up of 46.1 months (1-145). The patient with 1 month of follow up was a mortality. There were postoperative complications in 17 patients (85%). There was a total of 10 major complications (CDS ≥ 3) occurring in nine patients (45%). These included 5 infections requiring reoperation, 1 seroma requiring drainage, 2 severe cervical-thoracic deformities requiring reoperation, 1 implant failure requiring reoperation, and 1 death secondary to fungal sepsis and thromboembolic disease. 8 additional patients (40%) had minor complications (CDS 1-2). There were 8 intraoperative complications occurring in five of the PWS patients (33%), including loss of neuromonitoring signals and CSF leaks.

Conclusions: Surgical intervention for scoliosis in both PWS and AS has extremely high complication rates secondary to medical and behavioral comorbidities found in these patient populations. Both syndromes frequently present with several unique features that may predispose patients to develop surgical complications. Namely, the high rates of seizures found in the Angelman syndrome and osteopenia associated with Prader-Willi Syndrome both offer unique intraoperative and postoperative challenges. The high overall rates of infection and the high rates of intraoperative complications for Prader Willi patients was especially striking and merits further investigation.

Complications Following Spinal Fusion for Scoliosis in Patients with Myelomeningocele: Are We Getting Better?

Andrew Winsauer

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Collaborators: Erin Honcharuk, MD; David Thornberg, BS

Purpose: The purpose of this study is to assess complications following spinal fusion for scoliosis in patients with myelomeningocele with an emphasis on evaluating how changes in surgical techniques have influenced complications.

Methods: Retrospective chart and radiographic review of 107 patients with myelomeningocele who underwent instrumented spinal fusion for scoliosis (patients treated with kyphectomy were excluded) between 1979 and 2018 and had a minimum of two years follow-up. Patients were grouped based on the surgical approach: combined anterior/posterior spinal fusion (ASF/PSF) or posterior only fusion (PSF) and the generation of spinal implants. 1st generation defined as predominantly wire based constructs, 2nd generation as hook based, and 3rd generation as screw based.

Results: Eighty-seven patients underwent combined anterior/posterior spinal fusion (ASF/PSF) and 20 patients underwent posterior only fusion (PSF). Among the ASF/PSF patients, 42 had 1st generation implants, 33 had 2nd generation, and 12 had 3rd generation. For PSF patients there were 5, 1st generation; 6, 2nd generation; and 9, 3rd generation. Within the ASF/PSF group the incidence of deep infection was 14%, 36%, and 25% for generation 1, 2, and 3, respectively. The rates of hardware failure requiring re-operation were 14%, 3%, and 0%. The rate of re-operation for “other causes” (most commonly non-infectious wound issues) was 8%, 0%, 17%. (Total reoperation rate: 36%, 39%, 42%.) For the PSF group the incidence of deep infection was 40%, 17%, and 0% for generation 1, 2, and 3, respectively. The rates of hardware failure requiring re-operation were 20%, 0% and 0%. The rate of re-operation for “other causes” was 0%, 0%, 0%. (Total reoperation rate: 60%, 17%, 0%.) For third generation implants the “all cause” re-operation rate was 42% in the ASF/PSF group (n=12 patients) and 0% in the PSF group (n=9 patients).

Conclusions: Predominately screw based constructs have produced a decrease in re-operation for implant failure in both ASF/PSF and PSF groups. The total re-operation rate in patients having ASF/PSF has not improved over time. The total re-operation rate in PSF alone group has improved dramatically with screw constructs. Although there is likely a selection bias (ASF/ PSF patients having more severe disease); when possible surgeons should consider managing scoliosis in patients with myelomeningocele with PSF alone.

Pediatric Acute Stroke Team Activation: Differentiating Stroke from Mimics

William Wood

Mentor: Pamela Okada, MD, Department of Pediatric Emergency Medicine

Collaborators: Michael Dowling, MD; Joan Reisch, PhD

Acute pediatric stroke is a medical emergency requiring prompt recognition and treatment because quicker treatment improves neurologic outcomes and reduces excess resource usage on stroke mimics (non-stroke diagnoses). There is a clear need to better differentiate between strokes and their mimics.

We performed a single center retrospective cohort study using data from March 1, 2017 to December 31, 2020. We included pediatric patients (> 1m to < 18y) evaluated in the tertiary children's hospital ED for a stroke team activation. We compared clinical features for patients with stroke and those with a stroke mimic.

Of 179 children included in the study (55% female, mean age 11.2y, SD 5.7y), 38 children (21% of total patients, 50% female, mean age 10.5 SD, 6.2 years) were diagnosed with stroke. Strokes included acute ischemic stroke (AIS) (73.7%), hemorrhagic stroke (HS) (18.4%), and cerebral venous sinus thrombosis (CVST) (10.5%). The most common stroke mimics were seizure (14.5%), headache (10.5%), Bell's palsy (5.6%), and conversion disorder (2.7%). Compared to mimics, stroke patients were less likely to have a history of neurosurgery (16.3% mimic vs 2.6% stroke, $p=0.028$) and more likely to have altered level of alertness (7.7% vs 18.4%, $p=0.001$), abnormal coordination (15.7% vs 36.4%, $p=0.036$), abnormal muscle strength (33.1% vs 57.9%, $p=0.005$) and abnormal reflexes (18.9% vs 43.8%, $p=0.018$). Of note, there were no significant differences in stroke and mimics for: age, sex, race, ethnicity, basic metabolic panel or CBC, and time from last seen well.

Differentiating between strokes and mimics remains difficult without comprehensive diagnostic testing. Our study found that stroke patients are more likely present with altered level of alertness as well as abnormal coordination, muscle strength, and reflexes.

**A Study of Suicidal Thoughts and Behavior in a Sample of
Adults Affected by the 9/11 Attacks on New York City's World Trade Center**

Judy Xue

Mentor: Carol North MD, MPE, Department of Psychiatry
Collaborators: Josh M. Raitt, MTS, STM; Kimberly Roaten, PhD, CRC

Suicide is a serious public health concern. Over the past two decades, there has been an overall increase in suicide rates, which has resulted in major medical and work-loss costs. The negative mental health outcomes on suicide-bereaved family and friends also demonstrate the far-reaching effects of suicide and the pressing need for research that identifies precipitants of suicide. Suicidal thoughts and behavior are regarded as important signs of suicide risk. Major disasters have also been postulated as a potential risk factor of suicide and suicidal thoughts and behavior. However, existing research on suicide risk and disaster experiences has yielded inconclusive results, likely secondary to variable methods in defining disaster exposure and assessing psychopathology. This study assessed suicidal thoughts and behavior in 379 adults affected by the 9/11 attacks on New York City approximately 3 years postdisaster, using carefully defined exposure variables and DSM-IV criteria to assess psychiatric disorders. Only 7% of the study participants reported any postdisaster suicidal thoughts or behavior, of which 1% were new (incident) cases. Nearly half of the sample (45%) had a postdisaster psychiatric disorder, which was significantly associated with postdisaster suicide risk (15% vs 1%). Disaster exposure was not associated with postdisaster suicide risk. These findings are consistent with the well-known relationship between suicide risk and psychopathology, but also suggest suicide risk is not a direct product of the disaster experience. Nevertheless, the postdisaster setting provides an opportunity to educate about suicide risk and mental health, while also identifying and directing those who need treatment to appropriate mental health resources.

Hypofractionated Low-Dose Total Skin Electron Beam Therapy for Primary Cutaneous T-Cell Lymphoma: Analysis of Efficacy and Toxicity

Sophia Yi

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Collaborators: Akshat M. Patel, BA; Syed Rizvi, MD; Praveen Ramakrishan Geethakumari, MD; Jennifer L. Shah, MD; Neil B. Desai, MD; Heather W. Goff, MD

Introduction: Cutaneous T-cell lymphoma (CTCL) is a rare form of lymphoma where management and long-term disease control continue to be significant challenges. Recently, low-dose TSEBT to ~12 Gy has largely replaced traditional TSEBT to ~36 Gy for the treatment of CTCL, but there is little consensus on the optimal fractionation and dose per fraction. At our institution, we have implemented a novel condensed hypofractionated scheme for low-dose TSEBT, where instead of giving ½ cycle (3 positions) per fraction, we give a full cycle (all 6 positions) per fraction, leading to half as many treatments for the same total dose (12 Gy). We hypothesize that condensed low-dose TSEBT given in 6 fractions, compared to 12, will have similar toxicity and efficacy with the additional convenience of half as many treatments.

Methods: We conducted a retrospective review of patients with primary CTCL who received TSEBT at UT Southwestern between 2012 and 2021. We stratified patients based on whether they received high-dose TSEBT (18 Gy or above) or low-dose TSEBT (12 Gy), and among those with low-dose TSEBT substratified them between standard fractionation (12 fractions) or hypofractionation (6 fractions). We recorded each patient's primary outcomes, including response rate, time to response, duration of response, and any acute toxicities.

Results: Overall, 46 patients received 59 courses of TSEBT, with 39 patients receiving 52 courses of low-dose TSEBT. Of the low-dose courses evaluated, 40 patients had hypofractionation (full cycle) and 8 patients had standard fractionation (half cycle). There was no significant difference in the response rate between these two groups. The median time to response for the hypofractionation compared to the standard fractionation was 7 weeks versus 8.5 weeks, respectively, while the duration of response was 46 weeks versus 54 weeks, respectively. Importantly, no patients experienced significant toxicities including those in the hypofractionation group, with the exception of 1 patient who experienced grade 3 desquamation.

Conclusion: In the largest series to date of low-dose TSEBT using a hypofractionation scheme, our results suggest that it is equally safe and effective as traditional fractionation. This novel condensed low-dose TSEBT comes with the added benefits of convenience and cost-effectiveness, as well as decreased patient exposure to the healthcare system during the current pandemic.

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KEY

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* Poster Presenter

Epidemiology of International Patients with Lower Limb Deficiencies Treated at a United States-Based Pediatric Prosthesis Clinic

Shanee Abouzaglo

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Collaborators: Hannah M. Worrall, MPH; John A. Herring, MD;
Charles E. Johnston, MD

Purpose: Congenital and acquired lower limb deficiencies (LLD) in pediatric patients often lead to significant morbidity requiring prosthetic use. Limited research exists describing care of pediatric LLD patients born outside the United States (US). The purpose of this study was to define epidemiological and clinical data in a cohort of international patients treated at a US-based pediatric orthopedic hospital. We hypothesized that international patients would comprise a significant portion of the LLD population, and that epidemiologic and clinical variables would differ between adopted and non-adopted international patients.

