

Twenty First Annual Medical Student Research Symposium



Virtual University of Virginia School of Medicine

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Presentation #1

Investigating Exosome-Induced Modulation of Macrophages in Diabetic Wound Healing

Jasmina Abdalla

Almost 75 million patients with diabetes are at risk of developing a diabetic foot ulcer (DFU) in their lifetime. DFUs have a high probability of becoming infected, increasing the health and economic burden many people live with. In the diabetic wound environment, the prolonged elevation of inflammatory cytokines such as IL-1 β and TNF α leads to an unfavorable environment for macrophages (M ϕ), a key cell population involved in modulating wound healing. In normal wound healing, M ϕ infiltrate the wound area and transform from the pro-inflammatory type (M1) to the anti-inflammatory type (M2). However, in diabetic mouse wounds, anti-inflammatory M ϕ are rare but are present following tissue engineering local treatment with multipotent stromal cells or their exosomes. Exosomes are nanoscale extracellular vesicles secreted by all cells and have been shown to promote angiogenesis, cell migration, and re-epithelialization in diabetic wound healing. Our goal is to isolate and study the exosome and macrophage interaction in vitro and to determine whether lack of M ϕ attenuates the wound healing benefit in vivo. In the in-vitro study, bone-marrow derived macrophages (BMDM) from myeloid progenitors in wild type (WT) and LepR^{db/db} mice were polarized into pro-inflammatory M ϕ and anti-inflammatory M ϕ and verified using flow cytometry. In an in vivo time to closure study, we assessed if M ϕ depletion, using clodronate liposomes injected prior to exosome administration, attenuates the exosome treatment-induced excisional wound closure benefit in LepR^{db/db} mice. Following M ϕ depletion in vivo, the exosome treatment did not resolve the severely delayed healing in LepR^{db/db} wounds. Our in vivo results suggest that accelerated wound healing is a direct result of the uptake of exosomes, and ongoing in vitro studies are being done to elucidate if the effect seen is due to a pro-repair or anti-inflammatory polarization shift in the M ϕ of diabetic skin tissue.

Presentation #2

The expression and purification of ETS-Family proteins

Majd About Hosn, Ashish Kabra, John H. Bushweller

Prostate cancer is one of the most common forms of cancer found in men, with up to 11% of men being diagnosed within their lifetime. The ETS-related gene (ERG), a member of the E-26 transformation specific (ETS) transcription factor family, is found to have significant involvement in prostate cancer. ERG fusion with TMPRSS2 has been linked to about 50% of reported cases of prostatic adenocarcinomas (Adamo, 2016). Further, ERG fusion with the EWS gene has also been linked to Ewing sarcoma. Small molecule inhibitors have shown promising results in targeting and inhibiting transcription factors associated with cancer development (Bushweller, 2019) and could be an option for targeting ERG-based prostatic adenocarcinomas as well as Ewing sarcoma. ETS proteins specifically bind to a GGAA/T motif of DNA bases. Binding of various ETS proteins with DNA is regulated by a unique mechanism for each sub-family of the ETS family. ERG binding with DNA is autoinhibited by its N-terminal and C-terminal inhibitory domains that flank the central region. This autoinhibition is unique to ERG and FLI1 members of the ETS family (Regan et al., 2013). These autoinhibition elements provide a promising target for ERG inhibition. Here we discuss the expression and purification of multiple ETS-family proteins, a key step in the development of an ERG-specific transcription factor inhibitor.

Presentation #3

Long Term Outcomes of Patch Angioplasty Maturation (PAM)

Caila Bachmann, Michael H. Parker, MD, Homayoun Hashemi, MD

Background: Autogenous arteriovenous fistulas (AVFs) are considered the ideal access for hemodialysis (HD) in the United States. However, many AVFs fail to mature and may require assisted maturation. The current standard of care for assisted maturation involves endovascular techniques. Such methods have an overall maturation varying from 83-93.9% and an average primary patency at one year of 60-72%. On the other hand, patch angioplasty maturation (PAM) is a novel surgical technique that utilizes a bovine pericardial patch to assist with fistula maturation. It has been demonstrated to have a 92% overall maturation rate, but no studies have yet been published on long-term outcomes or patency. The objective of this study was to assess the long-term outcomes (>1 year) of fistula patency that had undergone PAM procedure.

Methods: A single-center, retrospective cohort study was performed of patients that had undergone bovine pericardial PAM of an AVF that had failed to mature between January 2007 and December 2019. Exclusion criteria included patients lost to follow-up and failure of AVF to mature following PAM. The outcomes of interest were overall patency, primary patency, and secondary patency.

Results: Of 163 patients that underwent surgery for PAM to improve maturation of an AVF during the study period at Inova Fairfax Medical Center, 146 fulfilled the criteria for study. Using a Kaplan-Meier estimator censored for death, kidney transplant, and peritoneal dialysis, the overall patency was a mean of 120 months (9.7 years). The median overall patency could not be calculated due to the majority of patients being censored prior to failed patency. Furthermore, the patency at one year was found to be over 90%. Once final data cleaning has been performed, one-year primary and secondary patency rates for PAM will be calculated.

Conclusions: Patch angioplasty maturation (PAM) has been demonstrated to be a safe potential alternative to more commonly implemented endovascular methods of assisted fistula maturation. Preliminary results indicate that while the overall maturation rates between PAM and endovascular methods are comparable, PAM appears to have a better one-year patency rate of over 90% and higher overall patency with a mean of 9.7 years.

Presentation #4

Preventative Health Measures and Health Literacy of Diabetes of American Indian and Alaska Natives living in Virginia

Brianna Baldwin

According to the CDC, one out of two American Indian and Alaska Native (AI/AN) children born in 2000 will be diagnosed with diabetes in their lifetime¹. In about two out of three Native Americans with kidney failure, diabetes is the cause, and diabetes is the fourth leading cause of death among AI/AN¹. Vulnerable and underserved populations remain the most at-risk for comorbidities and metabolic syndrome, including AI/AN people whose Tribal Nations remain under-resourced in healthcare services and whose people are under-reported in healthcare research²⁻³. This project seeks to understand the prevalence and health literacy of diabetes in

AI/AN populations living in Virginia, home to nine state and federally-recognized Tribal Nations that remain understudied in healthcare research. A community-based participatory research project was conducted after consulting the Healing Eagle Clinic, whose President describes diabetes as a major health concern for their Indigenous-focused patient population. A prevention assessment questionnaire was filled out by self-identifying AI/AN participants living in Virginia at local pow-wows on three major categories: perceptions of health, perceptions of diabetes, and knowledge about the etiology of diabetes. Results showed a general understanding that lifestyle choices, including physical activity and dietary choices, are correlated with healthy living. However, participants sought both orthodox and/or traditional healers only when ill, and do not expect to change their lifestyles unless or until they fall ill. Participants showed a willingness to undergo diabetes screening, despite the perception of diabetes as a worrisome illness that significantly plagues their AI/AN communities. Overall, participants had a general understanding of the symptoms and risk factors for diabetes. Considering community willingness to be screened, community outreach for screening efforts, such as with the Special Diabetes Program for Indians (SPDI), is a supported actionable item from this research. Sample size was encumbered by cancellations of pow-wows due to the COVID-19 pandemic and this will be an ongoing project with development of relationships with Virginia's Tribal Nations.

Presentation #5

Causal Language and Inferences in Observational Hip and Knee Arthroplasty Database Studies Across Four Orthopaedic Journals

Nadim Barakat

Background: The use of administrative databases and clinical registries in lower extremity arthroplasty research is growing. Such observational studies are unable to fully control for confounders and cannot establish causality. However, many authors use causal language when describing their aims or findings, potentially misleading readers. We examined the prevalence of causal language and inferences in the lower extremity arthroplasty literature.

Methods: We systematically identified administrative database and registry studies on hip and knee arthroplasty that were published in 4 orthopaedic journals in 2020. Papers were graded independently by two reviewers for the presence of causal language in both the title and abstract as well as the full text. Chi-squared analyses were conducted to determine the relationship between the causality grading and article characteristics including the journal of publication.

Results: Of 116 eligible articles, we classified 79.3% of titles and abstracts as either consistently causal or inconsistently causal, with only 20.7% as consistently non-causal. 40.5% of full texts were consistently causal, 49.1% were inconsistent, and 10.3% were consistently non-causal. Chi-squared analyses revealed no statistically significant association between the title and abstract's grading and the journal ($p = .720$), nor with the use of a database or registry ($p = .716$).

Conclusion: Causal language and inferences were present in 79.3% of titles and abstracts of lower extremity arthroplasty observational database studies published in 2020. The high prevalence of causal language and inferences in the arthroplasty literature may mislead readers

Presentation #6

Giant Cell Tumor of Bone in the Proximal Tibia of a 96-Year-Old Woman: A Case Report

Nadim Barakat

Background: Giant cell tumor of bone (GCTB) is a generally benign but locally aggressive tumor that most frequently arises in the metaphyseal-epiphyseal area of long bones such as the distal femur, proximal tibia, and distal radius. Clinically, the typical presentation of GCTB is joint pain, swelling, and joint disability. On radiographic findings, GCTB usually appears as a well-demarcated osteolytic lesion with a non-sclerotic border that may involve subchondral bone. GCTB typically affects young adults with 80% of cases in patients from 20 to 50 years old. Cases in patients younger and older than this are quite rare, with less than 10% of cases occurring in adults over the age of 65. Most studies show a higher prevalence in females. There are few reports of older patients with GCTB, with some suggestion that GCTB in older adults may be associated with a less aggressive behavior due to lower recurrence rates. We present a rare case of GCTB in a 96-year-old female's right proximal tibia. To our knowledge, this is the oldest reported patient with biopsy confirmed GCTB by 13 years.

Case Presentation: The patient is a 96-year-old white female with no known history of trauma or malignancy who presented to the orthopaedic clinic for worsening knee pain and difficulty standing and ambulating. She presented shortly after a fall with a painful and swollen right knee with full range of motion. Radiographic imaging revealed a well-defined lytic lesion in the right proximal tibia with no evidence of fracture or dislocation. An MRI showed an area of abnormal marrow replacement with well-circumscribed lobulated margins within the proximal tibia, corresponding to the lytic lesion on radiographs. CT guided needle biopsy yielded a highly cellular lesion comprising of numerous evenly spread osteoclast-like giant cells with interspersed mononuclear stromal cells, consistent with GCTB. Treatment involved a combination of curettes, high speed burrs, and saline lavage to remove pathological metaphyseal tissue. An argon beam laser was used along to extend the intralesional margin, and sterile bone cement filled the cavity. At 19 months of follow-up, the patient has no evidence of local recurrence or metastasis on radiographs postoperatively, and the patient has returned to baseline pain and activity level in addition to demonstrating smooth knee range of motion, normal flexion and extension strength, and balanced gait and stance without any assistive device.

Conclusion: To our knowledge, there are no reported cases of GCTB in the nonagenarian population, making this 96-year-old woman with GCTB in her right proximal tibia the oldest patient ever reported to have primary GCTB by a wide age margin. Her pathology matched the classic clinical, radiographic, and histopathological findings of GCTB, and she has shown no signs of local recurrence or metastasis at nearly 2 years postoperatively. Although very rare in this population, GCTB should be included on the differential diagnosis in elderly patients as this population continues to exponentially grow.

Presentation #7

Evaluating a Computer Vision Fall Detection System in a Simulated Clinical Setting

Nadim Barakat

Background: Falls are the leading cause of accidental injury and death in the United States among older adults. Annual medical costs associated with falls surpassed \$50 billion in 2015 and are projected to reach \$100 billion by 2030 due to aging trends. Reliable fall detection systems offer the potential to improve quality of life and reduce health system costs. In this study, we evaluated an automated video-monitoring and computer vision system designed to detect falls in a controlled, simulated clinical environment.

Methods: 27 healthy adult participants performed eight distinct simulation scenarios, consisting of sits, stands, falls, and other common patient movement patterns. Each scenario was performed five times in a randomized order. Scenarios were recorded by a video capture system of three camera angles and analyzed post hoc by computer vision software. Accuracy, sensitivity, and specificity of the system to properly identify falls were calculated. Analysis was performed both at the level of three individual cameras (“camera”) and a compiled three-camera system (“system”).

Results: In properly identifying fall-scenarios, the system had an accuracy of 87.9% (sensitivity 98.0%, specificity 81.8%). Cameras ranged in accuracy from 87.8% to 88.7% (sensitivity 78.1% to 86.8%, specificity 88.5% to 94.1%). For missed falls, the compiled system detected motion in all scenarios. For false positives detected by the system, 68.7% were attributable to one scenario in which participants sat on the floor.

Conclusion: Fall detection is critical in the care of older adults, particularly in the context of the aging population in the United States. This study demonstrated the pre-clinical viability of a three-camera computer vision system to reasonably identify falls in a simulated clinical setting. Future studies for this system should focus on further testing in various environments and real-time analysis to send alerts to healthcare professionals and caregivers.

Presentation #8

Natural IgA against oxidation-specific epitopes is associated with presence of interstitial lung diseases, worse lung function, and increased symptom burden.

Noora Batrash¹, Eva Otoupalova¹, and Jeffrey M. Sturek¹

Interstitial lung diseases (ILD) are characterized by progressive inflammation and scarring of the lung. Oxidation-specific epitopes (OSEs) are altered self-antigens that have been associated with lung inflammation in animal studies. Natural antibodies against OSEs have been described in various autoimmune diseases; however, no previous study has explored their role in ILD. Prior studies show that IgA is associated with worsening pulmonary fibrosis, but the exact mechanisms are unclear. In the current study, we determined whether elevated anti-OSE IgA correlated with lung function and presence of ILD.

We measured serum anti-OSE IgA in 109 patients with ILD, including idiopathic pulmonary fibrosis, hypersensitivity pneumonitis, non-specific interstitial pneumonia, and connective tissue

disease-associated ILD, and 56 healthy controls. Sandwich ELISAs were used to quantify IgA against OSE-ApoB100 immune complexes (IC) and P1, an OSE mimotope. Pulmonary function was assessed with absolute forced vital capacity (FVC), diffusion capacity for carbon monoxide (DLCO), and subjective symptoms. Total IgA, anti-P1 IgA, and anti-ApoB100 IC IgA were significantly elevated in the ILD cohort compared to age and sex-matched controls ($p=0.0003$, $p<0.0001$, $p<0.0001$, respectively). A significant negative correlation was found between OSE-IgA, FVC ($p=0.032$) and DLCO ($p=0.002$). Elevated anti-P1-IgA ($p<0.001$) and anti-ApoB100 IC IgA ($p=0.017$) were also associated with progressive respiratory symptoms. These results identify serum anti-P1-IgA and anti-ApoB100 IC IgA as possible novel markers of fibrotic interstitial lung diseases and ILD progression.

Presentation #9

Clinical Outcomes of Deltoid Ligament Repair: Barbed Suture vs Suture Anchor

Bellinger, Jeffrey

Purpose/Background: Despite the frequency of ankle fractures with concomitant deltoid ligament injury, there is still paucity in the field of the best way to manage the ligamentous injury. Data published decades ago suggested adequate healing and function with a conservative approach, while more recently repair with suture anchors has also become a common treatment option. A barbed suture deltoid ligament repair is a novel technique that may be noninferior to a more traditional suture anchor approach, with potential to reduce costs and patient complications.

Methods: A single-institution retrospective review of a Level 1 trauma center was performed on patients with ankle fractures and concomitant deltoid ligament disruption treated operatively with barbed PDS suture repair or suture anchor repair between 2012 and 2022. Demographic data, fracture characteristics, intraoperative reductions, additional plate fixation, and post-reduction MCS widening were assessed. Patient follow-up was evaluated including pain, MCS widening, and reoperation at 12-week and 'last known follow-up' in suture repair compared to suture anchor repair.

Results: At three months, MCS widening was apparent on plain x-ray in 0/21 patients (0.0%) in the barbed suture group and 2/12 (16.7%) in the suture anchor group. The barbed suture arm had 6/21 (28.6%) of patients report pain with a mean pain value of 4.67 +/- 2.80 at three months. The suture anchor arm comparatively had 4/12 (33.3%) of patients reporting pain with a mean pain value of 6.33 +/- 2.89 at three months. This was similar to results at last known follow up of 7/21 (33.3%) patients with a mean pain value of 4.57 +/- 3.26 in the suture group and 5/12 (41.7%) patients with a mean pain value of 7.00 +/- 1.41 in suture anchor group. Notably, one patient required reoperation (for screw removal) in the suture anchor group whereas 0 did in the suture group.

Conclusion: Deltoid repair with barbed PDS suture is a viable, cost-effective alternative to suture anchor repair, and results in appropriate clinical reduction intraoperatively and showed no widening of the MCS on radiographs 3 months after surgery. This suture repair effectively reduces and maintains the MCS during healing, while minimizing the cost and need for specialized instrumentation associated with suture anchors.

Presentation #10

Posterior Glottic Stenosis: Analysis of Search Query Quality, Readability, and Understandability

Jeffrey R. Bellinger, BS, Allyson R. Timm, BS

Purpose: Posterior Glottic Stenosis (PGS) is a condition of airway narrowing that occurs most often due to an intubation-related injury. Severity ranges, but PGS can be life-threatening and result in respiratory collapse. Treatment options balance airway, voice, and swallowing outcomes. Shared decision making between the physician and patient is especially critical given the multiple medical and surgical modalities available to treat PGS. Patient access to online information that is clear and at an appropriate reading level can facilitate informed shared decision making. This study aims to assess the quality, readability, and understandability of information about PGS available to patients online.

Methods: The top 50 Google search results for “posterior glottic stenosis” were categorized based on website affiliation and target audience (patient or provider). Readability was assessed using the Flesch-Kincaid Grade Level (FKGL) and the Flesch Reading Ease (FRE) scores. The DISCERN tool was used to assess quality and the Patient Education Assessment Tool for Printed Materials (PEMAT-P) was used to assess understandability and action ability. Simple descriptive statistics were used to analyze the data

Results: 36 of the top 50 results were eligible for scoring. 17% (6 of 36) were classified as patient-focused while 83% (30 of 36) were provider-focused. Patient-focused materials had a higher mean FRE score (36.9) than provider-focused materials (15.5) ($P = 6.30 \times 10^{-6}$). Patient-focused materials had an average reading level of 12.5 compared to 15.8 for provider-focused materials ($P = 7.74 \times 10^{-4}$). There was a significant correlation between overall PEMAT-P and DISCERN ($r = 0.63$, $P = 3.45 \times 10^{-5}$), PEMAT-P understandability and DISCERN ($r = 0.63$, $P = 4.01 \times 10^{-5}$), and FRES and FKGL ($r = -0.67$, $P = 6.65 \times 10^{-6}$).

Conclusions: This study shows that patient targeted PGS information is limited, and the readability, quality, and understandability is overall low. We suggest the development of web pages with PGS information tailored for patient education and search optimization to make this information appear earlier in Google search results. Furthermore, future studies should seek to characterize the link between online health information and socioeconomic-based health disparities.

Presentation #11

Analysis of Amputation-Related Social Media Use: A Thematic Analysis of TikTok

Eoin Bradley, Majd Aboul Hosn, Mackenzi Oswald, Erica Mark, and Brent DeGeorge, MD

Objective: The aim of this study was to understand how TikTok is utilized by the amputee community.

Methods: The study used a cross-sectional, descriptive analysis of 1500 videos using a total of 16 hashtags connected to amputations. Those videos were categorized with up to three core themes using a dynamic theming approach. This approach allowed us to add additional themes

as new theme content was discovered. After collecting the data, we had a total of 16 themes that were consolidated into seven to avoid overlap: information giving and seeking, personal, surgical updates, disability and accessibility issues, prosthetic fit, fitness, and humor. We also captured demographic, qualitative, and quantitative data from the videos. Race was determined either from self-identification by the creator or by each coder's best judgment when not explicitly stated. Within our analysis we took a logarithmic ratio of the number of views over followers, interactions, and days active to conduct our data analysis.

Results: Out of the 1500 videos collected, 513 individual accounts were identified. White creators were featured in the majority of videos (1163 videos or 78%), followed by 153 (10%) videos featuring Black creators, 87 (5%) videos featuring Hispanic or Latino creators, 80 (5%) videos featuring creators of a race of "other", and 17 (1%) videos featuring Asian creators. The most popular theme category was personal (39%). 'Information giving and receiving' had a 1.3x higher likelihood of a greater views-to-days ratio compared to other themes (p-value <0.001), and 'humor' had a 1.4x higher likelihood (p-value <0.001). Users with congenital amputations had a higher incidence of videos using 'humor' as a theme (48%). Video creators of color had a mean ratio of views:days active of 2.26 while White creators had a mean ratio of 2.38 (NS).

Conclusions: Our data suggests that TikTok mostly serves the amputee community as a place to discuss their personal journey with limb loss. Information giving and humor themed videos tended to have more views per day or time that the video was active. Additionally, the finding that users with congenital amputation tend to create videos using humor around their limb loss is particularly interesting given the association between humor and increased viewership over time. People of color having less views over time could be the result of the low number of creators of color, or potentially due to the TikTok algorithm. This is a potential area for additional research to better understand what could be impacting viewership, particularly of creators of color.

Presentation #12

The Effect of High Carbohydrate Diet on Nocturnal Blood Glucose in Type 2 Diabetes

Jessica Bryant

This project analyzes a subset of data from Dr. Basu's larger study HSR22074, the aim of which is to determine the effect of hepatic glycogen stores on nocturnal endogenous glucose production (EGP) in type 2 diabetes (T2D). This analysis focuses on the effects of high carbohydrate diet (HC) vs low carbohydrate diet (LC) on nocturnal glucose levels in people with T2D. The study had a randomized crossover design and included 13 ND and 14 T2D subjects matched for age and BMI with HbA1C (5.3% ± 0.4) vs. (7.1% ± 1.4) respectively. Subjects were studied twice, once in the HC (60% carb, 20% fat, 20% protein) condition and once in the LC (40% carb, 40% fat, 20% protein) condition. Study visits were 3-6 weeks apart to allow for elimination of deuterated water. Subjects reported to the CRU and consumed either the HC meal or LC meal based on the allocated study protocol order. IV cannula was inserted into forearm veins for infusions, and on the contralateral side to obtain blood samples. Primed continuous infusion of [6,6-2H₂] glucose was started at and continued until end of study. Liver glycogen content was measured in the adjacent MRIS research facility using 13C NMR coil on 3T MRI scanner 4 hrs after the meal (fed state) and 12 hrs (fasted state). Plasma samples were collected periodically to measure glucose, [6,6-2H₂] glucose, hormone panel (insulin, C-peptide,

glucagon). Because of the crossover design of the study, paired two sample T-test was used to compare plasma glucose at three time points, with a threshold p-value of 0.05.

Fasting and fed state plasma glucose were not different in ND subjects in the HC and LC conditions ($P=0.48, 0.25, 0.08$), while subjects with T2D in the HC condition had higher plasma glucose levels throughout the night in both the HC and LC conditions ($P_{LC}=0.023, 0.011, 0.004$; $P_{HC}=0.039, 0.034, 0.026$). Plasma glucose levels were not significantly different between subjects with T2D in the HC and LC conditions ($p=0.31, 0.21, 0.33$). HC diet did increase liver glycogen levels in T2D and ND subjects compared to LC diet, but glycogen levels in T2D subjects were still lower than ND levels. Therefore, HC diet intervention to increase hepatic glycogen content did not normalize nocturnal plasma glucose levels in subjects with T2D, despite the increased liver glycogen stores. In conclusion, we would not recommend HC diet with the aim of normalizing liver glycogen levels as an intervention to improve nocturnal blood glucose control in patients with T2D.

Presentation #13

The Impact of Smoking Cessation on Gestational Weight Gain and Infant Outcomes

Rachael Cal

Background: Smoking during pregnancy is a significant public health issue in the United States with consequences for both the mother and infant. Extensive research has documented the harmful effects of tobacco usage in pregnant women such as restricted growth of the fetus leading to small for gestational age babies; but little attention has been paid to weight gain after quitting smoking in pregnant women. One of the top cited reasons for failure to quit smoking and relapse in the general population is the association between smoking cessation and weight gain. Excessive gestational weight gain is common among pregnant women in the US, and this may be exacerbated when quitting smoking. Therefore, the current study seeks to explore the association between quitting smoking among pregnant women in order to understand its effect on gestational weight gain.

Methods: This study is a secondary data analysis from the Virginia Pregnancy Risk Assessment Monitoring System (VA PRAMS) surveys and linked birth certificate data between 2009-2020. Women were asked about cigarette usage in the three months prior to their pregnancy (yes vs. no) and cigarette usage in the last three months of pregnancy (yes vs. no). Women were asked to report in the birth certificate data any weight gain throughout the course of the pregnancy in pounds. Descriptive/bivariate analyses (t-test, ANOVA) and multivariable analyses (multilevel modeling) were conducted using the complex survey module of SAS.

Results: Quitting smoking during pregnancy was associated with increased likelihood of excessive gestational weight gain (odds ratio: 1.87, 95% CI: 1.47- 2.37) compared to those who continued smoking throughout pregnancy. However, mothers who quit smoking during pregnancy had lower likelihood of having small for gestational age babies (odds ratio: 0.54, 95% CI: 0.40-0.71). Sociodemographic factors were not statistically significant predictors of excessive gestational weight gain or small for gestational age babies in multinomial models.

Conclusions: These findings indicate that women who quit smoking are at higher risk of excessive gestational weight gain during pregnancy, and some of this weight is likely retained postpartum, leading to potential challenges in remaining quit postpartum as well as potential

maternal health concerns. However, quitting smoking during pregnancy is beneficial in reducing risk of small for gestational babies. Thus, addressing post-cessation weight gain in pregnant women could be beneficial in improving health outcomes for mothers and infants.

Keywords: PRAMS, Pregnancy, Tobacco Cessation, Smoking, Gestational Weight Gain

Presentation #14

Analysis of Usability Assessments of the Smoking Cessation App quitSTART: How Does Usability Differ Across Participant Groups and Relate to Smoking Cessation?

Chen, Ziyang

Smartphone applications (apps) are a promising and relatively new resource for the numerous and diverse populations attempting to quit smoking in the United States. App usability is an important consideration for the quality of mobile health (mHealth) technology. To our knowledge, no studies that focused on tobacco cessation have compared usability across demographic groups or evaluated usability as a predictor of cessation success. This study uses data from the smoking cessation app quitSTART to characterize 1) usability of the app across various participant characteristics and 2) the correlation between usability and short-term smoking cessation. We found that adults who belong to a racial minority group reported higher usability compared to White adults. We also concluded that higher app usability was positively correlated with successful tobacco cessation, reinforcing the importance of usability testing for mHealth interventions. Taken together, these findings point to the necessity of developing mHealth apps that are usable for all members of their potential audience.

Presentation #15

Identifying the Mutation Responsible for Congenital Heart Disease in a Pediatric Patient

Fatima Choudhary

Background: Congenital heart disease (CHD) is the most common birth defect and cause of death within the first year of life, affecting approximately 1% of live births.^{1,2} Determining the genetic basis of CHD provides patient families a reliable risk estimate in subsequent pregnancies and guides management. The coiled-coil domain containing 40 (CCDC40) gene, essential for cilia formation and left-right patterning, has been implicated in primary ciliary dyskinesia (PCD), an autosomal recessive ciliary disorder strongly associated with heterotaxy and heart disease.^{3,4} The aim of this study was to identify the role of CCDC40 mutations in a pediatric compound heterozygous CHD patient that inherited a distinct CCDC40 mutation from each non-syndromic parent.

Methods: To determine which mutation contributed to disease phenotype, wild-type CCDC40 (WT) was compared with three mutant CCDC40 (MT): maternal, paternal, and compound heterozygous mutations. *Xenopus* was used as an animal model due to its short life-cycle and microscopically visible cilia. The study attempted to identify the effects of each mutation by 1) localizing *ccdc40* to the axoneme, 2) knocking-out CCDC40 and rescuing the phenotype, and 3) pulling-down interacting proteins. Ccdc40 protein was localized by microinjecting WT or MT tagged RNA into 1-cell stage *Xenopus* embryos and visualizing via immunofluorescence to

ensure proper cilia formation and function. The CCDC40 gene was knocked-out with CRISPR and rescued with WT or MT RNA to verify whether each MT could restore left-right patterning and normal D-looping of the heart. Pull-down assays coupled with mass spectrometry were planned to identify interacting proteins that would indicate if each MT protein retained functionality.

Results: Prior to conducting MT trials, WT was tested to ensure it functioned as expected. Localization of both WT CCDC40 -myc and -LAP demonstrated localization at the cilia, though with nonspecific background signal. Knock-out with CCDC40 sg1-Cas9 resulted in decreased survival rate and an average rate of 7.2% abnormal heart-looping patterns (control: 0%).

Conclusions: Though the WT localization had nonspecific signal, the DNA and RNA sequencing results were as expected, suggesting that a different concentration of staining antibody may decrease diffuse signal and improve visualization. Once WT is localized, the same methods may be used on MT constructs. While the knock-out rate with CRISPR was not especially high, it demonstrated that CCDC40 knock-out can result in heart-looping defects, which will allow attempts at rescue in future experiments. Following localization and knock-out/rescue, pull-down assays may be performed to determine interacting partners with each mutant.

Presentation #16

Using telemedicine to implement criteria for appropriate UTI diagnosis in residents of long-term care facilities

Alyssa A. Costello, Amy L. Ryall, M.Ed, Laurie R. Archbald-Pannone, MD, MPH

Urinary tract infections (UTI) are one of the most common diagnoses, accounting for majority of antibiotic use, in residents of long-term care facilities (LTCF). However, due to the high prevalence of asymptomatic bacteriuria in this patient population, many of these antibiotics have been shown to be likely unnecessary. Accurate diagnosis of UTI has an important role in appropriate antibiotic stewardship. The expansion of telemedicine with the COVID-19 pandemic has shown potential for improving care for LTCF residents by providing more opportunities for direct clinical assessment of the patient. Telemedicine could serve as a tool for improved diagnosis of UTIs, but very few studies have examined the evidence to support the use of telemedicine in diagnosing UTI. In this study, we present findings from a literature review to highlight validated criteria for UTI diagnosis and best practices for conducting an assessment of history and physical examination via telemedicine. We also provide evidence-based recommendations for using telemedicine with patients who have communication impairments. Our findings suggest that telemedicine can be a useful tool to apply recommended criteria for the appropriate diagnosis UTI in residents of LTCF.