Methods: Retrospective chart review was performed on pediatric patients born outside the US who presented to a multidisciplinary prosthesis clinic at a US-based, tertiary orthopedic hospital between 1995-2020. Patients were divided into groups based on country of residence and adoption status. Data on demographics, medical history, prostheses, and surgeries were collected, and statistical analyses were performed using a chi-square or Fisher exact test for categorical variables and student's t-test for continuous variables.

Results: 111/579 (19.2%) of LLD patients were born outside the US, with 39.6% adopted. Of the non-adoptees, 53.7% lived abroad throughout their clinical care, while 46.3% moved to the US prior to or during treatment. Geographically, patients represented 32 countries (5 continents), with the highest percentage born in Russia (25.2%), Mexico (19.8%), and China (19.8%). 96.4% were born in lower- or middle-income countries (LMIC). Most common causes of LLD were congenital malformations (72.1%), trauma (17.1%), and tumor (5.4%). 54.1% presented with existing surgical or congenital amputation, while 42.3% had a surgical amputation after initial presentation. Syme was the most common amputation level (26.6%), followed by knee disarticulation (23.7%) and transtibial (18.7%). Significant differences were noted in sex ($p=0.0018$) and race ($p<0.0001$) between non-adoptees (68.7% male, 52.2% White) and adoptees (38.6% male, 40.9% Asian). Congenital diagnoses were more frequent in adoptees (93.1 vs 58.2%), while non-adoptees often had trauma (25.4%) or tumor (9.0%) as amputation cause ($p=0.0003$).

Conclusion: Pediatric LLD patients presenting to US-based hospitals are often born outside the US, most commonly in LMIC. Demographic and clinical variables differ significantly between adopted and non-adopted international patients.

Significance: Clinicians providing care to LLD patients should be aware of the unique presentation and challenges associated with treatment of international patients. Additional research and collaboration with organizations outside the US may identify and eliminate potential barriers to care of LLD patients born in LMIC.

Demonstrating Feasibility and Skill Acquisition of a Novel Proficiency-Based Robotic Surgery Curriculum: A Medical Student Pilot

Hayley Baker

Mentor: Daniel Scott, MD, Department of Surgery

Collaborators: Madhuri B Nagaraj, MD, MS; Patricio M Polanco, MD; Imad Radi, MD; Rodrigo E Alterio, MD; Juan C Tellez, BS; Herbert J Zeh, MD

Background: The SimNow® virtual reality platform was recently introduced but lacked validity evidence. Our team developed a novel robotic curriculum consisting of 19 SimNow® tasks and three inanimate tasks with previously reported content and construct validity evidence and expert-derived proficiency levels. This study aimed to assess the feasibility and skill acquisition for novices.

Methods: Based on pre-test performance, second year medical students (n=20) were stratified and randomized (3:1 ratio). Group-1 underwent self-practice to proficiency on 19 SimNow and three inanimate tasks (DaVinci-Xi System). Group-2 (control) received no training. Both groups were pre- and post-tested using five representative SimNow tasks and the three inanimate tasks. Scores were based on time and errors (testing score = average of SimNow and inanimate scores). Analyses were performed with Kruskal-Wallis tests; $p < 0.05$ was considered significant, median [interquartile range] reported.

Results: Over five months, two participants dropped (personal reasons) and three were still training. Data were analyzed for Group-1 (n=10) and Group-2 (n=5). There was no performance difference between groups at baseline (6.6 v 7.4; $p = 0.62$). Group-1 had significant skill acquisition (6.6 v 81.7; $p < 0.01$) but Group-2 did not (7.4 v 22.2; $p = 0.06$). At post-test, Group-1 performed significantly better than Group-2 (81.7 v 22.2; $p < 0.01$). Total training time took 48 days [42.3-79.8] with 7 VR sessions [6.3-9.3] and 2 inanimate sessions [2-2.8]. The total number of repetitions (per participant) was 162 [149.3-169.8]. This equated to total curriculum time (hh:mm) for Group-1, including both testing and training, of 15:29 [13:45-16:17]. Three Arm Relay 3 took the most attempts at 13 [11.3-15.3] followed by Posterior Needle Driving ATW 11.5 [8-17.8] for VR. For the inanimate, simple suture required 10.5 attempts [8.3-12], pattern cut 5.5 [3.3-7.3], and continuous suture 11.5 [7.3-15].

Conclusion: This study evaluated outcomes associated with implementation of the proficiency-based robotic curriculum we previously developed. Completion of this novel curriculum required considerable time and effort and it allowed novices to achieve expert-derived performance levels. Given these findings, we are optimistic about the utility of this curriculum for training surgery residents and faculty.

Whole Mount 3-Dimensional Fluorescent Imaging and Quantification of Non-Transgenic Mouse Knee Peripheral Nervous System

Andrew Baxley

Mentor: Harry Kim, MD, Department of Orthopaedic Surgery

Collaborators: Chi Ma, PhD; Weisheng Liang, BS

Introduction: Pain is one of the most important presenting symptoms of knee pathologies (e.g., avascular necrosis and osteoarthritis). To develop early disease detection, diagnosis, and treatment, it is critical to advance the knowledge of the peripheral nervous system (PNS) at the knee. One of the main obstacles is the lack of an effective method to image, trace, and analyze the PNS. Labeling cells using adeno-associated virus (AAV) packed with green fluorescent protein (GFP) DNA plasmid is a powerful tool in cell lineage tracing studies both in vitro and in vivo. Tissue clearing is a state-of-art technique for biomedical imaging that allows rapid three-dimensional (3D) mapping of intact organs or even whole bodies at single-cell resolution. In this study, we combine a series of protocols, including local administration of AAV and tissue clearance for 3D visualization and analysis of the PNS at the knee.

Methods: In order to label the limb PNS, four 5-week-old mice underwent intrathecal injection at L4-L5 with 5 μ L of AAV.pCAG-FLEX-EGFP-WPRE and 1 μ L of AAV.hSyn.Cre.WPRE.hGH. The animals were sacrificed three weeks post-injection. The knees were dissected and processed by tissue clearing, which includes tissue fixation, decalcification, hydrogel formation, lipid and pigment removal, and refractive index matching. The cleared knees were embedded in a sliceable gel then imaged using a Leica SP8 with a 20x objective. The images were stitched and reconstructed using ImageJ and Imaris.

Results: Two out of four mice were successfully labeled in their limb PNS. Three of the four knees were demolded during the slicing because the embedding gel was weak. One of four knees was successfully imaged, including distal femoral epiphysis (DFE), meniscus (Me), knee capsule (Kc), proximal tibia epiphysis (PTE), and muscle (Mu). 3D analysis showed the highest density of neuron fibers (NF) in the knee capsule, in which the NF density is $3.22 \times 10^{-3} \mu\text{m}/\mu\text{m}^3$. The DFE had the least density of NF at $6.39 \times 10^{-4} \mu\text{m}/\mu\text{m}^3$. The order of neuron fiber density is $\text{Kc} > \text{Mu} > \text{Me} > \text{PTE} > \text{DFE}$.

Discussion: Histological techniques have long been the standard procedure for investigating tissues. However, a complete understanding of biological mechanisms in health and disease requires an unbiased exploration of the whole organism, rather than just selected sections. This need is particularly evident in investigation of the nervous system, which consists of the heavily intertwined networks of microscopic nerve fibers. This study explored a new combination of the gene-editing techniques using AAVs and the tissue clearing technique of 3D imaging for mapping the knee PNS of non-transgenic mice. The method made a 3D visualization of PNS and verified the method of 3D quantitative analysis. However, the protocol has limitations. 1) Due to the small skeletal size of mice, the success rate of local AAV injection is as low as 50%; 2) The insufficient mechanical properties of the embedding gel lead to destruction of tissue specimens.

Warner-Wilson and Jones Syndrome: A Case Presentation

Lillian Carter

Mentor: James Seaward, MD, Department of Plastic Surgery

Collaborators: Imran Rizvi, BS

Introduction: Pyogenic granulomas present as a lobular capillary hemangioma of the skin and mucous membranes (1). A majority of these lesions appear in the first five years of life in patients with no history of trauma or previous skin conditions (1,2). Other cases may develop in response to ulceration, trauma, wound, or chronic irritation (3). Warner and Wilson-Jones Syndrome is a rare but benign clinical phenomenon in which a pyogenic granuloma disseminates into multiple satellite lesions after treatment or trauma (4). These lesions may be described as a florid collection of bright red papules. Not much is known about the pathogenesis of the syndrome, although its progression may be related to an infectious, neoplastic, or inflammatory etiology (5). Here, we present two cases of Warner and Wilson-Jones Syndrome that presented to Fogelson Plastic Surgery and Craniofacial Center at Children's Hospital in Dallas, Texas.

Case Presentation: A seven-year-old male presented with a history of a pyogenic granuloma on the lower back that began bleeding with noticeable change in size and color. The patient was referred to dermatology, who shaved the lesion without complications. The patient presented three months later to clinic with recurrence of the original lesion along with the addition of satellite lesions. The granuloma was treated with an excisional biopsy followed by continued observation of the satellite lesions. At five months post-operation, there was no recurrence of the excised lesion, although the satellite lesions were noted to be larger. Treatment with timolol was prescribed and initiated.

An eighteen-year-old female presented with an eighteen-month history of new-onset of multiple scattered pink papules on the anterior hairline that extend posteriorly into macules on the right frontal scalp. Two years prior to this visit, the patient had a singular pyogenic granuloma on the right frontal scalp treated with cryotherapy and surgical excision by a dermatologist. Nine months from the initial visit, this lesion returned with additional painless lesions that extended to the back of the scalp. After establishing a diagnosis of Warner and Wilson-Jones Syndrome, the cutaneous lesions were treated with a Cutera 532nm laser.

Conclusion: Warner and Wilson-Jones Syndrome is a rare but significant diagnosis to study because of its "pseudo-metastatic appearance" (6). Conservative therapies may lead to higher recurrence rates, so this syndrome may benefit from a wider surgical resection to further prevent recurrence (3). It is necessary to explore the relationship of the initial treatment and the risk of recurrence to prevent disseminated lesions.

Assessing Impact of a Student Curriculum Based on Patient Navigation for Individuals Experiencing Homelessness

Keerthana Chakka

Mentor: Nora Gimpel, MD, Department of Family Medicine

Collaborators: Chandana Golla; Arnav Kak

Background: The Patient Navigator Program (PNP) is a novel, student-led organization at UT Southwestern that strives to improve the health of vulnerable communities by connecting patients experiencing homelessness (PEH) with resources. As patient navigators, health students learn about the complex issues and barriers to care experienced by PEH.