Presentation #17

Non-Invasive, Real-Time Monitoring of Labored Breathing Indices: Current State of Technology and Future Directions

Valerie Cyphers, Shirang Gadrey, M.D.

Background: Assessment of respiratory status in hospitalized patients is most frequently accomplished through qualitative bedside assessment by a clinician. This approach is error-

prone given the possibility of missing subtle changes during visual inspection, the inability to monitor the patient continuously, and a lack of standardized terminology for describing respiratory distress. Continuous monitoring of respiratory kinematics in critical care settings has the potential to address these issues and improve patient outcomes by providing clinicians with real-time, quantitative feedback on respiratory condition.

Objectives: To assemble a standardized set of respiratory parameters that serve as reliable indicators of respiratory distress and summarize the current state of technology for measuring these parameters. A secondary aim was to determine the extent to which data collected from respiratory monitoring systems has been used to date for prediction of morbidity and mortality.

Methods: Four measures of ventilation that are of interest to clinicians beyond tachypnea were identified through review of the literature: respiratory rate variability, recruitment of accessory muscles, thoracoabdominal asynchrony, and respiratory alternans. A systematic literature search was performed for each of these respiratory variables. Included studies described a device or method to non-invasively measure the respiratory parameter(s) of interest, used the device or method on human subjects, and analyzed data collected from full breath cycles. Studies were excluded if a ventilator was used to collect respiratory data and/or subjects were only assessed during modified breathing patterns such that tidal breaths were not captured. A blinded abstract screen was completed by two independent reviewers, with conflicts resolved by an expert third reviewer. A full text analysis of papers that met inclusion criteria based on abstract and title was then performed. The principal technology used, study type, and number of patients enrolled were documented for each study included in the analysis.

Results: The electronic search resulted in 2,868 abstracts. Based on title and abstract, 2,443 articles were eliminated. At present, full paper review is ongoing, with data extraction completed for approximately 300 studies. Our results to date demonstrate that currently available technologies are studied on clinically stable patients ($n = 5,740$) at a much higher frequency than high-acuity patients ($n = 622$). Only three studies correlated quantified hallmarks of labored breathing with patient outcomes. No devices featured integrated measurement of more than two of the four respiratory signals of interest.

Discussion: Current respiratory monitoring methods may be understudied in the hospital setting, even though utilization of this technology may be of greatest benefit in admitted patients by enabling earlier identification of impending respiratory decompensation. Additionally, there is a need for further investigation into the predictive validity of measured labored breathing indices.

Presentation #18

Controversies in Surgical Approach to Achieve R0 Resections in Primary and Metastatic Liver Tumors

Nakul Dar, BS² Paola A. Vargas, MD¹, Nicolas Goldaracena, MD¹.

Background and Objective: Primary and metastatic liver tumors are a significant cause of mortality worldwide. Regardless of the etiology of the tumor, macro- and microscopically clear margins (R0), while preserving adequate liver function, is the main goal following resection. Currently, there is no consensus on what the ideal minimal safety margin for liver tumor resections should be, with contrasting reports regarding safety, tumor recurrence, and overall outcomes. Therefore, we aim to review current worldwide surgical practices to achieve R0 resections for

primary and metastatic liver tumors in challenging surgical techniques and their reported outcomes.

Methods: PubMed database, Google Scholar, and OVID Medline were searched for peer-reviewed original articles related to surgical techniques for R0 resections in the setting of primary and/or metastatic liver tumors. An up-to-date review of English-language articles published from 2015 to June 2022 was performed.

Key Content and Findings: Primary and metastatic liver tumors can be effectively treated using hepatic resection. Surgical advances have allowed for vascular control techniques, as well as R0 vascular resections, to be performed safely. Complex resections combining surgical techniques can be performed in certain patients after careful evaluation. Liver transplantation has been used with varying degrees of success for the treatment of patients with HCC, CCA, CRLM, non-resectable CRLM and metastatic neuroendocrine tumors.

Conclusions: There should be a balance between patient risk/benefit in attempting R0 resections. Transplant oncology techniques applied to HPB surgery, as well as advanced surgical training, represent a promising path towards improving long-term outcomes for liver-related oncology patients.

Presentation #19

Evaluation of Orthopaedic Resident Sleep Quantity and Quality Using a Validated Questionnaire

DeNovio, Anthony (Tony)

Introduction: Poor sleep quality and lack of adequate sleep are consistently cited as primary reasons for physician burnout. Previous studies on orthopaedic resident sleep habits focused on measurable physiologic variables as proxies for rested state. However, previous studies have not accounted for an individual's personal interpretation of their rested status. There are well established differences in responsibility and expectations as resident's progress through postgraduate years (PGYs), but overarching trends on sleep habits between years are not well established. Therefore, we sought to evaluate longitudinal subjective interpretations of sleep quantity and quality in orthopaedic residents at each PGY level using a standardized sleep assessment.

Methods: From November 2021 to April 2022, we prospectively administered the Pittsburgh Sleep Quality Index (PSQI) once per month to orthopaedic surgery residents. Survey questions included frequency of sleep latency longer than 30 minutes, waking in the middle of the night, nocturia, dyspnea, snoring, feeling cold or hot, bad dreams, pain, sleep medication use, difficulty staying awake, and general enthusiasm. Responses were weighted based on frequency with the minimum of 0 indicating no issue over the past month and the maximum of 3 indicating three or more times per week. These weights were then summated per the PSQI protocol to calculate the global PSQI score, with a cutoff value of greater than 4 to distinguish between adequate and poor sleep. The recorded outcomes included total monthly hours worked, hours of sleep per night, subjective sleep quality, and global PSQI score. A general linear model was created to assess for differences in results between months and between class years. Tukey simultaneous tests for differences of means were done for both time and PGY factors.

Results: Over the six-month period, a total of 63 surveys were obtained with 12, 19, 13, 7, and 12 obtained from PGY 1, 2, 3, 4, and 5 respectively. On average, this cohort worked approximately 72 hours per week and slept for 6 hours per night. There was no significant difference in means for any of the outcomes between months or between class years. Subjective sleep quality was overall rated as “fairly good” but global PSQI scores were 7, above the cutoff value that separates adequate from poor quality of sleep.

Conclusions: Trends in sleep quality were poor, but stable over both time and class year. All classes consistently scored in the “poor” sleep quality range despite abiding to the ACGME 80-hour restrictions. Although the PSQI score suggests generally poor sleep quality, residents did not subjectively rate their sleep quality accordingly. These results suggest that interventions to improve sleep quality for orthopaedic residents remain essential even in cases where residents feel they are well rested.

Presentation #20

Postoperative Pain Score does not Correlate with Injury Severity in Isolated Tibial Plateau Fractures

DeNovio, Anthony (Tony)

Methods: A retrospective review was completed of all tibia plateau fractures at a single institution. After excluding patients with concomitant injury, previous injury to the ipsilateral tibia or knee joint, compartment syndrome, inadequate follow-up, or intraoperative regional anesthesia, 88 adult patients were included in the study. The study groups were based on the AO/OTA classification system, which was used as a proxy for injury severity, with 55 patients in the 41B group and 33 patients in the 41C group. Additional data points to help quantify ‘injury severity’ were also collected including energy mechanism, presence of crush injury, external fixation prior to definitive ORIF, intraoperative tourniquet use, intraoperative tourniquet time, operative time, number of surgical approaches, numbers of plates used, intraoperative meniscus repair, and drain use. The primary outcome measure was the visual analog scale (VAS) pain score (average in the first 24 hours, highest in the first 24 hours, two- and six-week postoperative appointments). These data were further controlled by recording opioid use in the postoperative period including morphine milligram equivalents (MME) administered in the first 24 hours, discharge MME/day, opioid medication refill at or before the two-week postoperative appointment, and reported opioid use at the two-week postoperative appointment. Psychosocial and comorbid factors which might alter pain response were recorded including history of diabetes mellitus (DM), neuropathy, anxiety, depression, post-traumatic stress disorder (PTSD), tobacco, alcohol, drug use, and previous opioid use.

Results: The groups were significantly different in several injury and surgical variables, but were similar in all demographic, comorbid and postoperative opioid factors. VAS scores were similar between groups at each time point except the two-week postoperative time point. At the two-week postoperative time point, the absolute difference between the groups was 1.3. The minimally clinically important difference (MCID) of the VAS in this population has not been established. However, the closest VAS MCID analog in the literature is for total knee arthroplasty (TKA), which was 2.3. The difference seen at two-week postoperative time point falls below this MCID.

Conclusions: This study showed that there was no difference in postoperative pain between AO/OTA 41B and 41C tibial plateau fractures. This supports the idea of providers uncoupling nociception and pain in postoperative patients. Based on this, providers should consider implementing evidence based multimodal analgesia recommendations with a safer risk profile than opioids and minimize extended opioid use, even in more severe injuries.

Presentation #21

The impact of mental health diagnoses on postoperative outcomes following orthopedic surgery for distal radius fractures

Elizabeth Driskill

Background: Approximately 1 in 8 people in the world are living with a mental disorder, and anxiety, depression, and PTSD are some of the most commonly diagnosed.¹ The prevalence of clinically relevant depression in orthopedic trauma patients is even higher, at nearly 45%.² The impact of mental health on patients' perception of pain and function has been demonstrated in numerous studies within the field of orthopedics, as well as specifically in studies related to conditions of the upper extremity.³⁻⁶ Distal radius fractures are one of the most common fractures that occur in adults, and the rate of complications following surgery has been reported to be as high as 39%.⁷

Objective: The goal of this study was to analyze whether there is an association between preoperative mental health diagnoses and post-operative outcomes following surgery for distal radius fractures, as determined by difference in rates of various complications. With a better knowledge of which psychosocial factors may predispose patients to poorer surgical outcomes, physicians and other health care providers in orthopedics will hopefully be able to better address their patients' needs prior to surgery in order to improve outcomes postoperatively.

Methods: This study used the Pearl Diver database to identify patients who underwent open reduction and internal fixation following a distal radius fracture. Patients were divided into subgroups based on those without preoperative mental health diagnoses and those with preoperative mental health diagnoses of either depression, anxiety, or post-traumatic stress disorder. Multivariable logistic regression models were used to compare rates of various complications between the two subgroups.

Results: There was not a significant difference between patients with and without preoperative mental health diagnoses in terms of rates of general postoperative complications or orthopedic-specific postoperative complications, including nonunion, malunion, and revision surgery following surgery for distal radius fractures.

Conclusions: Although there were not higher rates of complications in patients with preoperative mental health diagnoses who underwent orthopedic surgery for distal radius fractures, it is still important to be cognizant of patients' mental disorders and how they could potentially affect their treatment. Further research is necessary to analyze the relationship of other mental disorders not included in this study and postoperative complications as well as to compare rates of complications in patients with treated vs. untreated mental health disorders.

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Presentation #22

The Impact of Socioeconomic Factors in the Management of Traumatic Spinal Cord Injuries: A Retrospective Cohort Study

Elizabeth Driskill and Kristina Kurker

Introduction: Traumatic spinal cord injuries (TSCIs) often necessitate urgent intervention to preserve neurologic function, thus making time to procedure a critical factor in optimizing post-surgical outcomes.¹ Several studies have identified barriers to receiving appropriate care based on socioeconomic status and race,²⁻⁵ though there is currently a lack of research looking at potential biases in time to spinal fixation following TSCI.

Objectives: The objective of this study was to evaluate the impact of socioeconomic factors on the time to surgical fixation in the management of TSCI. Although the optimal timing of surgical intervention for TSCI is controversial, early intervention has been identified as beneficial in several studies. Our primary goal was to identify socioeconomic factors that may delay treatment.

Methods: The present study utilized the Trauma Quality Improvement Program (TQIP) dataset to identify patients aged greater than 18 undergoing spinal fusion for TSCI from 2007-2016. Patients were divided into subgroups based on race and insurance types. Multivariable linear regression was used to compare time to procedure based on race and payer type while adjusting for demographic and injury-specific factors. Significance was set at $p < 0.05$.

Results: Hispanic and Black patients were associated with significantly increased time to fixation of 12.1 hours (95% CI 5.5-18.7, $p < 0.001$), and 20.1 hours (95% CI 12.1-28.1, $p < 0.001$),

respectively compared to White patients. Other cohorts based on racial status did not have significantly different times to fixation ($p > 0.05$). Using multivariable analysis, Medicaid payer status was associated with an increased time to fixation compared to private insurance (11.6 hours, 95% CI 3.9-19.2, $p = 0.003$).

Conclusions: Black and Hispanic race and Medicaid payer status were associated with statistically significant increases in time to fixation following TSCI, potentially compromising quality of patient care and resulting in poorer outcomes. More research is needed to better understand the reason behind these trends and ensure equitable care is being delivered.

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Presentation # 23

The impact of pre-surgical risk factors in rates of hardware removal following tibial tubercle osteotomy

Elizabeth Driskill and Alex Wahl

Background: Tibial tubercle osteotomy (TTO) is a surgical procedure indicated for patients with patellofemoral pain or instability, and/or patellofemoral chondral disease, who have failed conservative treatment.¹ TTO can significantly improve knee pain and tends to have positive outcomes overall, however studies have demonstrated up to 36.7% of patients requiring reoperation for hardware removal.² The rates of other complications, including anterior knee pain, wound infection, tibial fracture, and recurrent subluxation/dislocation, are relatively low.³

Objective: The objective of this study was to investigate what identifiable and potentially modifiable pre-surgical risk factors may lead to higher rates of hardware removal following tibial tubercle osteotomy.

Methods: 291 patients who underwent tibial tubercle osteotomy at UVA between July 2017 and August 2022 were included in this study. Data was gathered in a retrospective fashion. Chart review of these patients was utilized to collect demographic, imaging, and surgical data including age, BMI, anterior tibial soft tissue, gender, smoking status, history of diabetes mellitus, and previous surgery on the ipsilateral knee. Patients were divided into subgroups

based on those who required hardware removal postoperatively and those who did not. Statistics included independent samples t-tests and Chi squared tests to evaluate differences between the two groups.

Results: Patients who required hardware removal following tibial tubercle osteotomy had a significantly lower average body mass index (95% CI 0.33-5.22, $p = 0.027$) compared to patients who did not require hardware removal postoperatively. Otherwise, there were no significant differences between the two groups in terms of other demographic continuous and categorical variables.

Conclusions: Patients with low body mass index could be at higher risk of hardware removal following tibial tubercle osteotomy. Previous studies have shown lower rates of hardware removal with the Elmslie-Trillat technique compared to the Faulkerson technique, and thus it would be reasonable to use the Elmslie-Trillat technique on this higher risk group.² Additionally, more care should be taken in screw selection and placement for patients with lower BMI in order to decrease the risk of complications related to hardware following surgery. Further research is needed to identify other risk factors that may lead to higher rates of complications following tibial tubercle osteotomy.