Prior to working with PEH, students completed a semester-long 14-hour course, which included topics such as social determinants of health, common barriers and local resources, motivational interviewing, professional boundaries, and cultural sensitivity. This study evaluated the curriculum's impact on student attitudes and knowledge regarding PEH, along with their self-efficacy in working with PEH.

Methods: Health students (N=47) completed a survey before and after the virtual course, with scores compared through paired, two-tailed t-tests. The survey consisted of Likert-scale type questions from previously validated survey instruments, including the Health Professionals Attitude Toward the Homeless Inventory (HPATHI) and Student-Run Free Clinic (SRFC) Attitudes

Results: From HPATHI, students experienced significant improvements in their social advocacy ($p=0.00144$) but not their personal advocacy or cynicism. With SRFC scores out of 7, students experienced improvements in their knowledge of underserved health from 3.43 to 4.53 ($p<0.001$), confidence on self-efficacy in caring for underserved from 4.73 to 5.37 ($p=0.0102$), and clinical skillset in caring for underserved from 2.86 to 4.17 ($p<0.001$); their improvement in attitudes toward underserved groups from 6.29 to 6.37 was not statistically significant.

Conclusion: Students who successfully complete this novel course show statistically significant improvements in social advocacy, knowledge, confidence, self-efficacy, and clinical skillset. While a student's core healthcare curriculum may influence these scores, most students lack previous experience in these areas. Completion of this course may influence their future career choices and their ability to advocate for patients experiencing homelessness. Future work will focus on improvements to increase efficacy and student satisfaction, as well as to sustain improvement in previously mentioned fields.

Hospital Wide Implementation of a Standardized Central Line Placement Protocol

Ishwar Chuckaree

Mentor: Ashley Yager, MD, Kristina Goff, MD, Department of Anesthesiology

Collaborators: Robert Castillo; Shannon Chalk; Autumn Spencer

Background: While central lines are common medical procedures, they can be associated with preventable complications that worsen patient outcome and increase healthcare costs.

Local Problem: Central line associated complications, such as CLABSI, have increased over the past few years at the William P. Clements Jr. University Hospital.

Methods: A PDSA cycle, along with other quality improvement tools, was utilized to implement the interventions.

Interventions: The interventions include educational PowerPoints taught to nursing staff and proceduralists to implement utilization of a procedural checklist and visual aid during central line placements.

Results: While provider surveys show the educational PowerPoints were well received, data suggests that there is room for improvement with understanding and adherence to the checklist.

Conclusions: It has been shown that checklists can be utilized to increase patient safety but they require proper application in the clinical setting. Improving adherence is crucial before expansion to other ICUs at CUH. Additional data from provider surveys and central line observations will be done to increase data analysis and allow additional feedback for process optimization.

Clarification of Extensor Tenotomy Nomenclature

Trey Cinclair

Mentor: Shelby Lies, MD, Department of Plastic Surgery

This article clarifies the terminology and different applications for a proximal Fowler extensor tenotomy and distal Dolphin extensor tenotomy. Although Fowler is a popular eponym for all finger extensor tenotomies, the proximal Fowler tenotomy is specifically indicated for swan neck deformities whereas the Dolphin is indicated for boutonniere deformities. For swan neck deformity with distal interphalangeal joint extensor lag greater than 40 degrees, a central slip tenotomy can be combined with terminal tendon imbrication or reinsertion. The more distal Dolphin tenotomy of the lateral conjoined bands is complemented by centralization of lateral bands or central slip reconstruction to correct hyperflexion of the proximal interphalangeal joint. The pertinent anatomical structures, mechanisms of release and biomechanical principles are demonstrated with intra-operative and animated videos of surgical techniques.

The Landscape of Diversity in Simulation-Based Education: A Systematic Review

Priyanka Garigipati

Mentor: Daniel Scott, MD, Department of Surgery

Collaborators: Madhuri Nagaraj, MD

Background: Increasing evidence supports that diversity in healthcare education can lead to improved provider awareness, comfort, and knowledge as well as patient outcomes. We aimed to characterize the existing publications on simulation-based education (SBE) focused on diversity.

Methods: We performed a systematic review of all articles published to date in PubMed, EMBASE, Scopus, and CINAHL using 18 SBE and 16 diversity Medical Subject Headings (MeSH) terms. We screened for articles that used simulation for diversity-focused education and excluded systematic reviews, non-English articles, and those without full-text available. We categorized findings by simulation format (product, standardized patient (SP), curriculum, mixed-format), target learner group, intended outcomes (knowledge, attitudes, exposure, skills, comfort), and represented diversity constructs (gender, skin tone, race/ethnicity, body mass index (BMI), age, sexuality, socioeconomic status (SES), language, religion/spirituality, disability, intersectionality, unspecified).

Results: We analyzed 104 articles (16,882 were screened). Publications began in 1995, though half were written after 2016. Mixed-format SBE were the first to be published beginning in 1995, followed by SP in 2000, product in 2004 and curricula in 2006. Mixed-format SBE were the most common at (38.5%) curricula (25.0%) followed by product (19.2%), and SP (17.3%). Top three most common target learner groups were nursing students (43.2%), followed by medical students (16.3%), and medical residents (10.6%). Most frequently represented diversity constructs were: race/ethnicity (16%), age (16%), and gender (11%). Least frequently represented diversity constructs were: skin tone (2%), intersectionality (4%), and disability (5%).

Conclusions: Given the importance of diversity in healthcare education, simulation can serve as an adjunct. Ongoing needs include underrepresented constructs such as skin tone and disability, as well as the integration of intersectionality in healthcare simulation.

Characterizing Experiences of Fellows of Patient Navigation Program for Patients Experiencing Homelessness

Chandana Golla

Mentor: Nora Gimpel, MD; Shelley Speed, NP, Department of Family Medicine

Collaborators: Heather Lanier; Philip Day, PhD; Patti Pagels, MPAS, PA

Context: The Patient Navigator Program (PNP) is a novel, student-led organization at UT Southwestern that strives to improve the health of vulnerable communities by connecting patients experiencing homeless with resources. Student navigators worked in teams with an individual experiencing homelessness with a client-centered approach in either 4-week or 15-week cycles. The program provides clients with the opportunity to achieve their goals with the support and resource database of PNP teams, while also providing graduate health students the opportunity to learn about the barriers experienced by housing vulnerable communities.

Objective: 1) To characterize the experiences of fellows participating as patient navigators in PNP; 2) To identify potential areas of improvement in the program.

Study Design: Two hour-long focus groups were conducted during second of three 15-week cycles with clients. Total subjects included a single fellow from each PNP group (N=9) whose participation was incentivized with \$5 gift cards. Participants provided written feedback to a series of 20 questions on PollEv, followed by an opportunity to discuss their experiences as a group on each category of questions. Verbal feedback/discussion was recorded by a single facilitator in each of the two small focus groups. Categories included team dynamics, client-team relationships, fellow relationship to PNP organization, client loss to follow up (L2FU) procedure, virtual format, and potential expenditures.

Results: Nine fellows (100%) expressed positive experiences of developing a productive relationship with their PNP team, dividing labor appropriately, and resolving conflict. Fellows reported varying experiences in meeting their clients' needs in relation to the online format and client's understanding of program expectations. Fellows provided innovative expenditure ideas to direct future funding, such as bus pass funding, dental cleanings, and professional clothes.

Conclusions: Feedback from the focus group has been actively used for quality improvement purposes. Funding has been secured for bus passes, along with expansion of resource database to provide for other client needs. Future focus groups will be performed to understand fellow experiences with PNP, as well as address potential areas of improvement in the program.

6-Month Evaluation of a Pilot Patient Navigator Program Lasting 3-to-7 Weeks in Duration for Individuals Experiencing Homelessness

Avery Hager

Mentor: Nora Gimpel, MD; Shelley Speed, RN, MSN, Department of Family Medicine

Collaborators: Camille Powers; Heather Lanier; Aziz Shaaban; Parker Ragle; Brayden Seal; Akshat Patel; Isabel Gonzalez; Jonathan Tao; Kristine Yang; Robyn Scott; Glaiza-Mae Sande-Docor

Context: Creative solutions are needed to obtain health equity for people experiencing homelessness through reducing barriers and increasing access to immediate health services for this population. A novel student-led patient navigator program referred to as the Standardized Care System (SCS) connects persons experiencing homelessness to a community resource related to each patient's self-defined, individualized goal or health need, within the span of 3 to 7 weeks.

Objective: SCS has worked with clients on a small scale for 6 months, and this study will evaluate program design and readiness to implement on a larger scale.

Study Design: Case review of 12 men who participated in the SCS program after recommendation by shelter chaplains.

Setting: Men experiencing homelessness living in a large shelter in Dallas, Texas.

Population studied: Adult men experiencing homelessness and living at local shelter in Dallas, Texas.

Intervention: The six navigator teams, each consisting of two trained students, meets with their client once per week and develops one to two SMART (specific, measurable, actionable, realistic, and time-bound) goals based on the client's acute social or health-related needs.

Main Outcome Measures: The primary outcomes include the number of successful patient-navigator encounters and completion of goals.

Results: SCS teams met weekly for 3 to 7 weeks, amounting to 59 meetings at 30 minutes each for 29.5 hours total of direct client interaction. Four clients obtained or renewed their driver's license; three clients made appointments with specialists for eye, back, or dental problems; two clients obtained mental health care; two clients connected with resources to address legal troubles; and one client each obtained health insurance, social security benefits, cell phone, stimulus checks, food stamps, housing, telehealth counseling services for substance abuse, primary care services, birth certificate name correction, and renewed a pharmacist license. These addressed the following Centers for Disease Control and Prevention's (CDC) Healthy People 2030 (HP2030) objectives: AHS-R02, AHS-04, AHS-05, AHS-06, AHS-07, V-02, SDOH-01, MHMD-R01.

Conclusions: We saw successful completion of patient's SMART goals to improve health outcomes. This 6-month trial of SCS is a starting point for a sustainable community contribution to improve local social and health equity for people experiencing homelessness.