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Presentation #24

Early identification of frailty risk in community-dwelling older adults with multiple comorbidities: A feasibility and acceptability study

Lindsey Furness, BSE/MSE, MD Candidate; Meghan Mattos, PhD, RN, CNL

Frailty levels are significantly increased in older adults compared to their younger counterparts and can be an important prognostic indicator for predicting health-related outcomes. Current frailty measures used in the clinical setting are subjective and limited to a single time point, but with repeated assessments in homebound older adults, there is an opportunity to measure frailty over time and use this to predict and improve healthcare outcomes. The purpose of this observational study was to investigate frailty in a population of patients enrolled in the Virginia at Home (VaH) program, a home-based primary care program for older adults, using a combination of objective and subjective measures. Subjective measures were collected at home visits at baseline and three weeks and included the Rockwood Clinical Frailty Scale and Katz Index of Independence in Activities of Daily Living (ADL). Wrist-worn actigraphy was used to collect objective measures of sleep and activity to describe frailty. Feasibility and acceptability were assessed using questionnaires and included both patient and caregiver perspectives. Findings suggest that wearing a wrist-worn monitoring device was feasible and acceptable in

this population and may support measurement of objective frailty levels. Future studies should identify critical targets (e.g., sleep, activity) using objective measures collected in real time and clinician assessments to maintain independence and mitigate frailty in this population.

Presentation #25

The Current State of ACE Screening in Virginia General Pediatric Practices

Gaines Megan, Pappas Diane, Wells Kristen

Adverse childhood experiences (ACEs) are experienced by over 40% of children and cause toxic stress that harms cognitive, social, and physical development. Studies have shown that trauma during childhood can lead to adverse health outcomes later in life, including heart disease, diabetes, asthma, weight gain, cancer, and premature death. Currently, there is little consensus on how to best screen for ACEs and what interventions are beneficial for children. Primary care pediatric visits are a promising venue to identify and intervene in ACEs as most children visit a pediatrician and develop a relationship that can foster disclosure and lead to connections between families and community resources. Many barriers exist in implementing ACE screening including time constraints in visits and the need for additional training about ACEs. Resilience factors such as individual traits and having strong and connected relationships with an adult at home or school can protect children from the negative effects of ACEs. Screening for resilience factors as well can help better target interventions.

The objective of this study is to assess current trends in screening for ACEs in Virginia by identifying the frequency of ACEs screening, the resiliency factors most commonly screened for, pediatrician attitudes toward ACEs, and to identify regional differences in screening and resources. Participants in the study are practicing general pediatricians in the state of Virginia recruited through email, letter, and phone to major medical centers, medical schools, private practices, and medical societies. The Qualtrics survey portion of the study is a modified version of the validated 85th Periodic Survey of Fellows used by the AAP in 2013 with context specific questions added that include updated ACEs and resiliency factors. After completion of the survey, participants have the option to select to participate in a ten question semi-structured interview over video call or phone that expands on the reasoning and difficulties behind ACE screening in primary care. Recruitment and data collection are ongoing. We will thematically analyze the interviews to better understand the nuanced reasons providers do or do not provide screening and better understand the difficulties that come in uncovering and properly addressing adverse childhood experiences. Findings from this study will assist in providing a comprehensive picture of pediatric trauma screening in the state of Virginia and provide insight into how pediatricians in different regions are intervening in childhood traumas with the resources they have available to them.

Presentation #26

Progression of Lumbar Deformity after Thoracic versus Thoracolumbar Fusion for Adolescent Idiopathic Scoliosis: Does Length Matter?

Hafey, Alexander

Selective thoracic fusion with a lowest-instrumented vertebra (LIV) in the thoracic spine has gained popularity in the treatment of adolescent idiopathic scoliosis (AIS) as a means of preserving spinal mobility. However, there is concern that the less rigid construct may increase the risk of postoperative lumbar curve progression and a poor outcome. We retrospectively compared the 5-year longitudinal outcomes of patients with AIS treated with fusion to a lumbar LIV (L-LIV) to those who underwent fusion to a thoracic LIV (T-LIV). We found that while T-LIV led to a smaller correction of the lumbar curve and, therefore, greater residual deformity, there was no significant progression of lumbar deformity in either group or change in the between-group difference in deformity. These findings indicate while selective thoracic fusion results in a smaller correction of deformity, the less extensive construct is effective in halting curve progression. The results of our study challenge existing concerns about the risk of curve progression with T-LIV fusion and suggest that, in appropriate candidates, fusing to a more cranial LIV may provide adequate stability without compromising on stability.

Presentation #27

5-year Longitudinal Outcomes of Thoracic versus Thoracolumbar Fusion for Adolescent Idiopathic Scoliosis: Deformity, Flexibility, and Health-Related Quality of Life

Hafey, Alexander

Spinal fusion is the mainstay of surgical treatment for adolescent idiopathic scoliosis (AIS). While recent advancements in surgical techniques have led to improved outcomes with respect to deformity and quality of life, loss of spinal flexibility in the fused segments remains a concern. Selective thoracic fusion preserves mobility at the expense of greater residual deformity and increased risk of coronal decompensation. To date, no studies have compared the long-term radiographic, clinical, and patient-reported outcomes of selective and non-selective fusion. We conducted a large, retrospective analysis of the 5-year longitudinal outcomes of patients with AIS who underwent spinal fusion. Our study found that thoracic fusion leads to greater preservation of spinal flexibility and larger residual deformity. However, there were no significant differences in patient-reported outcome scores for health-related quality of life over 5 years of postoperative follow-up, and no curve progression was observed in either group. These findings confirm the mobility-sparing benefits of selective thoracic fusion and suggest that the greater residual deformity does not noticeably hinder quality of life.

Presentation #28

Percutaneous Ultrasonic Tenotomy for Refractory Chronic Plantar Fasciitis – A Retrospective Study

Hafey, Alexander

Chronic plantar fasciitis is the most common cause of chronic heel pain and a major cause of morbidity nationwide, affecting nearly 10% of the US population. While most cases respond well to conservative therapy, refractory plantar fasciitis remains an unsolved problem despite the numerous treatment modalities that have emerged over the years. Percutaneous ultrasonic tenotomy is a new, minimally invasive procedure wherein the plantar fascia is partially released using focused ultrasound delivered via a percutaneously inserted probe under local anesthesia. While the treatment has shown promise, there is a scarcity of literature evaluating its efficacy and safety. We performed a retrospective analysis of patients with refractory chronic plantar fasciitis who underwent the Tenex® procedure. All patients reported a reduction in pain, none required subsequent surgery for their condition, and there were no major complications or adverse events. Our results indicate that the Tenex® procedure provides a safe, effective, and well-tolerated treatment option that may reduce the need for more invasive surgical intervention.

Presentation #29

Arthroscopic Resection of a Symptomatic Bennett Lesion in a College Baseball Pitcher

Hafey, Alexander

Background: The Bennett lesion is a reactive exostosis of the posteroinferior glenoid commonly seen in overhead throwing athletes. Bennett lesions are typically asymptomatic, but are strongly associated with internal impingement and posterior labral injuries. In severe, refractory cases, arthroscopic resection offers a means of improving symptoms and restoring function.

Case: A healthy, 19-year-old male collegiate baseball pitcher presented with a two-year history of progressively worsening right shoulder pain and loss of pitch velocity. Imaging revealed a evidence of internal impingement and a posterior labral tear with a large Bennett lesion abutting the posterior labrum. The lesion was visualized arthroscopically and resected using a burr and shaver, the posterior labrum was repaired with suture anchors, and the capsular defect was not repaired in order to preserve range of motion. There were no immediate complications and the patient experienced resolution of pain and return to pre-injury performance baseline.

Conclusion: Bennett lesions of the shoulder are relatively common in overhead throwing athletes, and may cause internal impingement or labral injury. In such cases, shoulder arthroscopy provides both an accurate diagnosis through direct visualization and a means of treatment through resection. Further studies are needed to better elucidate the effectiveness of this technique and its ability to provide durable symptom relief and return to sport.

Presentation #30

Hypertension Education and Personal Goal Setting for Rural Patients

Emma Harrison

Uncontrolled hypertension significantly increases a patient's risk for severe medical complications, but it has been proven that modifiable lifestyle factors such as a heart healthy diet, physical activity, proper medication adherence, and limited alcohol and tobacco use can significantly lower these risks (Pruthi, 2021; Yusuf et al., 2004). However, these modifiable factors are disproportionately failing to reach rural communities (Singh & Sighpush, 2014a). The Hypertension Education and Personal Goal Setting program will bridge this care gap by recruiting medical students as community health volunteers to meet one-on-one with patients from rural Virginia who have high blood pressure. The program will consist of a four-week curriculum to teach patients about hypertension basics and lifestyle changes that can improve hypertension management, and individually support them in setting and achieving realistic health behavior change goals.

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Presentation #31

Clinical Features of Diffuse Glioma Molecular Subtypes in Accordance with the 2021 WHO CNS5 Classification: A Retrospective Analysis

Andrew How, BA

Objective: To determine and compare the demographic and presenting signs and symptoms of patients with newly-diagnosed IDH-mutant astrocytoma Grades 2 to 4, IDH-mutant 1p/19q codeleted oligodendroglioma Grade 2 and 3, and IDH wild type glioblastoma Grade 4.

Main Outcome Measures: age, gender, glioma diagnosis, neurological signs and symptoms at initial presentation, and duration of symptoms.

Results: A total of 697 patients were included for analysis from a retrospective chart review. Chi-squared analysis demonstrated significant difference in the rate of seizure presentation between patients with oligodendroglioma, astrocytoma, and glioblastoma ($P = 8.8 \times 10^{-7}$).

Conclusions: Differences in the rates of seizure presentation were seen between glioblastoma, astrocytomas, and oligodendrogliomas, but no differences in the rate of presentation of headache or cognitive impairment were observed.

Presentation #32

Pre-visit factors affecting the duration of IR procedure visits

Christine Huynh, Jordan Bagnall, Danita Massie, James Patrie, Daniel Sheeran, John Angle

Purpose: Despite the relatively low-risk and routine nature of interventional radiology procedures, procedure-visit duration is variable, complicating room utilization and staffing. The purpose of the study was to assess the impact of pre-visit choices on the duration of pre-procedure, intra-procedure, post-procedure, and total visit duration for patients undergoing interventional radiology procedures.

Materials and Methods: At a single institution, between June 6 and July 20, 2022, nurses recorded relevant visit timestamps using a combination of handwritten forms and the Hi-IQ scheduling software. Variables including inpatient versus outpatient, completed pre-arrival consent (routinely obtained for patients that had a prior office visit), the need to obtain same-day bloodwork, the type of pain management, procedure type, and operator type (physician assistant (PA) versus resident) were extracted from each case's electronic medical record. Times were analyzed by way of linear mixed models.

Results: Completed time durations were collected for 498 visits. For all visits, preparation time averaged 80.7 minutes (SD=52.6), procedure time averaged 77.2 minutes (SD=52.8) and recovery time averaged 42.7 minutes (SD=59.3). For preparation time, outpatient status (+46 minutes [95% CI: 37.9, 54.2], $p<0.001$), completed pre-arrival consent (-34 minutes [95% CI: 23.8, 44.3], $p<0.001$) and the use of anesthesia (+24 minutes [95% CI: 10.11, 38.7], $p<0.001$) made a significant difference, while the need for bloodwork did not ($p=0.955$). For procedure time, the use of anesthesia (24.4 minutes [95%CI: 10.11, 38.68], $p<0.001$), sedation compared to only local anesthetic (+37 minutes [95% CI: 28.9, 45.0], $p<0.001$) and the type of procedure (e.g. mean 20.0 minutes for a upper extremity venogram to 186.3 minutes for a runoff with atherectomy or stent ($p<0.001$)) were significant. For PICC and tunneled line placements, PAs provided a shorter procedure time than residents (PICC, -13.5 minutes [95% CI: -19.16, -7.91], $p<0.001$; tunneled line placement, -11.31 minutes [95% CI: -19.1, -3.53], $p=0.005$) but no difference in total visit time ($p=0.853$ and $p=0.857$); they had similar procedure ($p=0.365$) and total visit times ($p=0.885$) for port placements.

Conclusion: Differences in the availability of a pre-procedure consent, the choice of pain management, procedure type, and the selective application of PAs significantly impact pre-procedure and procedure time. Among these variables, the completion of pre-procedure consent prior to patient arrival appears the most easily modifiable.

KEYWORDS: quality, procedure preparation, resource utilization

Presentation #33

Tribalism in the workplace: a survey of perceptions on the causes for IR procedure delays

Christine Huynh, Jordan Bagnall, Danita Massie, James Patrie, Daniel Sheeran, John Angle

Purpose: Many interventional radiology practices suffer procedure-start delays worsened by staff shortages. To assess the relationship between staff role and perceived sources of delay throughout a procedure visit, a multidisciplinary interventional radiology survey and analysis were performed.

Materials and Methods: A Qualtrics questionnaire was distributed to the interventional radiology and anesthesia department at a single institution. Respondents were asked to indicate their staff position and rank a list of eight sources of pre-procedure delays and five sources of intra-procedure delays as most common and again as most lengthy. The provided sources of delays were chosen by the authors based on observation. Inter-staff comparisons of their ranks for causes of delays were statistically examined by way of the Kendall Tau statistics.

Results: A total of 47 responses were collected from 5 faculty, 5 advanced practice providers, 9 residents, 13 nurses, 5 technologists, 1 patient care tech, 6 anesthesia faculty, and 11 certified registered nurse anesthetists.

There was a negative correlation between IR faculty and residents compared to all other IR staff for the most common causes of pre-procedure delays (-0.75 [95% CI: -1.0, -0.18]) ($p=0.009$), with physicians indicating room availability and anesthesia availability and all other IR staff indicating waiting for the attending to see the patient and availability of pre-procedure note and consent. There was a negative correlation between anesthesia and IR team members for the source of the most lengthy pre-procedure delays (-0.75 [95% CI: -1.0, -0.18]) ($p=0.009$), with anesthesia indicating IR physician availability and IR team members indicating waiting for anesthesia. IR techs and nurses also had diverging views on the most lengthy pre-procedure delays (-0.75 [95% CI: -1.0, -0.18]) ($p=0.009$).

Conclusion: There are significant differences of opinion about the most common and lengthy sources of pre-procedure delays when comparing staff groups. It appears that each group has a tendency to ascribe the majority of delays to members of other staff roles, which could lead to tension between groups. These tensions should be investigated as an intervention point to promote greater inter-colleague empathy, communication, and teamwork, and as a result, better efficiency and quality of care.

Presentation #34

The Impact of Patient Demographics, Distance from Home, and Socioeconomic Status on IR Procedure Visit Duration

Christine Huynh, Jordan Bagnall, James Patrie, Danita Massie, Luke Wilkins, John Angle

Purpose: Patients of different race, ethnicity, primary language, and socioeconomic status may suffer delays in IR procedures due to implicit bias. One-on-one nursing and Spanish-speaking

nurses on staff may help prevent disparity in IR peri-procedure care. To further understand the impact of patient characteristics on care, an analysis of visit times was performed.

Materials and Methods: At a single institution, with one-on-one nursing for IR patients and 1-2 Spanish-speaking nurses during most procedure days, between June 6 and July 20, 2022, nurses recorded relevant visit timestamps using a combination of handwritten forms and the Hi-IQ scheduling software.