Let’s Spend Our Time Wisely: Implementation of a Quality Improvement Program Reduces Wait Time for Patients with Acute Myeloid Leukemia

Aaron Hong

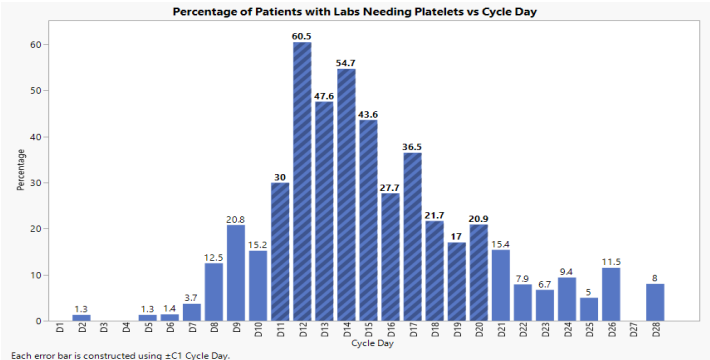
Mentor: Hsiao Jenny Li, MD, Department of Internal Medicine
Collaborator: Savannah Brock, RN

Introduction: Acute myeloid leukemia (AML), a heterogenous hematologic malignancy, carries a poor five-year survival (~ 28%). The treatment for AML includes four cycles of consolidation with HiDAC (High-dose cytarabine) and close monitoring of patients’ health with frequent clinical visits. However, clinical visits are not all high yield, often requiring no interventions in the form of blood product transfusion. This translates to more clinical time for patients as they wait for lab results before seeing the clinician. For cancer patients, time spent in benign checkups could be better spent with family and friends.

Goal: Our aim is to decrease the amount of time AML patients need to be in the clinic for their checkup during consolidative Cytarabine visits by 20% before April 2022.

Method: Charts of seventy-nine patients diagnosed with AML were reviewed to calculate the percentage of patients who needed blood products, and in turn, determine which visits could be done virtually to reduce wait time. From this data (Figure 1, below), it was determined that if a patient had a less than twenty percent (20%) chance of requiring platelet transfusions on a particular day, then they can have that specific visit converted to a virtual visit rather than in-person. This translated to days 11-20 of the cycle requiring in-person visits, and appointments falling on days outside this range could be changed to virtual visits.

Plan/Results: An index patient was identified to follow this new plan. The new plan reduced the number of clinical hours needed for the index patient by 30.77% compared to the original treatment plan. These are hours that our patient can now spend with friends and family rather than waiting in the clinic. If this new treatment plan continues to provide replicable results in future AML patients, we hope to implement a similar plan for other hematological diseases in the future.



Cancer Disparities and African American Representation in Clinical Trials Involving Accelerated Partial Breast Irradiation

Ev Kakadiaris

Mentor: Prasanna Alluri, MD PhD, Department of Radiation Oncology

Collaborator: Brian Lue, BS

Radiation therapy is a critical component in the multi-disciplinary care many breast cancer patients, but traditionally, has necessitated daily treatment visits over several weeks. Accelerated partial breast irradiation (APBI), in appropriately selected patients, affords clinical outcomes that rival those achieved with conventionally fractionated whole-breast radiation. In addition to exposing a smaller volume of breast to radiation, APBI also allows reduction in total number of radiation treatment fractions to 1-10. . This regimen, thus, stands to particularly benefit minorities such as African American patients, who suffer disproportionately from high rate of economic burden in the form of absence from work, lost wages and transportation costs related to prolonged cancer treatments. Yet, Black Americans have been traditionally underrepresented in clinical trials, threatening the generalizability of new treatments like APBI. In this study, we evaluated the racial makeup of clinical trials evaluating ABPI and the inclusion of Black Americans in these studies.

We retrospectively reviewed all published manuscripts involving accelerated partial breast irradiation therapy and analyzed the demographics of their study populations. Studies reported from centers outside the United States were excluded.

A total of 130 APBI trials were identified by pubmed search. Out of these, 80 studies were based in the United States. A total of 20 studies investigating APBI provided demographics data, comprising 1735 total patients. Of these, 1488 patients were White (85.7%), 124 were Black (7.1%), 67 were Hispanic (3.9%), and 46 were Asian (2.7%), 10 patients were classified as multiple or unknown (0.6%). This percentage is lower than the 2019 US Census estimate of 13.4% Black Americans. We compared these results to two APBI trials conducted at our institution investigating a 5 fraction and single fraction APBI regimens. Out of a total of 104 patients treated on these trials, 17 patients (16.3%) were Black. The higher proportion of African American patients in our trials is likely due to a unique partnership between Parkland Hospital, a county Hospital that serves a high proportion of minority patients, and UT Southwestern Medical Center, which provides access to technologically sophisticated treatments such as APBI to Parkland patients. Black Americans are underrepresented in clinical trials evaluating APBI, mirroring the broader national trend in all clinical trials, despite the treatment being uniquely positioned to provide increased benefits to racial minorities that suffer from increased financial burdens due to cancer therapy. Based on our institutional experience, partnership between academic medical centers, which serve a large proportion of minority patients is needed to reduce racial disparities in clinical trial participation.

Prevalence and Characteristics of Violence Against Persons at Parkland Hospital

Anjali Kalra

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Collaborators: Alaina Beauchamp, MPH; Heather Scroggins, MSN, RN-BC; Brittany Pahl, PhD; Amanda Pitt, MBA, BSN, RN; Andrea Skaliks

Background: Violence against persons (VAP) including interpersonal violence and human trafficking is a significant public health problem in the United States that affected 1.6% of the population in 2020. Systematic screening for VAP is inconsistent across hospital systems and often targets limited populations (i.e. pregnant women, homeless youth), resulting in inadequate broad detection of VAP. This study examined the prevalence of VAP and evaluated characteristics of VAP-positive patient encounters at a large safety-net hospital after implementation of an expanded screening program.

Methods: We conducted an analysis of the first six months of an expanded VAP screening program in the Emergency Department (ED) at Parkland Health and Hospital system from January to July 2021. The program involved: 1) a mixed four-question survey and observational procedure 2) strengthening referral pathways to Parkland's Victim Intervention Program/Rape Crisis Center (VIP), and 3) clinical education on VAP. A prospective chart analysis was conducted using Electronic Health Records (EHR) data for all patients who received the new screening.

Results: A total of 67,535 patient encounters were screened, out of which 1,349 (2.00%) were positive for VAP. On average, VAP positive patients were six years younger than VAP negative patients (38 vs 44 years respectively). VAP positive patients were more likely to be female (69.61%) than male (30.39%), and more likely to identify as Non-Hispanic Black (43.58%). VAP positive patients spent 28 less minutes in the ED in comparison to VAP-negative patients. The most prevalent VAP was physical abuse (71.76%), followed by psychological VAP (39.21%), observational signs VAP (37.06%), sexual VAP (31.36%), and control of food or money VAP (18.68%). The most referred VAP was physical with 48.33% of positive VAP encounters referred to VIP.

Conclusions: Our results showed evidence of successful implementation of a broad screening program for VAP at a safety-net hospital. The rate of VAP identified in screening our population was greater than the national average. Furthermore, demographic data showed a higher prevalence of VAP in patients who are young, female, or Non-Hispanic Black, highlighting the need for further research on compounded effects of gender and race on VAP.

Systematic Review of the Global Literature on Uncomplicated Recurrent Urinary Tract Infections in Women

Zara Khan

Mentor: Philippe Zimmern, MD, Department of Urology

Collaborator: Parker RM Kenée, BA

Introduction: Varying definitions for uncomplicated recurrent urinary tract infections (rUTI) in clinical and research contexts¹ complicate comparability of evidence about rUTI, which affect women across the lifespan and contribute to significant morbidity, global healthcare expense, and antimicrobial resistance. This systematic review compares definitions of rUTI in peer-reviewed studies published globally and assesses the quality of global evidence about rUTI prevalence.

Methods: The databases PubMed, Embase, WHO Global Index Medicus, and SciELO were searched for the keywords and/or MESH terms “recur* OR chronic” AND “urinary tract infection* OR cystitis”. Two reviewers screened abstracts and extracted data from included studies, which published between 2000-2020 and restricted to female participants age ≥18 years. Studies excluded 1) did not provide a definition for rUTI, 2) did not cite or report a national-, regional-, or facility-level estimate for rUTI prevalence, and/or 3) included participants <18 years or participants with complicated rUTI. The review was prospectively registered in PROSPERO and conforms to PRISMA guidelines.

Results: The search yielded 2,681 studies from PubMed (N=1,591), Embase (N=858), WHO Global Index Medicus (N=189), and SciELO (N=43). Following removal of duplicates (N=411), 2,270 studies were screened, from which 125 were ultimately included. Most studies were conducted in Europe (n=54, 43.2%) or North America (n=36, 28.8%), with the remainder in East Asia/the Pacific (n=12, 9.6%), the Middle East/North Africa (n=8, 6.4%), Latin America/the Caribbean (n=5, 4%), Australia (n=2, 1.6%), and South Asia (n=2). No studies were set in sub-Saharan Africa. While some studies focused exclusively on premenopausal women (n=27, 21.6%) or postmenopausal women (n=19, 15.2%), most studies included both postmenopausal and premenopausal participants (n=79, 63.2%). All studies defined rUTI, although 51 (40.8%) did not provide a citation for their definition. Regardless of study setting, most studies cited prevalence estimates for rUTI derived from U.S.-based populations.

Conclusions: This study represents the first formal investigation of the global literature base on uncomplicated rUTI. Definitions used for rUTI are heterogeneous, and more studies are needed to ascertain the true prevalence of rUTI in contexts outside of North America and Europe, especially in sub-Saharan Africa.

References: ¹Malik et al., FPMRS, 2018

“I Just Need to Know I'm Not Alone”: A Qualitative Analysis of Reddit Discourse on Recurrent Uncomplicated Urinary Tract Infections

Zara Khan

Mentor: Philippe Zimmern, MD & Rena Malik, MD, Department of Urology

Collaborators: Parker RM Kenée, BA; Shanee Abouzaglo, BS; Jennifer Foster, BS; Jordan McCoy, BA, BS; Naeemul Hassan, PhD

Background: Recurrent urinary tract infections (rUTI) substantially impact quality of life for many women, with rUTI-associated morbidity leading to limitations on daily activities, missed school or work, mental stress, and increased healthcare expense.¹ The aim of this study was to qualitatively analyze rUTI discourse on the website Reddit and identify areas that medical professionals may better address to improve care for women with rUTI.

Methods Public subreddits r/TwoXChromosomes, r/Askwomen, r/WomensHealth, and r/CUTI were queried for combinations of the search terms “recurrent” or “chronic” “urinary tract infection”, “UTI”, or “cystitis”, as well as abbreviations “rUTI” and “cUTI”. Search results from r/CUTI were limited to the most recent 200 posts, while no limit was placed on other subreddits. All posts were reviewed for relevance to uncomplicated rUTI; from relevant posts, study team members used a small subset to inductively identify themes and develop a codebook. The codebook was finalized over weekly team meetings using an iterative process. Posts were coded using the web application Dedoose and analyzed thematically.