Age, race, ethnicity, marital status, primary language, sex, and address were imported from the electronic medical record. Home addresses were used to calculate distance in miles from the hospital and the corresponding national and state Area Deprivation Index (ADI) as a proxy for socioeconomic status. Relationships between the patient demographic variables and visit times were examined by way of linear mixed models.

Results: There were 788 patient visits during the study period and complete demographic data were available for 779 (98.9%). Of the analyzed demographic information, none were found to significantly contribute to average preparation, procedure, or total visit time including: age above 75 (preparation time, $p = 0.411$; procedure time, $p = 0.535$), race other than white or caucasian (preparation, $p = 0.155$; procedure, $p = 0.358$), Hispanic ethnicity (preparation, $p = 0.580$; procedure, $p = 0.977$), marital status (total visit, $p = 0.993$), non-English primary language (preparation, $p = 0.994$; total visit, $p = 0.552$), non-male legal sex (preparation, $p = 0.974$; procedure, $p = 0.406$), lower ADI national rank (preparation, $p = 0.113$; procedure, $p = 0.288$), and address further from the hospital (preparation, $p = 0.279$; procedure, $p = 0.360$).

Conclusion: In a single mixed inpatient and outpatient interventional radiology practice, age, race, ethnicity, marital status, primary language, legal sex, socioeconomic status, and distance from care did not affect patient preparation time, procedure time, or total visit time, supporting that important demographic differences can be mitigated in IR procedures and periprocedural care.

Presentation #35

Utilization of Radiomics to Predict Radiation Associated Cardiovascular Morbidity in Lung SBRT

Knechel, Martina

Purpose: SBRT for early lung cancers is now considered standard of care for some patients, but there is increasing evidence linking long-term cardiac toxicity with cardiovascular dose. While the dose constraints for aortic radiation exposure are still unclear, there is accumulating data that higher aortic doses can be associated with mortality. Our study explores the link between central thoracic radiation and early radiomic changes, determining if these radiomic changes are associated with relevant cardiovascular toxicity. This information will allow us to identify the most relevant dosing information for a variety of central thoracic organs in predicting cardiovascular toxicity from SBRT to lung.

Methods: We analyzed 28 patients who received SBRT to lung tumors with curative intent. Pretreatment and post treatment contrast enhanced diagnostic CT scans were accessed. The following structures were manually contoured: aorta, vena cava, pulmonary artery, heart, L atrium, R atrium, L ventricle, R Ventricle, and septum. For this analysis, the aorta was divided

in to 10 equal sections along the inferior/superior direction. To ensure that the contours precisely defined the aorta wall, “first order mean”, a radiomic feature comparable to the Hounsfield Unit (HU), was employed. The desired range in HU value was defined as 12.2 to 180.5 to include soft tissue and noncalcified plaque and greater than 234.8 to include calcified plaque. We excluded HU values from 180.5 to 234.8 to avoid voxels that defined the aorta lumen and values below 12.2 to avoid voxels that defined the lungs. Contours were also normalized to blood radiomic features of the Z aorta to remove impurities coming from different CT scanner parameters, as well as patient and image contrast variance. 107 radiomic features were extracted for each section of the aorta wall for all 28 patients. (Mean value /standard deviation >10) between patients was used as a criteria to determine the useful and stable features. Dose dependent aortic wall volumes for 28 pre and post (up to 4.5 years post) treatment contrast enhanced CT scans were evaluated for radiomic feature changes with dose.

Results: Only 6 radiomic features were deemed stable according to our radiomic feature analysis between patients across all 10 sections of the aortic wall. These include 2 Gray-Level Co-occurrence Matrix (GLCM) features, 1 Gray Level Dependence Matrix (GLDM) feature, 1 Gray-Level Run-Length Matrix (GLRLM) features, and 2 Gray Level Size Zone Matrix (GLSZM) features. Early results indicate that no statistically significant radiomic changes of these 6 parameters were observed post SBRT to lung up to 4.5 years even with a dose of 67 Gy to the aorta. These observations were confirmed by the patient’s clinical status.

Conclusions: Preliminary analysis suggests that radiomic features for contrast enhanced CTs could be used to evaluate the absence of radiation damage to cardiovascular structures.

Presentation #36

Impact of Histopathological Classification of Non-Functioning Adenomas on Long Term Outcomes: Comparison of the 2004 and 2017 WHO Classifications

Jacob Kosyakovsky¹, Ajay Chatrath², Parantap Patel³, Jungeun Ahn¹, Mazin Elsarrag⁴, Lena C. Young⁵, Angela Wu⁵, Jennifer D. Sokolowski¹, Davis Taylor⁶, John A. Jane Jr¹, M. Beatriz S. Lopes¹

Outcomes of patients with non-functioning pituitary adenomas categorized using the 2004 and 2017 WHO classification systems are understudied. We report outcomes from the University of Virginia of patients with non-functioning pituitary adenomas categorized using both systems. We constructed a database from all 239 patients who underwent resection of a non-functioning pituitary adenoma between 2003 and 2015 and had at least five years of follow-up. Pathologic diagnosis was determined under both the 2004 and 2017 WHO classification systems. We compared the rates of recurrence and progression between subtypes using univariate and multivariate Cox regression analyses. We found that nearly 30% of the tumors in our database were classified as null cell adenomas under the 2004 classification system, whereas only 10% of the tumors were classified as null cell adenomas using the 2017 classification system. Most of these tumors were reclassified as either corticotroph or gonadotroph adenomas. Despite our relatively large cohort and average follow-up of nearly nine years, we did not detect a significant difference in recurrence and progression between subtypes. In summary, the majority of null cell adenomas diagnosed under the 2004 WHO classification system are reclassified as gonadotroph or corticotroph adenomas under the 2017 WHO classification system. Rates of progression and recurrence between subtypes are not as different as previously believed at our institution and require a larger cohort to further investigate

Presentation #37

Patient-Reported Outcomes following Focused Ultrasound Thalamotomy for Tremor-Predominant Parkinson's Disease

Jacob Kosyakovsky¹, Georgios A. Maragos², Patricia Zhao¹, Kathryn N. Kearns², Shelly Rush-Evans², Shayan Moosa², W. Jeffrey Elias²

Magnetic resonance-guided focused ultrasound (MRgFUS) has emerged as a precise, incisionless approach to cerebral lesioning and an effective alternative to neuromodulation in movement disorders. Despite landmark clinical trials, data on long-term patient-centered outcomes following MRgFUS for tremor-predominant Parkinson's Disease (PD) are relatively lacking. In a retrospective study of patients who underwent MRgFUS thalamotomy for management of tremor-predominant PD at our institution from 2015 to 2022, we administered a patient survey to collect self-reported measures of tremor improvement, tremor recurrence, global impression of change, and procedural side effects. Patient demographics, methodological FUS parameters, lesion characteristics, and post-operative MRI findings were analyzed to assess their association with clinical outcome. A total of 29 patients with tremor-predominant PD who underwent MRgFUS thalamotomy were included with median follow-up of 16 months. Immediate tremor improvement was achieved in 95% of patients. Tremor control was durable as 70% of patients reporting meaningful clinical change at last follow-up with an overall mean of 75% tremor improvement. Higher peak and mean sonication temperatures were associated with lower tremor recurrence rates. Long-term side effects were reported by 9 patients and were mostly mild. Performing a secondary anteromedial lesion to target the pallidothalamic tract was associated with higher rates of speech-related side effects (56% vs 12%), without significant improvement in tremor outcomes. MRgFUS thalamotomy is an effective, durable, and well-tolerated approach to improve tremor and quality of life in tremor-predominant PD. Extended lesioning to target the pallidothalamic tract does not appear to improve tremor control and may contribute to greater frequency of postoperative side effects related to motor and speech function.

Presentation #38

A Review of the AraC/XylS Family of Proteins and its Regulators in *Escherichia coli*

Nidhi Kuchimanchi

Acute diarrhea is one of the top five causes of death in children under five years of age despite improvements in sanitation and public health campaigns. A bacterial organism that is widely associated with childhood diarrheal illnesses is *Escherichia coli*. *E. coli* has developed diverse mechanisms to cause disease. These mechanisms include, but are not limited to, the formation of biofilms, adhesion to host cells, secretion systems, and multi-drug resistance. These processes are mediated by virulence factors. Developments in high-throughput sequencing and collective genomic databases have led to the identification of complex regulatory pathways involving virulence and pathogenicity. Examples of these protein regulators in *E. coli* include the AraC/XylS family, the H-NS family, and the AraC Negative Regulators (ANRs). Despite the improvements seen in public health measures, it is crucial that research into specific *E. coli* virulence pathways be conducted to decrease the morbidity and mortality of childhood gastrointestinal disease. Here, we present a brief review of the AraC/XylS protein family, H-NS

proteins, and the ANRs to gain a better understanding of the complex regulatory mechanisms that dictate childhood diarrheal illness caused by *E. coli*.

Presentation #39

A protocol for the use of artificial intelligence analysis of edema patterns to assist with diagnosis, prognostication, and guidance on the development of treatment plans for metastatic brain cancer

Kristina Kurker and Grant Sutherland

Introduction: Despite advances in therapies, the prognosis for brain metastasis remains poor. There continues to be a paucity of information on the relationship between tumor-associated vasogenic edema and patient survival.

Objective: Our aim is to use artificial intelligence (AI) to analyze cerebral edema patterns of brain metastases to improve diagnostic efficiency and prognostic accuracy as well as provide guidance on designing optimal treatment plans for patients with metastatic brain cancer.

Methods: Our study will include all patients diagnosed with CNS metastases who underwent neurosurgical intervention between the years 2010-2021. Data will be collected from Epic and de-identified. Data points of interest include the following: demographics, comorbidities, family cancer history, personal cancer history, primary cancer diagnosis, date of diagnosis with cranial metastasis, the presence of metastasis outside the CNS, number of cranial metastases, location of metastases, leptomeningeal invasion, laterality, presenting symptoms, Eastern Cooperative Oncology Group Performance Status Score (ECOG), Karnofsky Performance Scale (KPS) Index, date and type of neurosurgical procedure, steroid treatment, chemotherapy treatment, cranial radiation therapy, Gamma Knife surgery, and date of death.

Outcomes: Outcomes of interest include: 1) Time (in months) from primary cancer diagnosis to CNS diagnosis, 2) Time (in months) from CNS diagnosis to surgery date, 3) Survival time (in months) from brain cancer diagnosis to time of death 4) Change in KPS and ECOG scores after surgery.

Conclusions: In the next stages of this project, the imaging data will be analyzed for trends in vasogenic edema in hopes of developing AI to aid in diagnosis, prognostication, and treatment planning. This software, if effective, may help in improving survival and quality of life for patients with metastatic brain cancer diagnoses.

Presentation #40

Gender and Authorship Trends in Academic Neurosurgery in the United States

Kristina Kurker and Patricia Zhao

Introduction: Despite women representing ~20% of the national neurosurgical resident cohort, only ~10% of academic neurosurgeons in the United States are women. Publication of scientific literature contributes to advancement in academic neurosurgery.

Objective: We measured authorship trends of academic neurosurgeons to query publication differences as an explanation for the discrepancy of female representation in academic positions.

Methods: Physician data were obtained from program and individual physician webpages. Annual total, first author, and senior author publications were recorded for each neurosurgeon over 1980-2020 (<https://pubmed.ncbi.nlm.nih.gov>). Mean publication number as a function of year relative to residency graduation was calculated for all, first author, and senior author publications for all time points with >50 individuals. Mean first years of publication were compared using unpaired two-tailed t-tests. Slope of publication for senior author and all publications were calculated using individual best fit lines from years 0-10 relative to residency graduation.

Results: 1601 faculty members were evaluated (female=167[10.4%], male=1434[89.6%]). First author publication for females peaked at 0.60 publications/year, and for males at 0.80 publications/year, both at -1 year from graduation ($p=0.038$). Female first publication occurred earlier (-2.4 years vs. 1.45 years; $p<0.00001$). Mean increase in all publications/year from years 0-10 was 0.25 for females and 0.28 for males ($p=0.68$). Increase in senior publications/year was 0.11 for females and 0.13 for males ($p=0.39$). The ratio of total publications to Scopus *h*-index was 3.08 for females and 3.62 for males ($p=0.07$).

Conclusion: These data suggest women begin publishing earlier but have fewer first author publications at -1 year, the time point of peak publication for both genders. There was no significant gender difference in the rates of first author and all publications over years 0-10. The ratio of publications to *h*-index did not differ significantly but showed a trend suggesting women produce higher impact articles and may need fewer publications to achieve the same change in *h*-index.

Presentation #41

Comparing rates of postpartum depression before and after the start of the COVID-19 pandemic

Emily Labruna

The rapid emergence of the COVID-19 pandemic resulted in unexpected social isolation and a myriad of other stressors for new mothers. The objective of this study was to determine whether measures of postpartum depression, including Edinburgh Postnatal Depression Scale (EPDS) scores, new postpartum mental health treatment rates, and breastfeeding rates, may have changed in the context of the COVID pandemic. We collected this data, as well as demographic information, partner status, parity, postpartum diabetes screening rates, and maternal mental health history, from the electronic medical records of patients presenting for postpartum care at UVA in the same 3-month period (March-May) in 2019, 2020, 2021 and 2022. The median EPDS score was the same in each year, and there was no statistically significant change in rates of new mental health treatment or breastfeeding. Although it was expected that these measures would indicate higher rates of postpartum depression due to the added stress of the pandemic, we did not observe changes in any of these primary outcomes.

Presentation #42

A pilot study for validation of clear cell likelihood scores in cT1a small renal masses with multiparametric magnetic resonance imaging

Moritz J Lange ,Katherina Y Chen*, Jennifer M Lobo, Jessica X Qiu, Drew Lambert, Ayman Mithqal, Bethany J Horton, Tracey L Krupski, Noah S Schenkman

Renal tumors are among the 10 most common malignancies, and account for nearly 14,000 deaths per year. All renal tumors begin as small renal masses; however, most renal masses found on radiology are incidental with low metastatic potential. Therefore, to determine benign versus malignant SRMs, serial imaging is employed to monitor the evolution of the mass. Masses with malignant behavior are then biopsied for diagnosis. Notably, of the many renal malignancies, clear cell renal cell carcinoma (ccRCC) has a more aggressive phenotype than other subtypes necessitating its early diagnosis. Interestingly, due to its pathology, ccRCC exhibits unique radiographic findings. However, the efficacy of imaging has yet to be established. As such, this study investigated the use of multiparametric magnetic resonance imaging (mpMRI) as an alternative to biopsy for differentiating ccRCC. Using an IRB-approved SRM database, we reviewed patients with cT1a small renal masses who received a pre-treatment mpMRI within one year of a pathological tissue diagnosis at a single institution between 2015-2021. Two blinded radiologist retrospectively assigned each renal mass a ccLS score based on the first version of the published algorithm. 70 mpMRIs were considered with 33 being ineligible to score (8 cystic, 7 macroscopic fat, 18 inadequate imaging). Tissue diagnosis was determined by surgical removal or biopsy. Among the 37 patients scored, a cut point of ccLS4 provided 65.9% sensitivity, 76.7% specificity, 80.6% positive predictive value, and 60.5% negative predictive value and a Cohen's kappa of 0.317. In closing, ccLS scoring provides a promising methodology for diagnosing ccRCC; however, further optimization is needed.