Results: The search yielded 704 posts, of which 306 were identified as relevant and analyzed. Post authors were primarily premenopausal women experiencing rUTI located in the United States, United Kingdom, Canada, and Australia. Preliminary themes identified were 1) trust in online communities for support and advice, 2) lack of support from healthcare professionals, 3) willingness to try new strategies for rUTI management, and 4) frustration with rUTI-associated morbidity. Emergent concepts from the preliminary themes were: decreased confidence in healthcare providers leads to avoidance of the formal healthcare system and reliance on online support communities; anxiety about repeated use of antibiotics results in search for alternative therapies and promotion of more sensitive bacterial detection methods; and long term RUTI has far reaching effects on personal relationships, psychological and sexual health.

Conclusions: Women with rUTI perceive lack of support from healthcare professionals and preferentially seek support and advice from online communities, especially in relation to prevention and treatment of recurrences. Familiarity with online discourse is necessary for medical professionals to be able to dispel misconceptions about rUTI management and to address unmet health needs.

Funding: Office of Global Health, UT Southwestern Medical Center

References: ¹Wagenlehner et al., 2018.

Assessing Quality of Information about Uncomplicated Recurrent Urinary Tract Infections on Reddit

Zara Khan

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Collaborators: Parker RM Kenée, BA, Shanee Abouzaglo, BS; Jennifer Foster, BS; Jordan McCoy, BA, BS; Naeemul Hassan, PhD

Background: Risk of patient exposure to misinformation on social media (SoMe) is high. Within Urology, there is a developing literature base on SoMe misinformation, although to date, there has been no analysis of SoMe content about uncomplicated recurrent urinary tract infections (rUTI), which is common among women and significantly impacts quality of life. This study analyzes the quality of publicly available content about rUTI posted to the website Reddit.

Methods Public subreddits r/TwoXChromosomes, r/Askwomen, r/WomensHealth, and r/CUTI were queried for combinations of the search terms “recurrent” or “chronic” “urinary tract infection”, “UTI”, or “cystitis”, as well as abbreviations “rUTI” and “cUTI”. Results from r/CUTI were limited to the most recent 200 posts; no limitations were placed on other subreddits. All posts were screened by two reviewers for relevance to rUTI, with posts identified as informational included in the analysis. Two reviewers determined post authorship and assessed quality of informational content using DISCERN, which has 16 criteria (rated 0-none to 4-yes), with higher scores indicating higher quality.¹ Misinformation was evaluated on a Likert scale (0-none, 1-some, 2-high) using AUA/CUA/SUFU rUTI guidelines.²

Results: The search yielded 704 posts: 306 were identified as relevant to rUTI, of which 40 were informational and included in the analysis. Most posts were authored by rUTI patients (n=34, 85%), with the remainder authored by medical or health professionals, representatives of patient advocacy organizations, or commercial entities. Post topics included rUTI etiology and prevention and treatment of recurrences. Quality of information as assessed by DISCERN was low, with 82.5% of posts rated as DISCERN ≤ 3 . Across posts, the average overall quality rating was 0.3 (SD 0.7) of a possible 4. Only 3 posts (7.5%) were assessed to have no misinformation per AUA/CUA/SUFU rUTI guidelines, while a majority (n=27, 67.5%) were assessed to have at least some misinformation and 10 (25%) a high level of misinformation. Only 15% of posts (n=6) included referenced sources.

Conclusions: Publicly available Reddit content about rUTI is generally poor in information quality, representing a potential for harm to patients. Medical professionals should be knowledgeable about the prevalence and content of SoMe misinformation to appropriately counsel patients.

References: [1] Pace et al., *Neurourol Urodyn*. 2021

[2] Anger et al., *The Journal of Urology*, 2019.

Addressing the Transferability Gap: How Well Do FLS-Acquired Skills Transfer to ATLAS and Real-life Suturing?

Kyle Langston

Mentor: Daniel Scott, MD, Graduate Medical Education/Surgery

Collaborator: Madhuri Nagaraj, MD

Background: Despite programs such as FLS, a gap exists for trainees to develop robust skills for laparoscopic suturing in the clinical environment. Recognizing this need, the Association for Surgical Education (ASE) developed the Advanced Training for Laparoscopic Suturing (ATLAS) program. This study aimed to assess the extent to which skill acquisition from FLS transfers to ATLAS and real-life laparoscopic suturing.

Methods: First-year medical students (n=20) were enrolled in an IRB- approved protocol and were pre-tested on three modalities: five FLS tasks, six ATLAS tasks, and a previously reported live Porcine Lap- Nissen (PLN) Model, which replicated a realistic operating room environment. Scores (based on time and errors) were normalized to expert performance (100-point scale) for each task and modality. The overall testing score was defined as the average score for all three modalities. Participants were stratified according to pre-test performance and randomized (3:1 ratio). Group-1 trained to proficiency on all five FLS tasks; Group-2 received no training. After one month, both groups underwent post-testing (identical to pre-testing). Analyses were performed with Kruskal-Wallis tests; $p < 0.05$ was considered significant, median [interquartile range] reported.

Results: Four participants dropped (personal reasons). Data were analyzed for Group-1 (n=11) and Group-2 (n=5). There was no significant difference between Group-1 and Group-2 for each modality and overall pre-test score ($p > 0.05$). Between pre-test and post-test, Group-1 had significantly improved FLS (37.7 vs. 74.4; $p < 0.01$), PLN (0.0 vs. 51.7; $p < 0.01$), and overall testing scores (12.6 vs. 42.9; $p < 0.01$). There was no significant change in their ATLAS score (0.0 vs. 0.4; $p = 0.14$); median ATLAS scores for all tasks on post-test were 0. Group-2 had no significant change for all scores.

Conclusion: This study demonstrated that novices demonstrated significant skill acquisition following proficiency-based FLS training according to FLS scores and a transferability PLN test. However, our findings identified a substantial gap in transferability compared to expert performance, as FLS training resulted in 51.7% of expert scores in the PLN operative environment. Additionally, FLS training did not improve ATLAS performance, which involves a more advanced skillset. The ATLAS program may offer a unique training opportunity and improve training transferability to real-life suturing.

Developing a Student-Led Patient Navigator Program for Individuals Experiencing Homelessness

Heather Lanier

Mentor: Nora Gimpel, MD, & Shelley Speed, NP, Department of Family Medicine

Collaborators: Cameron Ward; Nicholas Campalans; Umaru Barrie; Natalie Bonner, MS; Brayden Seal; Ashlyn Lafferty; Kyle Swartz

Background: People experiencing homelessness encounter complicated barriers to healthcare while facing greater burdens of disease. Patient navigation improves health outcomes for those with chronic illnesses experiencing homelessness. Additionally, patient navigation as a healthcare trainee promotes self-identification as a change agent and prepares future healthcare workers to better understand how to address the needs of their patients based on social determinants of health.

Methods: A PNP providing services at in-shelter clinics for people experiencing homelessness was designed, using a multi-pronged development structure over a nine-month period. An initial group of students met with community stakeholders to outline primary health-related needs and barriers faced by individuals experiencing homelessness. A mission and vision were then created, from which the following programmatic components were identified: curriculum, navigation system, resource database, quality improvement and research, and marketing and communications. Component leaders generated timelines, specific aims, and details of operation and substructure. Recruitment of a dedicated leadership team was accomplished by engaging peer networks via e-mail and in-person meetings. Reporting structures were built to ensure accountability and effective coordination between teams.

Results: By August 2020, over 40 students and numerous faculty from UT Southwestern Medical School and Health Professions programs were engaged in development of the PNP. A 3-month long curriculum was built in which an additional 47 students enrolled in fall 2020 followed by over 50 students who enrolled fall 2021. These students committed to a 1.5-yearlong fellowship experience, consisting of iterative cycles of longitudinal patient navigation, pairing navigator teams with clients for three 15-week cycles as well as short-term 3 to 6-week cycles for clients needing assistance with 1 acute goal. A resource database of over 110 community, social service, and healthcare groups was created. Assessment tools and infrastructure were built to monitor client and learner related outcomes.

Conclusion: Guided by a robust developmental structure, this program plans to bridge critical gaps in care for individuals experiencing homelessness, link curricular experiences with service-learning opportunities for health professions students, and generate additional insights into the optimization and implementation of this PNP.

Pan-Cancer Analysis Utilizing the Effector and Perturbation Estimation Engine

Abigail Lewis

Mentor: Murat Can Cobanoglu, PhD, Department of Bioinformatics

Collaborator: Didem Agac Cobanoglu, PhD; Kevin VanHorn, MS

Cancer is one of the leading causes of death in the United States, yet its development is still not well understood. Many avenues have been investigated for analyzing the mechanisms of cancer development, one of which is transcription factor (TF) misregulation. TFs regulate the process of genome transcription which has a plethora of downstream effects. Thus, understanding the activity of TFs is essential to recognizing their role in cancer etiology.

To predict the regulatory effect of TFs across potential targets, statistical methods need to address their complex interactions. Our novel computational method, Effector and Perturbation Estimation Engine (EPEE), infers the activities of all TFs simultaneously, allowing for an accurate and holistic prediction of how diverse TFs may participate in the development and regulation of cancer.

In this project, we utilized EPEE to perform a pan-cancer analysis, focusing on six common cancer types in America: prostate cancer, lung cancer, colorectal cancer, corpus uteri cancer, kidney cancer, and thyroid cancer. To demonstrate the efficacy of each network used in EPEE, we investigated the current literature on the predicted TFs as they relate to their cancer type. Through literature review, TFs were classified in the following manner: supporting evidence, indirect supporting evidence, contradicting evidence, and currently not studied, warranting further research. We then calculated the mean average precision test for each network utilized and chose the most promising results for further investigation. For each TF with indeterminate evidence, we predicted the top 100 target genes corresponding to each transcription factor utilizing the method described by Marbach et al. These targets were then processed through The Gene Ontology Resource, a database on gene functionality, to find statistically significant processes that might allude to the importance of a specific gene in the development of cancer.

Taken together, we have identified and supported novel transcription factors that warrant further investigation based on the predictions by EPEE. Based on key process involvement predictions, we present avenues for a better understanding of the roles of TFs in cancer. Moreover, experimental research of this data would allow for exponential growth in our understanding of the role of TFs in cancer development.

Evaluating Student Food Selections After a Nutrition Education Intervention in a Montessori Community School

Hannah E. Miller

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Collaborators: Michaela Carrington, RDN; Jijia Wang, PhD; Kathy Jones; Philip Day, PhD

Introduction/Background: Schools are unique sites for nutrition education interventions due to their ability to provide educational activities as well as meals, allowing for observation of behavioral change. Nutrition education and physical activity awareness programs implemented in the school setting have the potential to positively impact students' eating habits. Eating habits are developed at a young age, but few efforts have been made to deliver and assess education interventions in the pre-K through grade 3 age group. The purpose of this study was to evaluate student (pre-K through grade 3) food selections before and after a nutrition education intervention was implemented in a Montessori school.

Methods: A retrospective exploratory analysis was conducted by examining aggregate lunch food selection data, including total food items offered and total food items left over, via daily productions records from one school site. Records were collected from three school years to compare the food acceptability – the percent of food item taken from the total offered - of fruit (F), vegetable (V), F&V, 0% milk, 1% milk, and all milks before and after the implementation of the intervention program. Food acceptability served as a proxy for food consumption. ANOVA was used to compare the consumptions among three years with Tukey's adjustment.

Results: In all years, fruit (82.88%) and all milks (81.74%) were well accepted by students, but vegetables (62.00%) were not. The study found that from year 1 to year 2, there were statistically significant ($p < 0.0001$) decreases in intake in all categories. This trend continued when comparing year 1 to year 3.

Conclusion: Prior studies show that even in successful interventions, when vegetable or F&V intake does increase, changes are minimal. These findings corroborate the difficulties prior studies have demonstrated in changing students' food selections for the better, particularly regarding vegetable consumption. This analysis of production records showed a decline in acceptability of foods over the three years. It is unclear if these changes are directly related to the instructional program, due to the presence of confounding factors. Future studies should attempt to reevaluate nutrition education and subsequently conduct a plate-waste study for a more accurate representation of food consumption before and after an intervention. A strength of this study is that it utilizes more data than similar studies in the literature, thus providing a more robust account of food acceptability amongst elementary school children.

Adapting a Patient Navigator Program for Individuals Experiencing Homelessness to the Virtual Environment during the COVID-19 Pandemic

Dalia Mitchell

Mentor: Nora Gimpel, MD, & Shelley Speed, NP, Department of Family Medicine

Collaborators: Brayden Seal; Akshat Patel; Tri Pham; Kevin Ma; Ashlyn Lafferty; Parker Ragle; Nicholas Campalans; Umaru Barrie

Background: The COVID-19 pandemic has stressed the ability to provide health and social services to individuals experiencing homelessness. A novel student-led patient navigator program can connect persons experiencing homelessness to community resources specific to each patient's needs within a virtual environment. Virtual patient navigation aims to mitigate any barriers to care and ensure timely delivery of health services without increased risk of COVID-19 transmission.

Methods: A team of four medical student patient navigators and one patient experiencing homelessness piloted the program in an entirely virtual setting. Over Zoom, the team identified six objectives related to the patient's health and social needs and created SMART (specific, measurable, actionable, realistic, and time-bound) goals geared toward achieving each respective objective in a stepwise manner. Iterative cycles of SMART goal completion provided holistic community coordination and empowered the patient to set and achieve health related goals. All interactions between the student team and patient were done virtually. The primary outcomes in this pilot program were the number of successful virtual student-patient navigation interactions and completion of client-individualized objectives.

Results: Despite the obstacles posed by the COVID-19 pandemic, the pilot program achieved 15 successful student-patient interactions. Conducting all these interactions virtually provided the additional benefit of increasing the patient's confidence in using technological resources to adapt to challenges posed by the pandemic. Of the six objectives set by the patient, one objective was definitively completed with successful enrollment in a health insurance plan. Considerable progress was made on the remaining five goals, and the patient was equipped with the necessary tools and self-efficacy to bring them to completion after graduating from the virtual program.

Conclusions: Achieving health equity requires addressing the specific barriers to care faced by individuals experiencing homelessness, and the need for this care has only increased with the additional obstacles created by COVID-19. This pilot patient navigation program marks the beginning of a sustainable community impact in improving health outcomes among individuals experiencing homelessness even during a global pandemic.

Comparison of Sacrococcygeal Teratoma Presentation and Outcomes at a High- and a Low- Middle- Income Hospital

Aparna Panatpur

Mentor: Erik Hansen, MD, Department of Surgery

Collaborator: Yves Mpongo, MD

Purpose: The timing of diagnosis influences the management and outcomes of sacrococcygeal teratoma(SCT) patients. Access to care and resources differ in low/ middle-income (LMIC) countries compared to high income countries (HIC). We sought to compare SCT patients at a LMIC and HIC hospital. We hypothesized patients seen at the LMIC hospital would have later presentation and greater mortality than those managed at the HIC.

Methods: A retrospective chart review of patients diagnosed with SCT between January 2009 and December 2019 at a LMIC in East Africa (n=30) and a HIC in North America (n=22) was conducted. Nonparametric tests of comparison and Fisher's exact were used; $P < 0.05$ was significant. IRB approval was obtained from both institutions.

Results: Median age at diagnosis was 1d at each hospital while the time from initial diagnosis to treatment initiation was 6 d (HIC) and 89.5 d (LMIC) ($p = 0.03$). Eighteen and 10% at the HIC and LMIC, respectively, were diagnosed prenatally ($p = 0.44$). 45% HIC and 40% LMIC patients presented during the neonatal period ($p = 0.69$). Altman IV tumors accounted for 41% (HIC) and 10% (LMIC) of patients ($p = 0.0175$). Malignancy was diagnosed in 13.6% (HIC) and 23.3% (LMIC) patients ($p = 0.209$). The mortality rate was 13.3% at AICKH vs 27.2% at CMC ($p = 0.29$). The median follow-up period was 769 d (HIC) vs 106 d (LMIC) ($p = 0.017$).

Conclusions: SCT patients at a LMIC hospital experienced a delay in initiation of treatment despite fewer Altman IV tumors relative to HIC patients and similar age at initial diagnosis. Rates of malignancy and mortality were similar though follow up was longer at the HIC hospital.

Characterization of Oral Cavity Lesions within Betel Nut Users in Remote Pacific Islands

Hiren Patel

Mentor: William Moss, MD, Department of Otolaryngology

Collaborator: Mary Chang, MD

Background: Betel nut is a commonly chewed substance by the residents of Saipan and many other islands in the Western Pacific Ocean. 43% of Asian Pacific Islander adults in Saipan chew betel nut and 13% of cancer-related mortality in this region is due to oral cavity lesions. The purpose of this study is to further characterize the types of oral cavity cancers that occur due to chewing betel nut and better understand best methods of treatment and prevention.

Methods: A single-institution retrospective review was undertaken for 81 patients who were treated for primary cancers of the head and neck region at the Commonwealth Healthcare Corporation (CHC) in Saipan, CNMI between 2005 and 2019. Biopsies of the oral cavity lesions were obtained from the patients in Saipan and analyzed for further workup.

Results: A majority of head and neck cancer patients had oral cavity cancer (64/81, 79.0%). Preliminary biopsy results show a high incidence of squamous cell carcinoma with squamous hyperplasia. A particularly high incidence of rare verrucous carcinoma was found (8/55, 14.5%).

Conclusions: Patients with the uncommon verrucous carcinoma should be treated differently as surgical outcomes differ in comparison to oral squamous cell carcinoma. Surgical resection in comparison to radiation therapy has been shown to have a good prognosis in patients with oral verrucous carcinoma. Further studies should be conducted to best prevent and treat these oral lesions.

Are Standardized Patient Educators Worth the Cost? A Literature Review and Randomized Controlled Trial

Hunter Pyle & Patrick Lynch

Mentor: James Wagner, MD, MSC & Dorothy Sendelbach, MD, Department of Internal Medicine and Department of Pediatrics

Background: Clinical skills instruction in US medical schools has frequently relied on standardized patient educator (SPE) instruction. However, SPE instruction has not been shown to be more effective than less-expensive peer-to-peer (P2P) instruction. With the suspension of USMLE Step2CS, the utility of SPE instruction in teaching clinical skills is called into question. This trial compared OSCE scores and clinical confidence among students who received extracurricular SPE instruction, extracurricular P2P instruction, and no extracurricular instruction.

Methods: A pre-survey was administered to all first-year medical students to assess confidence and willingness to participate in clinical skills instruction. Experiment group sizes were limited by COVID-19 pandemic. 13 students underwent one extracurricular SPE instruction, 8 students underwent one extracurricular P2P instruction, and 227 students completed no extracurricular instruction. A post-intervention survey was completed by students participating in extracurricular instruction. OSCE scores were collected at the conclusion of intervention and compared using descriptive statistics.

Results: For all OSCE score parameters, P2P and SPE groups scored higher than control group. Students receiving P2P clinical skills instruction significantly outperformed control group in parameters including 'gathering info' and 'conducting a physical exam' (not significant upon application of Bonferroni correction). No significant differences were found in performance between P2P and SPE groups. At baseline, students in control group were more confident in their clinical skills than students in SPE or P2P despite having equivalent levels of clinical experience. Following intervention, both SPE and P2P groups self-rated confidence improved, without a significant difference in confidence between the two groups post-intervention.

Discussion: Students that underwent a single SPE or P2P clinical skills instruction session generally outperformed peers who did not receive additional instruction. Consistent with existing literature, this study found no significant difference in OSCE scores between SPE versus P2P instruction. Students receiving SPE instruction did rate themselves as significantly more confident in performing a clinical skills encounter compared to students receiving P2P instruction. Results from this study (underpowered due to COVID-19 pandemic) and prior trials provide no strong evidence supporting SPE instruction versus less expensive P2P instruction. Better-powered RCTs are needed to definitively conclude whether SPE instruction is truly worth the cost.

Keys to Successful Implementation: Integrating the Emotive Virtual Patient into UTSW's Pre-Clerkship OSCE Curriculum

Hunter Pyle

Mentor: Robert Rege, MD; James Wagner, MD, Department of Undergraduate Medical Education, Continuing Education, Surgery

Collaborators: Marjorie Zielke, PhD; Djakhangir Zakhidov, MFA

Background: Medical schools strive to provide educational experiences that are self-driven, patient-centric, and accessible on-demand. Objective structure clinical examinations (OSCEs) allow for training and assessment of medical student communication and clinical skills, but two key challenges exist within the current OSCE teaching methods: limited practice opportunities for students, and the logistical and cost-related issue of standardized patients (SPs).

Objectives: This research aims to integrate a novel teaching and assessment tool – Emotive Virtual Patient (EVP) – into the pre-clerkship OSCE curriculum at UTSW. The study's primary objective is to determine if extra practice sessions increase student confidence in taking a medical history and improve performance on OSCE examination, while secondary objectives include assessing student perception of additional practice sessions with an EVP versus SP.

Design: This is a randomized, investigator-blinded study that aims to compare learning and confidence gains between two intervention groups and a control group. Participants in the first intervention group received an extra EVP practice session, while participants in the second intervention group received an extra SP practice session. The control group received no extra practice session. Groups were compared subjectively via pre- and post-intervention survey, and will be compared objectively via institutional OSCE scores.