Presentation #43

Characterization and Outcomes of Iatrogenic Urinary Catheterization Injuries

Jack D Lawton, Alexander J Henry, Caleigh E Smith, David E Rapp.

Introduction and Objective: Iatrogenic injury during urinary catheter placement is a common reason for inpatient urologic consultation and has been associated with increased morbidity and resource utilization. Literature defining the patient population, interventions, or outcomes associated with traumatic urinary catheterization (UC) is scarce and requires further exploration to justify and guide development of new strategies for prevention. This study presents a single-hospital experience of iatrogenic UC injuries with focus on patient characteristics and complications.

Methods: We performed a retrospective review of prospectively collected data related to 300 consults for adult urethral catheter placement at a single tertiary care center between July 2017 and December 2019. Traumatic UC was defined as catheterization attempts by the primary team with one of these conditions: gross hematuria, blood at the meatus, or cystoscopic evidence of urethral trauma. Traumatic removals were excluded. Characteristics collected included urologic history, catheterization circumstances, procedural intervention, and resource utilization.

Results: Ninety-eight total injuries were identified. Median patient age was 70.5 years and 100% were men. Forty-eight patients had a Charlson Comorbidity Index ≥ 5 . Seventy-six patients had notable urologic history, including BPH, TURP, prostate cancer, and chronic catheterization. Eighty-seven injuries occurred with two or less primary team catheterization attempts. Forty-nine, thirteen, and two patients developed gross hematuria, CAUTI, and urosepsis respectively. Two patients developed acute urinary retention secondary to retained blood clots, requiring OR removal and suprapubic tube placement. Complications required an additional 12 ICU and 10 floor admission days, as well as 74 outpatient urology visits and 10 return ED visits.

Conclusions: Traumatic UC is an infrequent event that is associated with increased need for procedural intervention, risk of significant morbidity, and additional resource utilization. There is an identifiable patient subgroup that may be targeted in future interventions. Injuries were incurred throughout all units of the hospital, and did not require multiple missed attempts. Additionally, while most patients had relatively benign hospital courses, there was a small subset of patients with notable adverse outcomes requiring significantly increased healthcare resources. Further studies on risk factors and costs are needed along with related efforts to develop systems and care teams that facilitate urethral catheter placement while minimizing injury and cost.

Presentation #44

Designing Wearable Technology to Improve Patient-Clinician Communication

Hansung (David) Lee

Background: Effective communication is paramount to delivering high-quality healthcare to patients and their families, but it continues to be a problem across the medical landscape at the individual and organizational level. Poor communication may lead to suboptimal outcomes, medical errors, misuse of healthcare resources, and distrust of the healthcare system. While work has been done related to communication skills training for health care providers, there are gaps regarding how to best monitor the benefits of this training, measure communication skills at the bedside, and provide timely feedback to clinicians regarding their communication.

Objective: This project is a three-phase, proof-of-concept study to develop and test 'CommSense,' a wearable sensor technology that leverages natural language processing (NLP) to assess clinical communication. Our team consists of experts from engineering, nursing, medicine, and library science.

Method: In phase 1 (completed), the team conducted a thorough literature search to gather communication metrics for CommSense to detect. In phases 2 and 3 (current), the team is designing and testing CommSense via simulated patient-clinician conversations. Eight verbal scripts simulating patient-clinician interactions have been developed by our team to help train the CommSense algorithm.

Results: From our literature search in phase 1, our team identified 72 articles for full-text extraction to develop of list of core communication metrics for CommSense to detect. The data collection phase involves recruiting volunteers to pilot test CommSense by reading scripts in a simulated clinic room setting. Scripts have been reconciled by the team and contain communication metrics for extraction by CommSense. Data collection is ongoing.

Conclusion: Recruitment of volunteers to test CommSense has been successful with over 30 volunteers to date. Recruitment and data collection will conclude in the fall of 2022, and we are looking forward to seeing the efficacy of CommSense in a controlled setting. Research participants have also been completing a post-simulation survey which will help our team better understand how future users would like to receive feedback from the device.

Presentation #45

Impact of Patient Health Literacy on Contralateral Prophylactic Mastectomy

Madeline Leonard

Introduction: Despite recent focus on discouraging contralateral prophylactic mastectomy (CPM), studies have shown that breast cancer patients who are younger, White, and have a higher socioeconomic status are more likely to have CPM. The current study evaluates the relationship between health literacy (HL) and CPM to determine whether there is a need for interventions to address disparities in surgical treatment.

Methods: Data was extracted from a prospectively maintained institutional database of newly diagnosed breast cancer patients. HL was estimated using a validated self-reported three question assessment with higher HL scores representing lower HL. Univariate analysis and logistic regression were performed to estimate the relationship between HL and CPM.

Results: 593 patients were included in the analysis. 70 patients (11.8%) had a CPM. Of these patients, 80% had high HL, whereas 72.5% of the patients who did not receive a CPM had high HL. The mean health literacy score among those who had a CPM was 4.89 vs. 5.39 among those who did not ($p = .136$). Logistic regression did not show a statistically significant relationship between HL and CPM ($p = .44$).

Conclusion: This study confirmed findings from previous studies that there is not an association between HL and CPM. Although race and age of diagnosis were associated with CPM, as seen in prior studies, the associations did not reach statistical significance in the current study. Our findings suggest that other drivers of inappropriate CPM should be explored, such as physician bias or the publication of inaccurate medical media content.

Presentation #46

Hydroxychloroquine Prescribing Patterns at UVA before and after release of the 2016 American Academy of Ophthalmology Dosing Guidelines

Duaa Malik

Hydroxychloroquine (HCQ) is a common treatment prescribed by rheumatologists and dermatologists in the chronic management of many autoimmune diseases, such as rheumatoid arthritis and systemic lupus erythematosus. Though generally well-tolerated, HCQ use has been associated with central vision loss secondary to retinal toxicity. To limit the risk of developing retinopathy, the American Academy of Ophthalmology (AAO) released amended guidelines in March 2016 that recommended a maximum daily HCQ dosage of ≤ 5.0 mg/kg of real weight.

The objective of the following study was to examine HCQ prescribing habits at the University of Virginia prior to and after the release of these guidelines. A single-center retrospective chart review was performed on a total of 200 adult patients who had been on HCQ continuously from 2015 to 2017 through a UVA prescriber. Weight-based dosages were calculated at three time points and stratified into dosing groups. Shifts among dosing groups were noted, along with the contributing factor that led to the shift (either weight and/or dose change). Of the 200 patients included in the study, 84 (42%) were prescribed a weight-based dose above the recommended maximum of 5 mg/kg/day for at least one of the time points reviewed. Shifts to higher-risk dosing groups were driven by changes in weight only (4.5% from 2015-16 and 4.5% from 2016-17). The study revealed that patients can and will shift to higher levels of retinal toxicity risk even while being maintained on the same HCQ dose. Since real weight remains a better predictor of risk over ideal weight, prescribers should note weight fluctuations especially when adjusting maintenance doses.

Presentation #47

A Social Media Characterization of Gender-Affirming Voice Care: A Cross-Platform Analysis

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Background: Gender-affirming treatments, such as speech therapy and surgery, are highly impactful for transgender patients experiencing vocal dysphoria and may be discussed on social media platforms including Twitter and Reddit.

Objectives: Our goal was to characterize the content and sentiment of social media posts pertaining to gender-affirming voice treatment, particularly voice modification training and surgery, to better understand the needs of the transgender patient population.

Methods: 18,695 Tweets from 2001-2021 and 23,742 r/Transvoice Reddit submissions and comments from 2009-2020 were extracted in R using publicly available APIs. Language processing and sentiment analysis techniques were applied to the datasets. Highly emotive r/Transvoice posts related to voice modification treatment were manually reviewed to further characterize commonly discussed themes and resources.

Results: Online discussion of transgender voice centered primarily on vocal feminization. Recurring themes included use of online training resources, singing voice, and barriers to care such as cost and variable experiences with healthcare providers. Sentiment analysis demonstrated that posts discussing gender-affirming voice training had higher average sentiment scores than those discussing voice surgery, on both Twitter (0.252 vs 0.161; $p < 0.001$) and Reddit (0.349 vs 0.301; $p < 0.001$). Frequently appearing themes in highly negative surgery posts included mixed outcomes (9.3%), surgical complications (9.3%), recovery time (8.5%), and surgeon variability (5.9%).

Conclusions: Transgender patients share various resources and concerns regarding voice modification treatment in online communities. Aggregated online sentiment towards gender-affirming voice surgery is more negative than voice training, largely due to concerns about surgical outcomes, risks, and recovery period.

Presentation #48

Prior Bariatric Surgery as a Predictor of Postoperative Outcomes Following Multilevel Fusion Surgery for Adult Spinal Deformity in Obese Patients

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Background: Obesity is a rapidly growing health burden, with projections of more than half of US adults to be obese by the year 2030. Obesity has been shown to be an independent risk factor for postoperative complications and reduced patient-reported outcomes following spine surgery. For patients with obesity refractory to conservative management or morbid obesity, bariatric surgery (BS) is often the next therapeutic step. The American Society for Metabolic and Bariatric Surgery reports an increasing number of BS performed, with a total of 252,565 BS procedures performed in 2018. In spine surgery, including adult spinal deformity (ASD) corrective surgery, obesity has been found to be a significant risk factor for postoperative complications. However, little is known of the impact that BS has on corrective ASD fusion surgery.

Methods: A matched cohort study utilizing the PearlDiver patient records database. Obese (BMI>30) ASD patients undergoing posterolateral fusion of 3 or more levels for ASD correctional surgery were coded for using International Classification of Disease 9th (ICD-9-CM) and 10th revision (ICD-10-CM) diagnoses and procedure codes. A one-to-one matched cohort of patients who had previously received BS was compared to a control cohort who had not previously underwent BS (non-BS), the cohorts were matched for demographics and comorbidities. The cohorts were analyzed for rates of post-operative complications, length of stay, and hospitalization costs.

Results: In patients undergoing multilevel fusion surgery for ASD, those having previously received BS, when compared to non-BS patients, had decreased risk of developing major complications (6.3% vs 15.4%, $p < 0.001$), minor complications (18.2% vs 25.9, $p < 0.001$), emergency intubation (0.3% vs 1.1%, $p < 0.001$), aspiration (0.3% vs 1.1%, $p = 0.026$) pulmonary embolism (3.4% vs 7.3%, $p < 0.001$), pneumonia (0.5% vs 1.9, $p < 0.001$), cerebrovascular accident (1.4% vs 2.0, $p = 0.001$), transfusion (1.9% vs 3.1%, $p = 0.019$), acute kidney injury (3.9% vs 8.2%, $p < 0.001$), urinary tract infection (12.6% vs 16.0%, $p = 0.003$), sepsis (1.6% vs 6.0%, $p < 0.001$), myocardial infarction (0.9% vs 2.5%, $p < 0.001$), wound complications (7.4% vs 13.3%, $p < 0.001$), surgical site infection (4.8% vs 10.3%, $p < 0.001$), pseudarthrosis within 2 years (6.4% vs 8.6%, $p = 0.026$), instrument failure within 2 years (7.4% vs 10.9%, $p < 0.001$), and reoperation within 1 year (21.4% vs 25.9%, $p = 0.001$). Non-BS patients had longer lengths of stay (4.2 vs 8.2, $p < 0.001$) and higher 90-Day Postoperative hospitalization Costs (\$4,503 vs \$6,168, $p < 0.001$).

Conclusion: Prior BS-receiving patients had overall lower rates of postoperative complications following multilevel fusion surgery for correction of ASD, than obese patients having not received previous BS. This study warrants further investigation with the goal of understanding and improving surgical outcomes for obese patients undergoing ASD corrective surgery.

Presentation #49

Employing Machine Learning Techniques to Translate ICD Codes to AIS Codes

Charbel Marche

Trauma patients have injury diagnoses recorded using the International Classification of Disease (ICD) codes. ICD codes are useful for billing but not as much for research and statistical purposes. Abbreviated Injury Scale (AIS) codes are created by the American Association for the Advancement of Automotive Medicine (AAAM) and are unique in that they contain information on the level, location, organs affected, and severity of trauma sustained. This makes them much more useful data points for conducting trauma research. There are large administrative medical databases containing outcomes and many other metrics based on ICD codes, however, these lack corresponding AIS codes. Currently, the standard is to use the AAAM map to convert ICD codes to AIS codes. While this method performs moderately well, some challenges cannot be overcome with direct mapping. We aimed to outperform the AAAM map by employing machine learning techniques such as feedforward neural networks (FFNN), neural machine translation (OpenNMT), and statistical machine translation (SMT). Of the aforementioned methods, all outperformed the AAAM map. The FFNN predicted AIS matches the most accurately. It precisely predicted 66% of observed AIS codes, followed by OpenNMT and SMT at 58% and 47%, respectively. The AAAM map does not provide the ability to perform direct matching. Additionally, FFNN predicted close (same region and same severity AIS codes) or exact AIS codes for 83% of observed AIS codes, while OpenNMT achieved this 82% of the time. This was followed by SMT at 79% and the AAAM map at only 74%. While FFNN seemed to outperform the other techniques, there is room for improvement. The FFNN overpredicted the number of AIS codes for a given patient 13% of the time and underpredicted 7% of the time. This compares to 7% and 1%, respectively, using OpenNMT, 4% and 3% using SMT, and 5% and 3% using the AAAM map. To build on the work done, we aim to adjust the FFNN to decrease unmatched observations and predictions. Additionally, we plan on adjusting the parameters of the OpenNMT training process in an attempt to enhance results.

Presentation #50

The state and significance of diversity inclusive medical illustrations in medical education

May, Emily

Medical illustration currently presents a homogenous subset of the patient population. This review comments on the current state of medical illustration in medical education and how medical illustration is a valuable tool that can be employed to combat biases, incorporate ethical consideration and education in an integrated manner, and serve as a tool to combat nuanced lessons and pressures that are products of the hidden and conscript curriculums of medicine. Further, it is suggested that diversifying medical illustrations and including aspects of narrative medicine within medical illustrations can prove useful in reframing the lessons of the hidden curriculum and removing discriminatory effects derived from the conscript curriculum. In addition to reviewing literature, the author produced illustrations attempting to begin addressing the existing, evident deficiency in medical illustration's current diversity. The author also ends the essay with recommendations of increasing awareness of the current absence of diversity in illustrations, advocating for inclusion of images into the curriculum to benefit medical student

education, and by listing future plans of quantitatively researching the prevalence of diversity inclusive medical illustration in American medical school curricula.

Presentation #51

The Anterior Distal Tibia Slope in Pilon Fractures after Surgical Fixation

Mallory Maza, BS, BA¹, C. Jayson Esdaille, MD², Seth Yarboro, MD²

INTRODUCTION: Failure to restore the tibiotalar relationship following an unstable ankle fracture can contribute to decreased range of motion and difficulty with dorsiflexion. Kellam et al. introduced the concept of the anterior distal tibia angle (ADTA), which showed reliability as a template for reducing ankle fractures to their normal anatomy¹. We hypothesize that the anterior distal tibia slope has greater variation in fractures that have the potential to alter DTS than in the normal population. We investigated the distal tibial slope at the articular surface in a group of patients with pilon fractures (AO/OTA classification 43A, 43B and 43C injuries). The aim of this study is to identify the range of the anterior distal tibia slope (ADTS) in distal tibia fractures after surgical fixation.