Results: 10 students completed an extra EVP practice session and 8 students completed an extra SP practice session. Students with an extra EVP practice session had mean confidence for medical interview post-intervention of 3.1 (95% CI 2.6 to 3.6) and mean confidence for HPI-portion of interview of 3.1 (95% CI 2.3 to 3.9). 70% of students with an extra EVP practice session indicated that multiple sessions with EVP would be beneficial, and 40% of these students agreed that practice with EVP should be integrated into the clinical skills curriculum. Students with an extra SP practice session had mean confidence for medical interview of 4.9 (95% CI 4.7 to 5.2) and mean confidence for HPI-portion of interview of 4.6 (95% CI 4.2 to 5.0).

Discussion: A higher mean confidence after intervention was found with an extra SP versus EVP practice session. Still, the majority of students with an extra EVP session indicated that additional sessions would be beneficial. The difference in confidence between the two groups may be due to difficulties in interacting with EVP augmented reality after a single encounter. Future iterations of EVP will emphasize improved emotive characteristics and the provision of student feedback.

Assessing Perceptions of Accommodations for Medical Students with Disabilities

Vanessa Ramirez de Arellano

Mentor: Didem Inanoglu, MD, Department of Physical Medicine and Rehabilitation

Individuals with disabilities are the largest minority group in the United States, yet disability remains underrepresented in medical school populations and curriculums, creating barriers for medical students with disabilities. This study focuses on perceptions of disabilities as a barrier, which to our knowledge, has never been studied in a medical school environment. The primary objective of this study was to assess perceptions of disability and accommodations amongst medical students. The secondary objective was to assess baseline knowledge of disability amongst students. The participants were 87 currently enrolled medical students who were recruited via mass e-mail. They completed an anonymous survey with questions and statements on disability knowledge and accommodations. They were also asked to assess the appropriateness of various accommodations for a series of clinical vignettes, each representing a type of disability (e.g. physical, psychiatric). The survey demonstrated a disability prevalence of 6.5% among participants. One quarter of participants did not feel comfortable defining the term disability, emphasizing the need for greater disability education. This was reinforced by the fact that 92% of students would like to receive more training on disability both in pre-clerkship and clerkship periods. Alarming, 75% of respondents said they were not familiar with the process of requesting disability accommodations. Participant perceptions of disability were generally positive, yet almost half of students indicated that participants may struggle in the “real world”. When assessing accommodations by disability type, we found two major knowledge gaps amongst students. The first was that students seemed unaware of the extensive impact of pain and fatigue on performance. The second was that they seemed unaware of the impact of psychiatric illness on higher functioning. We recommend the implementation of a disability curriculum that is longitudinal and combines both lecture-based and didactic elements. We also recommend that information on the accommodations process be made available to students throughout their education, starting with orientation. Lastly, we recommend implicit bias training and increased exposure to individuals with disabilities to dispel preconceived notions. With these enhancements, we can begin to address the many barriers for patients and medical students living with disability.

Implementation and Evaluation of a Program Providing Patient Navigation to Individuals Experiencing Homelessness

Garrett Ray

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Collaborators: Dalia Mitchell; Heather Lanier; Avery Hager; Camille Powers; Jamie Lehnert; Akshat Patel; Brayden Seal; Natalie Bonner; Ashlyn Lafferty; Umaru Barrie

Individuals experiencing homelessness demonstrate higher incidence of disease, limited access to healthcare, and overall poorer health outcomes. The unique obstacles faced by homeless populations require novel solutions in order to reduce barriers to care and ensure timely delivery of health services. A student-led Patient Navigator Program (PNP) connects persons experiencing homelessness to community resources and services specific to each client's goals and health needs. PNP's continuous care system has been serving at Center of Hope for since January 2021.

Teams of four to six medical student patient navigators work with one client and their family to develop six SMART (specific, measurable, actionable, realistic, and time- bound) goals based on the client's social or health-related needs, identified by a pre- survey. The primary outcomes include the number of successful patient-navigator encounters and completion of SMART goals. Secondary outcomes include changes in patient attitudes, self-efficacy scores, and quality of life as measured by pre- and post-surveys.

As of 11/19/2021, PNP has enrolled 23 clients (8 currently enrolled) into our 15-week program. Navigators meet with clients in weekly meetings and aid with community resource management. Like many other programs targeting people experiencing homelessness, PNP has struggled with loss to follow up. Of the 15 clients that have had the opportunity to complete the 15-week cycle, only 6 have finished. As a result, we've developed a loss-to-follow up protocol that aims to minimize the number of clients lost. Post-survey data has not yet been analyzed due to insufficient data quantity.

A core challenge in achieving health equity is addressing the specific barriers to care faced by individuals experiencing homelessness. The first year of PNP has provided insight into how implementation of a sustainable community-based program to improve health outcomes among individuals experiencing homelessness can be achieved. The program will continue to serve this population as 53 new medical students are being trained as navigators and will begin in January.

Case Report: Presentation and Management of Novel Post-COVID Psychosis in the Emergency Department

Meghana Reddy

Mentor: Bo Wu, MD, Department of Psychiatry

Background: The SARS-COV-2 infection has potential neurological and psychiatric manifestations. While our understanding of these effects continues to evolve, psychosis as a manifestation acutely after the COVID-19 infection has been reported infrequently. The management of this condition's symptomology and understanding of the neuropsychiatric etiology are still being discovered. We aim to bring more understanding to the symptoms and management of COVID-19 related psychosis through this report.

Case Description: We report the case of a 42-year-old Hispanic woman with a previously confirmed diagnosis of SARS-CoV-2 who presented to the emergency department with depressive symptoms, paranoid delusions, and hallucinations. She had significant insomnia, decreased appetite, and slow thought process. She had excessive thoughts of worries and fears about dying. Her symptoms began two days after being discharged for a two-week long COVID-19 hospitalization that required mechanical ventilation. A neurology team was consulted which assessed for low suspicion for primary neurologic etiology. Acute psychosis due to her COVID-19 infection was suspected due to the proximity of her symptoms to the hospitalization and prior reports of similar presentation. The patient was treated in the emergency department for 5 days. Upon initial presentation, she was given lorazepam and haloperidol. She was given olanzapine the day after and refused medication by the third day. Subsequently, she was transferred to an inpatient unit for further care at a different institution. Follow up with the patient found that she was discharged from the psychiatric unit after a three-day admission with olanzapine, sertraline, and hydroxyzine. Her acute psychosis resolved after a short period of antipsychotics.

Discussion: This case adds to the limited evidence of the manifestation of this psychosis. It corroborates previous reports that state that delusions, specifically paranoid, are the most frequently reported symptom of this psychosis manifestation. Other diagnoses to be considered when assessing for COVID-19 psychosis are major depressive disorder with psychotic features and acute stress disorder. The etiology of cognitive impairment in the post-COVID patient remains unclear, but may be caused by hypoxic insult of brain due to infection-related hypoxia, related medications, or traumatic effect of hospitalization.

Developing a Robotic Surgery Curriculum: Construct Validity Analysis of a Novel Virtual Reality Training Platform

Juan Tellez

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Collaborators: Imad Radi, MD; Rodrigo E Alterio, MD; Madhuri B Nagaraj, MD, MS; Haley B Baker, BS; Daniel J Scott, MD; Herbert J Zeh, MD

Background: Despite the importance of simulation training for developing foundational robotic skills, there is no consensus on a validated training curriculum. Our institution recently implemented a Virtual Reality (VR) skills curriculum for general surgery residents using the novel da Vinci SimNow platform and found it to be feasible, effective, and transferable to robotic inanimate simulation training. A subsequent content validity analysis reduced the number of VR tasks from 33 to 20 and identified 3 inanimate tasks on the da Vinci Xi robot to fill content gaps in the VR curriculum and serve as a bridge to more complex simulation exercises. This study aimed to identify proficiency thresholds for each task through a construct validity analysis.

Methods: Two expert robotic surgeons performed 5 repetitions of each VR and inanimate task. VR task performance was assessed by SimNow's automated scoring formula and inanimate task performance was assessed via a previously validated scoring system utilizing time and errors. The lowest scoring attempt was eliminated, and outlier attempts were excluded. The mean score of the remaining repetitions became the proficiency threshold for each task. Mann Whitney-U test was used to compare the first attempt scores from residents ($n=41$, PGY2-4) in the first iteration of the curriculum to the expert scores to determine if the proficiency score differentiated novices from experts.

Results: Proficiency thresholds were identified for the 20 VR tasks and the 3 inanimate tasks. Comparison of expert performance with historical trainee performance demonstrated that 5 VR tasks did not differentiate experts from novices ($p>0.05$). Two of these tasks were deemed desirable as introductory exercises and retained in the curriculum without proficiency thresholds; two tasks were retained with the identified proficiency thresholds for further data collection; one task was excluded. For the inanimate robotic tasks, 2 standard deviations were subtracted from the mean expert score to determine a proficiency score deemed attainable by trainees.

Conclusion: This construct validity analysis identified 15 VR tasks that differentiated novices from experts and allowed selection of unique proficiency scores for these VR tasks and 3 inanimate robotic tasks. These data provide further validity evidence to support our introductory robotic skills curriculum for general surgery residents.

Radiation Uptake Among Patients with Breast Cancer in Botswana

Chinmayee Venkatraman

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Background: In 2020, female breast cancer ranked as the most commonly diagnosed cancer for the first time, worldwide, and the fourth highest cause of cancer mortality.¹ In Africa, the proportion of cancer deaths (7.2%) exceeds the proportion of new cases (5.7%), influenced by, “the different distribution of cancer types and higher case fatality rates”.¹ In Botswana, breast cancer is the second most prevalent cancer diagnosis, and the government provides free healthcare to its citizens, including radiation therapy (RT).^{2,3} This study aims to determine what proportion of patients with breast cancer who were eligible for radiation therapy actually initiated it.

Methods: We reviewed patients with breast cancer from January 2015 to December 2019, using data from the Princess Marina Hospital in Gaborone, Botswana. Our eligibility criteria for radiation therapy was TNM Stage T ≥ 3 , N ≥ 1 ; AJCC Stage IIB to IIIC; and any patient who had received a lumpectomy. Our focus was patients eligible for curative RT, which was defined as doses ≥ 3000 cGy. This study received Institutional Review Board approval from the University of Pennsylvania and the Ministry of Health in Botswana.