PATIENTS AND METHODS: A retrospective review of patients from 2018-2021 with distal tibia/pilon fractures (AO/OTA classification 43A, 43B and 43C) that were corrected with open reduction internal fixation (ORIF) at a single academic institute was performed. Patient demographics and measurements of the ADTS on supine lateral radiographs were collected.

RESULTS: 100 patients with post-operative radiographs that met inclusion criteria were evaluated and analyzed. 72 of these patients had pre-operative films in the database. The average anterior distal tibia slope in the post-operative group was $83.08^\circ/6.92^\circ$ (70.8° - 93.29° , $\sigma=4.62^\circ$). In the pre-operative group, the average slope was $85.9^\circ/4.1^\circ$ (65.82° - 102.52° , $\sigma=7.39^\circ$).

CONCLUSION: This descriptive analysis of ADTS in surgical fixation of ankle fractures produced results similar findings by Kellam et al., which reported an average measurement of 84° (76° - 92°) in radiographs of uninjured individuals. With neutral alignment of the long axis of the tibia estimated to be around 90° , it is plausible that an excessively negative ADTS could adversely impact ankle dorsiflexion and contribute to gait difficulty. Future studies can build on this concept with ankle satisfaction scores and monitoring of range of motion in long term post-operative follow ups to improve surgical outcomes.

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Presentation #52

Ten Simple Rules of Developing, Deploying, and Utilizing Artificial Intelligence in Medicine in an Ethical Manner

Sheyna Nathwani & Maggie Woods, Syed Laboratory

Artificial Intelligence (AI) and Machine Learning (ML) are both quickly rising to the forefront of medicine and other scientific fields. AI has been lauded as an objective way to aid in a variety of tasks – including but not limited to disease prevention, monitoring, treatment, diagnosis, and informing and driving clinical management – while eliminating human error. However, AI/ML carry their own set of biases that are crucial to account for when developing and using these tools. It is imperative that these biases are recognized to avoid the use of AI/ML as a rationalization for dangerous and unjust ideals like how statistics was applied in the early 20th century as “scientific evidence” for the eugenics movement. This project aimed to establish ten simple rules to be considered to ensure the development, deployment, and utilization of AI/ML in healthcare occurs in an ethical, just manner.

Presentation #53

3D Single-breath Chemical Shift Imaging Hyperpolarized Xe-129 MRI of Healthy, CF, IPF, and COPD Subjects

Jill Nehrbas, Steven Guan, Nick Tustison, Kun Qing, Y Michael Shim, John Mugler III, Talissa Altes, Dana Albon, Deborah Froh, Borna Mehrad, James Patrie, Alan Ropp, Braden Miller, and Jaime Mata

3D Single-breath Chemical Shift Imaging (3D-SBCSI) is a hybrid MR-spectroscopic imaging modality that uses hyperpolarized xenon-129 gas (Xe-129) to differentiate lung diseases by probing functional characteristics. This study tests the efficacy of 3D-SBCSI in differentiating physiology among pulmonary diseases. 45 subjects: 16 healthy, 11 idiopathic pulmonary fibrosis (IPF), 13 cystic fibrosis (CF), and five chronic obstructive pulmonary disease (COPD) were given 1/3 forced vital capacity (FVC) of hyperpolarized Xe-129, inhaled for a ~7s MRI acquisition. Proton, Xe-129 ventilation, and 3D-SBCSI images were acquired with separate breath-holds using a radiofrequency chest coil tuned to Xe-129. The Xe-129 spectrum was analyzed in each lung voxel for ratios of spectroscopic peaks, chemical shifts, and T2* relaxation. CF and COPD subjects had significantly more ventilation defects than IPF and healthy subjects, which correlated with FEV1 predicted ($R=-0.74$). FEV1 predicted correlated well with RBC/Gas ratio ($R=0.67$). COPD and IPF had significantly higher Tissue/RBC ratios than other subjects, longer RBC T2* relaxation times, and greater RBC chemical shifts. CF subjects had more ventilation defects than healthy subjects, elevated Tissue/RBC ratio, shorter Tissue T2* relaxation, and greater RBC chemical shift. 3D-SBCSI may be helpful in the detection and characterization of pulmonary disease, following treatment efficacy, and predicting disease outcomes.

Presentation #54

K9: A Novel Anti-Alzheimer's Drug

Joseph Nguyen, B.S., Praveen Yerramothu, Ph.D., Xiaoyu Cai, B.S., Ashley Ban, Kaitlyn Cheng, Jayakrishna Ambati, M.D.

Alzheimer's disease (AD) is a major public health crisis and is the leading cause of dementia in the United States today. The estimated annual healthcare cost of the treatment of AD is \$305 billion and rising. Because most patients are diagnosed at late stages, where treatment options are limited, research in AD is centered around identifying ways to slow the disease progression. As the NLRP3 inflammasome has been implicated in the pathogenesis of AD, we studied K9, a novel small-molecule inhibitor of the NLRP3 inflammasome. Using a 5xFAD transgenic mouse model, which expresses multiple AD-linked mutations, we tested the effect of chronic K9 administration on disease progression. To assess spatial learning and memory, we used the Morris Water Maze (MWM) test. We observed an improved performance across all training days, suggesting improved spatial memory, in K9-treated mice. Additionally, we noted decreased amyloid- β deposition and smaller plaque size in the brains of K9-treated mice in multiple regions. In summary, K9 treatment demonstrated several positive effects in 5xFAD mice: reversed cognitive impairment, improved spatial memory formation and learning, and decreased amyloid- β burden in the brain. This study suggests a potential future role for K9 in the clinical management of Alzheimer's disease.

Presentation #55

The Effect of Empagliflozin and Insulin on Vascular Biomarkers in Subjects with Type 2 Diabetes

Thi Nguyen, Kevin Aylor, Eugene Barrett, MD, PhD,

Objective: Sodium-glucose cotransporter 2 inhibitors (SGLT2is) for blood sugar reduction in type 2 diabetes (T2D) decreases incident cardiovascular events. At the microvascular level, diabetes is associated with increased levels of inflammatory biomarkers. We hypothesized that the SGLT2i, empagliflozin, would decrease inflammatory biomarker expression in T2D.

Methods: We screened T2D patient charts for study eligibility. Inclusion criteria included age 18-60 years, $6.5 < A1C < 9\%$, never on SGLT-2i, on stable dose of oral hypoglycemic agents and other medications >3 months, and $BMI \leq 45$. Exclusion criteria included smoking in the past 6 months, taking insulin, $BP > 160/90$, and history of severe medical issues. Before and following 12-week empagliflozin treatment, 10 participants underwent a 2-hour insulin infusion to measure metabolic and vascular insulin resistance. We held plasma glucose constant with variable glucose infusion. We used enzyme-linked immunosorbent assays (ELISAs) to determine the concentration of biomarkers before and after insulin infusion at baseline and after 12 weeks on empagliflozin.

Results: Empagliflozin lowered baseline and post-insulin ICAM-1 ($p=0.00184$) and increased VCAM-1 ($p=0.000445$). Insulin infusion consistently lowered PECAM-1 ($p=0.00222, 0.0275$) and vasoconstrictor ET-1 ($p=0.00794, 0.00633$) with or without empagliflozin treatment. E-selectin decreased and S100A8/9 increased during infusion both dates, although not significantly.

Conclusions: The ICAM-1 decrease indicates that empagliflozin decreases microvascular inflammation. Increasing VCAM-1 suggests oxidative stress is involved. The data suggests empagliflozin and insulin did not strongly impact S100A8/9 nor E-selectin. Overall, the biomarker response to empagliflozin was complex.

Presentation #56

Childhood Obesity

Mackenzi Oswald

Childhood obesity is a national concern. UVA Health has taken steps towards decreasing childhood obesity and overweight via the creation of the Children's Fitness Clinic (CFC), which is a behavior modification program for children meeting inclusion criteria (including having a BMI of 85th percentile or higher). In order to evaluate the efficacy of the CFC in reducing BMI, blood pressure (BP) and/or heart rate (HR), CFC patient data was compared to patient data from the Birdsong general pediatrics clinic. Patients were sourced from EPIC using the SlicerDicer program and patient data was obtained via chart review. In total, 149 patients were included in the CFC group and 147 patients were included in the Birdsong group. Statistical analysis was performed using ANOVA, 1-tailed and 2-tailed t-tests. Baseline characteristics showed a significantly higher baseline BMI Z-score for the CFC population compared to the Birdsong population ($p < 0.001$). Within-group analyses showed a significant decrease in diastolic BP percentile in the CFC population ($p = 0.014$) and a significant increase in systolic BP percentile in the BC population ($p = 0.022$) over a one-year maximum time period. No significant differences in BMI Z-score, BP percentile or HR were found between groups. Future research could evaluate other program aspects that are unable to be evaluated via chart review.

Presentation #57

Directional Deep Brain Stimulation – A step in the right direction? A systematic review of the clinical and therapeutic efficacy of Directional DBS in Parkinson Disease

Purushotham Ramanathan BS, Sebastian Salas-Vega MD PhD, Mahesh Shenai MD

Background: Deep brain stimulation (DBS) is a highly effective adjunctive therapy in controlling the symptoms of medication-responsive Parkinson Disease (PD). Traditionally, DBS technologies consist of an electrode with 4-8 cylindrical contacts placed vertically along its length; newer directional DBS (dDBS) technologies split these discrete contacts into radially separated segments to allow steering of stimulation towards or away from certain targets.

Objective: This review aims to qualitatively synthesize the literature comparing traditional, omnidirectional DBS (oDBS) and dDBS in PD patients to assess the efficacy of this new technology.

Search Strategy: A systematic review was conducted under PRISMA guidelines of the MEDLINE and Web of Science databases from 1/1/2010 to 6/22/2022. We performed a keyword search incorporating the Boolean operators "OR" and "AND," with combinations of the keywords "directional deep brain stimulation," "directional stimulation," and "Parkinson disease".

Selection Criteria: Included studies analyzed outcomes pertaining to clinical efficacy, which include but are not limited to the Unified Parkinson Disease Rating Score (UPDRS), and therapeutic window (TW) or surrogate measures. Studies must have outcomes comparing oDBS and dDBS specifically in PD patients. Studies were excluded if reported outcomes were not excluded to PD patients (i.e., if they included patients with essential tremor).

Results: Ten studies were included. Out of the 3 studies that explored PD patient motor function as quantified by UPDRS III, none of them found significant differences between oDBS and dDBS. The Parkinson Disease Questionnaire 39 (PDQ-39), a quality-of-life measure, was not different between oDBS and dDBS groups. Six studies analyzed TW or surrogate measures, and all found a raw increase in TW size in the dDBS group. Of the 4 studies that analyzed TW directly, 2 found a statistically significant increase in the dDBS group, one showed a strong trend towards an increase ($p < 0.06$), and the last study did not comment on significance.

Conclusions: A qualitative review of oDBS and dDBS in PD patients does not suggest an improvement in motor clinical improvement by UPDRS III at this time; however, the literature consistently supports a widening in TW and surrogate measures.

Presentation #58

Repeat stereotactic radiosurgery for cerebral arteriovenous malformations

Purushotham Ramanathan BS, Stylianos Pikis MD, Georgios Mantziaris MD, Zhiyuan Xu MD, Jason P. Sheehan MD PhD

OBJECTIVE: The purpose of this retrospective, single-institution study was to evaluate radiological and clinical out-comes of patients managed with repeat stereotactic radiosurgery (SRS) for residual cerebral arteriovenous malformation (AVM) after prior SRS.

METHODS: The authors evaluated the clinical and radiological outcomes of consecutive patients treated with repeat single-session SRS for a residual brain AVM from 1989 to 2021.

RESULTS: In total, 170 patients underwent repeat SRS for AVM (90 [52.9%] females; median [interquartile range] age at the first SRS procedure 28 [21.5] years; median [interquartile range] age at the second SRS procedure 32 [22.5] years). After repeat SRS, the actuarial 3-, 5-, and 10-year AVM obliteration rates were 37.6%, 57.3%, and 80.9%, respectively. Higher obliteration rates were associated with margin dose ≥ 19 Gy ($p = 0.001$). After the second SRS procedure, hem-orrhage occurred in 8.2% of patients and was lethal in 1 patient. The risk factors of intracranial hemorrhage were age < 18 years ($p = 0.03$) and residual AVM diameter > 20 mm ($p = 0.004$). Lower obliteration rates were noted in patients with residual AVM diameter > 20 mm ($p = 0.04$) and those < 18 years of age ($p = 0.04$). Asymptomatic, symptomatic, and permanent radiation-induced changes (RICs) after the second SRS procedure occurred in 25.9%, 8.8%, and 5.3% of patients, respectively, and were associated with RIC after the first SRS procedure ($p = 0.006$). There was 1 case of a radiation-induced meningioma 12 years after SRS.

CONCLUSIONS: Repeat SRS is a reasonable therapeutic option, in particular for patients with residual AVM. Repeat SRS was associated with more favorable outcomes in adult patients and those with residual AVM smaller than 20 mm in maximum diameter. To increase the rate of residual AVM obliteration, a prescription dose ≥ 19 Gy should ideally be used for repeat SRS.

Presentation #59

Predictive Factors for Operative Intervention in Adhesive Small Bowel Obstruction

Purushotham Ramanathan BS, Tara van Veen MD, Lolita Ramsey PhD, Dina Tabetello DO

Background: Small bowel obstruction (SBO) is responsible for 350,000 U.S. hospitalizations and healthcare costs of ~\$2.3 billion annually. The current standard of care for SBO is to trial 3 to 5 days of non-operative management, which is successful up to 82% of the time. It remains a clinical challenge when to change the course towards operative management. Delaying surgery increases morbidity, mortality, length of stay, and cost. This study evaluated if any clinical factors were associated with operative management in adhesive SBO.

Methods: This retrospective cohort study included adult patients who were admitted between 2013 to 2020 with an ICD-10 code for SBO and history/risk for adhesion. Exclusions were for operative intervention within 24 hours of admission or hospice/death prior to surgery. Descriptive statistics, univariable and multivariable logistic regression were conducted (SPSS: IBM, v26).

Results: 360 out of 623 patients were eligible. At baseline: mean age was 66 years, 57.5% female, 71.3% white, mean BMI 26, 38.7% with history of SBO and 98.1% had history of abdominal surgery. Patients had 1-2 days of symptom onset prior to hospitalization. 55.6% had successful non-operative management at discharge (median length of stay 3 days, symptom resolution 1.7 days) vs. 44.4% failed to improve, requiring surgery.

In a univariate analysis, BMI, history (prior SBO, abdominal surgeries, colorectal surgery, exploratory laparotomy), initial vitals (temperature, blood pressure), abdominal pain, obstipation, acute kidney injury, and small bowel feces sign on CT scan were significantly associated with operative management. In a multivariable logistic regression, after controlling for all other variables, small bowel feces sign (Adjusted Odds Ratio=0.43, 95% CI 0.2-0.9, $p = .03$; protective against surgery) and history of exploratory laparotomy (Adjusted Odds Ratio=0.43, 95% CI 0.2-0.9, $p = 0.02$) were statistically significant factors associated with treatment.