Results: We reviewed 441 records of patients with breast cancer. The mean age of patients was 53.0 years and 56.0% of patients presented with Stage IIIA-C breast cancer. Regarding surgery, 41.0% of patients underwent mastectomies, and 11.3% underwent lumpectomies. Almost half of the patients received chemotherapy (44.4%), and most of the patients presented with a Karnofsky Performance Status of 90-100 (84.1%). The majority of the patients in our study were eligible for curative RT (340; 77.1%). However, of these 340, only 150 (44.1%) went on to initiate adjuvant radiation treatment. The median dose of curative RT received was 4500 cGy and the median boost dose received was 900 cGy. Univariate regression analysis revealed the following variables as significantly associated with initiating RT: Mastectomy ($p < 0.001$); Chemotherapy Received ($p < 0.001$); and Karnofsky Performance Status > 90 ($p = 0.04$).

Conclusions: This study identified a sizable gap in the level of RT uptake among patients with breast cancer in Botswana. Since radiation therapy is covered by the government, eliminating one financial barrier, it is imperative to consider other factors that could contribute to the lack of treatment initiation. These could include distance to the health facility, health literacy, and screening mechanisms to diagnose patients earlier in the disease process, which we will explore in future work.

Evaluating Awareness of Skin Cancer in Skin of Color Organ Transplant Recipients

Jennifer Wang

Mentor: Arturo Dominguez, MD & Rajiv Nijhawan, MD, Department of Dermatology & Internal Medicine

Organ transplant recipients are up to a 65-fold increased risk for developing skin cancer compared to the general population. Skin cancer in skin of color has a different clinical presentation and risk factors such as a higher incidence in sun-protected areas (groin-genital area) and an association with HPV. Additionally, skin cancer in skin of color is associated with higher morbidity and mortality, and currently, more than half of the transplant waiting list is comprised of skin of color patients. Yet, skin cancer prevention resources and efforts are primarily focused on non-skin of color patients. A cross-sectional pilot survey was administered to assess and compare skin cancer attitudes, behaviors, and knowledge especially risk factors and features specific to skin of color in skin of color and non-skin of color organ transplant recipients. 219 of 403 patients completed the survey. For almost all survey items, there was either a knowledge gap or a poor understanding in skin of color organ transplant recipients. Skin of color organ transplant recipients were significantly more likely to never practice skin cancer recommended preventative behaviors, to hold a lower perceived self-risk, to worry less about getting skin cancer, and to have false perceptions about risk factors in either univariable or multivariable analysis. However, they were more likely (38%) to HPV as a risk factor. Additionally, less skin of color organ transplant recipients received dermatologic care even though all organ transplant recipients are referred to dermatology post-transplant due to their high risk for skin cancer. The knowledge gaps identified can guide the development of skin cancer educational resources more comprehensive and relevant to skin of color recipients. This can lead to better outcomes and reduce racial health disparities.

Prevalence and Impact of Left-Handedness on Surgical Training in Dermatology Residency

Jennifer Wang

Mentor: Rajiv Nijhawan, MD; Ravi Patel, MD, Department of Dermatology

The impact of left-handedness on surgeons and trainees has been investigated in some surgical specialties. However, this has not been well described in dermatology. This study will characterize the prevalence and perceived impact of left-handedness on surgical training in dermatology residency and fellowship. Our aim is to collect data about: 1) prevalence of left-handed dermatology physicians and trainees 2) perceived impact of left handedness on surgical training during dermatology residency and fellowship 3) impact of left handedness on surgical technique. By investigating into this, we hope to gain a better understanding on whether there is a need for increased specificity in surgical training for left-handed versus right-handed dermatology residents. An online cross-sectional survey was generated on RedCap and distributed via email to members of the Association of Professors of Dermatology and American College of Mohs Surgery. 191 dermatologists, dermatologic surgeons and trainees completed the survey. From our data, approximately half of left-handed participants have considered changing handedness for surgery. However, the majority of left-handed dermatologists do not have access to left-handed instruments (74.1%), have never used a left-handed instrument (65.5%), or did not receive left-handed specific training for surgical skills (87.9%). Regarding a need for formal laterality-specific training, 50.8% of left and right-handed participants were unsure while 16.2% answered yes. Participants who answered no primarily provided reasons such as practicality (difficulty accessing left-handed instruments) and experience with adapting to right-handed objects. However, participants were more likely to agree that being left-handed in a surgical field is inherently more challenging suggesting that left-handedness is an important issue that should be addressed and supported to some extent in training and practice.

Understanding the Impact of Virtual Medical Education on Medical Student Interest Group (SIG) Participation

Alexa Wilden

Mentor: Samira Syed, MD, Department of Internal Medicine/ Hematology-Oncology

Collaborators: Feroz James; Maishara Muquith; Sofia Yi

Background: One of the first great challenges in a medical student's career is specialty selection. At our institution, student interest groups (SIGs) play a large role in medical students' exposure to different specialties. In response to the COVID-19 pandemic declared in early 2020, medical education transitioned to a virtual format and SIG activities were either limited or eliminated. This study examined the impact of the virtual platform on SIG participation of pre-clerkship and clerkship students.

Methods: 120 medical students at UT Southwestern Medical School were anonymously surveyed in March 2021. Students were asked about demographics, SIG involvement, the impact of SIG events on career interests, and the impact of COVID-19 on SIG involvement. Survey data were analyzed to compare the responses between pre-clerkship and clerkship students.

Results: Of the 116 students who were not MSTP students, 65% (78) were pre-clerkship students, defined as MS1 and MS2 students, and 32% (38) were clerkship students, defined as MS3 and MS4 students. 89% (103) of these students reported participating in a SIG, of which 67% (69) were pre-clerkship students and 33% (34) were clerkship students. 80% (55) of pre-clerkship students reported their specialty interests were impacted by SIG involvement compared to only 53% (18) of clerkship students. Of the 116 MS1-4 students surveyed, only 18% (7) of clerkship students reported having more than 50% of their medical education conducted virtual compared to 92% (72) of pre-clerkship students since March 2020. Interestingly, 54% (42) of pre-clerkship students reported they are less interested in participating in SIGs due to COVID-19, compared to only 21% (8) clerkship students.

Conclusions: SIGs play a larger role in pre-clerkship students' specialty interests compared to clerkship students, partially due to reduced clinical exposure during the pre-clerkship phase of medical school. COVID-19 restrictions resulted in a transition to virtual education, more so for pre-clerkship students. The data showed that during 2020, pre-clerkship students educated largely on a virtual/remote platform, had less interest in virtual SIG involvement. Given that virtual education may be necessary as the state of the pandemic fluctuates, SIGs should attempt to enhance in-person activities and explore ways of enhancing and enriching their virtual platform to maximize student participation.

The Other Side of the Mirror: Improving Students' Simulation Performance and Interest through Simulation Control Room Experiences

Alexa Wilden

Mentor: Krystle Campbell, MS, CHSE, Department of Simulation Center

Collaborators: Lillian Carter BS; Kyle Langston, BS

Background: Simulation has been used in a multitude of high-stakes professions for over 40 years. Simulation has been proven to improve performance at every level of medical education while protecting patients from harm. High-fidelity simulations are now a staple of medical education, and first became available at UT Southwestern in 2018. There are very few experts on high-fidelity simulation. The aim of this project is to introduce students to high-fidelity simulation training from the perspective of an educator and evaluate their interest as well as competency in high-fidelity simulation.

Methods: Ten pre-clerkship medical students at UT Southwestern Medical School participated in an extracurricular, experiential simulation experience. This experience included a lecture on the history, utilization, and development of simulation in medical education. Next, students applied newly gained knowledge to facilitate a high fidelity simulation for their peers. Participants' understanding of and future interest in medical simulation were evaluated before and after the simulation experience via a 20-question anonymous REDCap survey. Participants were interviewed about their understanding of and future interest in medical simulation before and after the simulation activity. Survey data were analyzed using a two-tailed unpaired t-test comparing the aggregate pre- and post-simulation responses of each survey question. Qualitative data were obtained from the interviews in the form of thematic prevalence.

Results: A significant difference was found between the following pre- survey and post-survey responses: I have a good understanding of the pre-brief, simulation, and debrief of a simulation event ($p= 0.004$). I have a good understanding of how a simulation event is developed ($p< 0.001$). I have a good understanding of how simulation events are planned and conducted ($p<0.001$). I have a good understanding of how simulation enhances my training ($p=0.006$). I believe simulation is critical to my education and training as a future physician ($p=0.008$). Qualitative thematic data showed association with the results seen above.

Discussion: This study demonstrated that the intervention of training in and conduction of high-fidelity simulation improved students' understanding of simulation procedures and their recognition of the importance of simulation to their medical education. Interventions such as this can be used on a broader scale to create cohorts of future physician educators more competent in utilizing the power of simulation in medical education.

Simple Measures to Reduce Opioid Prescriptions Following Pediatric Spinal Fusion Surgery: A Multidisciplinary Quality Improvement Project

Andrew Winsauer

Mentor: Brandon Ramo, MD, Department of Orthopaedic Surgery

Collaborators: Charu Sharma, MHA, MS; Stacie Bukowsky, MS, RPh; Sandi Greenberg, RN; Craig Birch, MD

Background: The opioid epidemic is one of the biggest challenges facing modern healthcare. Among the adolescent and young adult populations opioid overdose is one of the leading causes of death.

Local Problem: Within pediatric orthopaedics, spinal fusion is a common procedure making up 7% of the surgical volume at our institution. Spinal fusion also has high postoperative opioid prescribing rates. Review of baseline data showed that there was wide variability in prescribing habits. The goal of this quality initiative was to reduce and standardize post-operative opioid prescribing following spinal fusion procedures.

Methods: Data, including opiate-prescribing habits and a patient survey to assess patient and parent satisfaction with pain control, was collected retrospectively in the pre-intervention phase for 99 consecutive Adolescent and Juvenile Idiopathic Scoliosis patients undergoing spinal fusion surgery. This was followed with 2 PDSA cycles following implementation of a new protocol during which prospective surveys were administered to a total of 273 patients. Physician prescribing data was collected for 150 patients during the sustain phase.

Interventions: A multi-pronged approach was utilized consisting of the following aspects: 1) Instruction to orthopaedic trainees to limit opioid prescriptions to 45 and 40 for PDSA cycles 1 and 2, respectively. 2) A pharmacy-led education program with an opioid tapering handout given to families and encouragement of usage of non-opioid pain control. 3) A call to the prescribing physician from pharmacy if the prescribed dosage was greater than the maximum allowed.

Results: There was a significant reduction in opioid prescriptions from a preintervention mean of 48.5 doses to a PDSA 1 mean of 39.0, PDSA 2 mean of 37.5, and a sustain phase mean of 36.4 ($p=0.000$). This represented an estimated reduction of 22.8% over the course of the study. During this time, there was no significant change in patient and parent reported postoperative pain.

Conclusions: Through simple measures, our institution was able to significantly reduce total opioid prescriptions following spinal fusion surgeries while maintaining good pain control.