20.4% of surgeries were laparoscopic vs. 79.6% open. Time from admission to surgery averaged 3.89 days: small bowel resection ($n=55$) was 4.9 days (median=4), compared to patients without resection (3.4 days, median=2; $p = 0.00$; OR=1.2, 95% CI 1.07-1.35).

Discussion/Conclusions: A lack of (i.e. negative) small bowel feces sign can be a potential indicator for operative management and should be further explored. Since the median resolution of symptoms in the non-operative management group was ~2 days and 20% higher odds for bowel resection each day surgery is delayed, the conservative trial period for adhesive SBO should not exceed 3 days after admission.

Presentation #60

Effect on Postoperative Atrial Fibrillation by Timing of Beta-Blocker Administration Relative to Diuresis: A Case-Control Study

Shahroze Ranjha; Mark P. Pressler, MD; Ziyad O. Knio, MD; Edgar Luat; Robert H. Thiele, MD; Matthew C. Hulse, MD

Purpose: Post-operative atrial fibrillation (POAF) occurs in 20-40% of cardiac surgical patients.¹ It is associated with an increased risk of complications, stroke, and mortality.² It has been proposed that this event can be prevented by diuresis, which decreases atrial stretch, and beta-blockade, which decreases conduction through the atrioventricular node.^{3,4} This study aims to investigate whether POAF is associated with timing of postoperative beta-blocker administration relative to diuretic administration (after versus before). The authors hypothesize that earlier initiation of these medications, and the administration of beta-blockers before diuresis, would be associated with decreased incidence of POAF.

Methods: The study identified 500 candidate coronary artery bypass patients without history of cardiac arrhythmia from 2017 through 2020 at a single institution. Of these, 114 (22.8%) experienced POAF. These cases were propensity score matched 1:1 by preoperative and operative characteristics in order to design a balanced case-control study comprised of 228 total patients. Characteristics of diuretic and beta-blocker administration were compared using univariate tests.

Results: POAF cases and controls were similar in preoperative and operative characteristics after the matching procedure. Median time to POAF was 54.24 hours (IQR 41.80 – 74.33). Compared to controls, the cases had similar time to diuresis (39.54 ± 11.14 vs 39.92 ± 13.43 , $p=0.816$), time to beta-blocker initiation (64.11 ± 41.56 vs 53.47 ± 32.31 , $p=0.072$) and time to a stable regimen on both agents (64.11 ± 41.56 vs 58.05 ± 31.15 , $p=0.237$). Administration of beta-blockade after diuresis was a more common prescribing pattern and was not associated with the development of POAF (67.3% [cases] vs. 60.8% [controls], OR=1.33, $p=0.327$).

Conclusions: There is no significant difference between timing of administration of diuresis or beta blockade in regards to development of POAF.

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Presentation #61

A case of hereditary hypophosphatasia mimicking pyoderma gangrenosum

N. Shen, BA¹, L. Yi, MD², W. Omesiete, MD³, S. Raghavan, MD⁴, K. Greer, MD⁵

Case Presentation: A 61-year-old Caucasian female with history of hypophosphatasia presented to the dermatology clinic with a one-month history of a non-healing ulcer on her arm. Physical examination was notable for a 2 cm ulcer with raised violaceous border on the right triceps in addition to multiple firm subcutaneous nodules on bilateral elbows. An incisional biopsy was performed at the edge of the ulcer and histopathology revealed mixed inflammation

and abundant calcium deposition. There were no areas of neutrophilic infiltrate suggestive of pyoderma gangrenosum. PAS staining was negative for fungal elements. There was no growth on bacterial, mycobacterial, or fungal tissue cultures.

Hereditary hypophosphatasia (HPP) is an extremely rare genetic condition caused by a loss-of-function mutation in tissue-nonspecific alkaline phosphatase resulting in serum hypophosphatasemia and poor skeletal mineralization. The exact prevalence of HPP is unknown but the severe form in Europeans is estimated to be 1 in 300,000. Common clinical manifestations in adult patients include osteomalacia and early loss of teeth. However, disease onset and symptoms are highly variable, which makes diagnosis challenging. The patient's previous genetic testing revealed a pathogenic variant in *ALPL* c. 1427A>G consistent with hypophosphatasia.

HPP is a rare genetic disorder that may be unfamiliar to many dermatologists. In our case, the patient presented with an ulcer mimicking pyoderma gangrenosum. To our knowledge, there are no other reports describing the cutaneous manifestations of HPP.

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Presentation #62

Addressing Rates of BMI Follow-Up Appointments at UVA General Pediatrics Clinic to Improve Childhood Obesity

Ashley Silver BS, Julia Sessions MD, Elisa Hampton MD

Introduction/Objective: Over the past few decades, the prevalence of childhood obesity has more than doubled in children and tripled in adolescents, with recent data indicating a prevalence of 19.3%. Childhood obesity has lifelong implications including cardiovascular disease, metabolic derangements, asthma, musculoskeletal problems, anxiety, and depression. Meaningful and timely actions are crucial to altering the trajectory for these patients. The USPSTF found that frequent physician-patient contact focused on healthy habits (≥ 26 contact hours over 2 to 12 months) was associated with decreased weight in pediatric patients with obesity.

The aim of this project was to increase the rate of offering a follow-up BMI check for pediatric patients identified as overweight or obese at their well child check, to address BMI at University of Virginia's general pediatrics clinic.

Methods: Patients 5 to 18 years old identified as overweight or obese at their well child check at the general pediatrics clinic at the University of Virginia in Charlottesville, Virginia based on a BMI $\geq 85^{\text{th}}$ percentile on CDC Growth Charts were included. Baseline rate of offering a follow-up in overweight or obese patients was collected from July 2020 to January 2021. A survey was sent to residents regarding barriers to offering BMI checks, followed by a series of targeted interventions implemented from February 2021 to February 2022. Intervention 1 consisted of a conference emphasizing the inadequate number of follow-up BMI checks offered. Intervention 2 included email and written reminders for residents to utilize an Epic dot phrase that prompts them to schedule a follow-up BMI check for patients with BMI $\geq 85^{\text{th}}$ percentile. Intervention 3 auto-added the dot phrase to all well-child note templates for patients with BMI $\geq 85^{\text{th}}$ percentile. Intervention 4 entailed distributing formal BMI check visit note templates and after-visit summaries in both Spanish and English. Data were analyzed using run charts.

Results: Baseline data showed 17% of patients who were overweight or obese were offered a follow-up BMI check within 1 to 6 months. Residents cited unclear recommendations on when to follow-up, family refusal, clinic timing, and scheduling difficulties as barriers to offering follow-up BMI checks. Following the four interventions, percent follow-up BMI checks offered increased to 37% and demonstrated a shift with eight consecutive points above the median, indicating special cause variation corresponding to changes implemented during this project.

Conclusion: Interventions targeted at resident education and standardization of clinic-based counseling improves the rate of offering follow-up BMI checks and therefore physician-patient contact hours, which can foster early change for childhood obesity.

Presentation #63

Efficacy and acceptability of a patient decision aid for women with elevated breast cancer risk considering MRI screening

Caleigh Smith, Crystal Chu, Mark Smolkin, Janelle Gorski, Patricia Hollen, Lynn Dengel

Objectives: Despite recognition of magnetic resonance imaging's (MRI's) ability to detect breast cancer in a high-risk population, patients experience significant decisional conflict when considering this supplemental screening. The goal of this study was to assess the effectiveness of a developed patient decision aid (PDA) in improving shared decision making regarding this screening.

Methods: Our PDA was developed and modified following international models with consultation from five experts to verify its content and readability. The PDA was administered among a sample of patients recruited from a comprehensive breast center who were estimated to have a greater than 20% lifetime breast cancer risk by Tyrer-Cuzik estimates. Patients with known breast cancer history or BRCA mutation were excluded.

Results: Our sample includes 24 females with a median age of 44 years. Prior to use of the PDA, 16 patients (67%) were unsure of whether to pursue MRI screening, 6 would like to use MRI (25%), and 2 would not (8%). Following PDA use, 13 of the initially undecided participants

(81%) established a preference, with 11 electing to pursue MRI and 2 electing not to. Of the participants with an initial preference, they all maintained the same decision following use of the PDA. Prior to the PDA, the median decisional conflict score among participants was 25% (range 0-60%) compared with 0% (range 0-25%) after the PDA. In evaluating the experience, 96% of patients considered the tool helpful, and 92% endorsed greater peace of mind about their decision following use of the PDA. All healthcare providers agreed that the tool was helpful, and all reported using the answers to guide their screening plans. In three instances, physicians' slight preferences for screening approach changed after reviewing the PDA. In seven instances, physicians transitioned from no preference to a slight preference for their patient to pursue MRI versus not. While 71% of providers did report increased time required for consultation, all agreed that the PDA was easily incorporated into their workflow.

Conclusions: Our PDA was highly effective in reducing decisional conflict and supporting women in establishing a screening preference. This approach was feasible and acceptable to both patients and physicians and could be integrated into care for this high-risk population of women.

Presentation #64

Values and attitudes of women with elevated lifetime breast cancer risk regarding additional screening and tests for early detection

Caleigh Smith, Crystal Chu, Mark Smolkin, Janelle Gorski, Patricia Hollen, Lynn Dengel

Objectives: Many breast cancer screening tools provide women with an estimated lifetime risk of breast cancer based on various risk factors. Given this information, patients may elect to pursue additional screening methods, though patient preferences, values, and risk tolerance likely vary. The purpose of this study was to elicit descriptive data about patient attitudes related to their perceived risk and desired screening approach.

Methods: Our sample of patients includes women estimated to have a greater than 20% lifetime breast cancer risk by Tyrer-Cuzik estimates. This sample was recruited from a comprehensive breast care center and excludes patients with a personal history of breast cancer or known BRCA mutation. We administered a patient decision aid to this sample with an associated survey around feelings and values related to their breast cancer risk and screening options.

Results: This sample includes 24 women with a median age of 44 years (range 26-66). Seventeen patients (71%) agreed that they are very worried about having or getting breast cancer. Twenty patients (83%) endorsed being willing to undergo any and all imaging to make sure they do not have breast cancer. Twenty-two patients (92%) would be happy to have a negative biopsy after MRI, and only one would be upset to have gone through an unnecessary test. Nineteen (79%) feel that they would wish they used MRI if they went with a mammogram alone and developed cancer. Only five endorsed claustrophobia or problems sitting still for medical tests. Nineteen patients (79%) feel that their screening choice is a personal decision, and they should not worry about the impact on relatives and friends. Fifteen (63%) preferred to make an independent decision about screening without input from family and friends, while the remainder reported seeking guidance from family and friends. Fourteen patients (58%) reported wishing their healthcare provider would tell them whether to get an MRI, while the rest of the

sample preferred to make an independent decision. Two-thirds of patients reported having enough information at this time to make an informed decision.

Conclusions: Preferences around breast cancer screening and perceptions of risk in this population of moderate risk women varied. Interestingly, a vast majority of patients endorsed being willing to undergo all additional tests and imaging necessary and most wished their healthcare provider would choose their screening plan.

Presentation #65

Evolving Endotracheal Tube Preferences and Practices and Reducing Intubation-Related Laryngeal Injury

Cameron Stadlin BA; Julian S. De La Chapa, MD; Katherine Webb, MD; BA; Adithya Reddy, BS; Stephen F. Schoeff, MD; Robert Reed, MD; Logan McColl, MD; Kyle Enfield, MD; Robert H. Thiele, MD; James J. Daniero, MD, MS

Background: The complex management of intubation-related laryngeal injury makes prevention vital. Identifying knowledge deficiencies and sex disparities in management of intubated patients in the ICU may help reduce long term sequelae in this population.

Objective: To assess trends in current endotracheal tube (ETT) practices and preferences among intensivists at our institution.

Methods: A two-pronged cohort study of 399 participants was conducted at the University of Virginia University Hospital. Chart review of all intubated patients at our institution and intensivist survey were simultaneously performed in January 2016 and August 2022. To assess ETT size relative to height, a height to ETT size ratio was calculated for each patient in the 2022 cohort. Intubated patients were followed until tracheostomy, extubation, or death occurred. Descriptive statistics were used to compare the 2016 and 2022 cohorts. The survey assessed ETT size preferences, indications for increasing size, preferred time to tracheostomy conversion, barriers to tracheostomy conversion, and knowledge of intubation-related laryngotracheal injuries.

Results: A total of 300 ICU patients were included, including 182 (60.7%) in the 2016 cohort and 118 (39.3%) in the 2022 cohort. The mean ETT size for males decreased from 7.73 ± 0.30 in 2016 to 7.57 ± 0.25 in 2022 ($p < 0.001$). The mean female ETT size was not different between the two cohorts ($p = 0.101$). Average height (cm) to ETT size (mm) ratio (H:ETT) in the 2022 cohort was 23.14 ± 1.55 . The average H:ETT of men was higher than females ($p = 0.004$), indicating that females in this population were intubated with larger tubes relative to their height compared to males. While the majority (66.7%) of intensivists endorse 7.0 ETTs as standard for women, the majority (70%) of women at our institution are intubated with a 7.5 ETT or larger. Of all intubated patients in the ICU, 23 (19.5%) were intubated 11 days or longer.

Conclusion: Disparities exist between ventilated men and women at our institution with regard to ETT size, potentially putting women at higher risk of intubation-related laryngeal injury. Multidisciplinary collaboration between critical care, anesthesia, and otolaryngology should seek to establish new guidelines for ETT size selection and improve intensivist understanding of complications of prolonged intubation.

Presentation #66

Spatial Distribution of Broadband Accessibility and Telehealth No-show Appointments at a Single Primary Care Adolescent and Young Adult Medicine Center

McKenna Stidham

This study explored the geographic distribution of broadband access and telehealth no-show events at a single primary care adolescent and young adult medicine center between March 2020 and January 2022. The purpose of this analysis was to provide an aggregated, visualized data output in the form of descriptive statistics and thematic maps describing this relationship geographically which may aid more targeted approaches to addressing broadband access as a determinant of health in this patient population. The data for this analysis were sourced from UVA Teen and Young Adult Health Center Electronic Medical Records (EMR) between March 2020 and January 2022 and American Community Survey 5-year data (ACS 5-year) on self-reported broadband accessibility. Three variables measuring broadband accessibility were all found to be clustered using Moran's I measure of spatial autocorrelation. This indicated a relative disparity in broadband accessibility across space. The geographic distribution of no-show events was also found to be clustered which suggested a potential role of social geography in the occurrence of these missed encounters.

Presentation #67

Analysis of Chemical Shift Imaging data in patients with COPD or CF

Anant Tewari

Chemical Shift Imaging (CSI) utilizing hyperpolarized Xenon-129 gas is a non-invasive, non-radioactive method of probing lung physiology and anatomy. This study utilized CSI examinations in patients with Chronic Obstructive Pulmonary Disease (COPD), mild and severe Cystic Fibrosis, or healthy controls to analyze ventilation throughout the lungs and compare diffusion of gas through the lung parenchyma and red blood cells. The COPD data analysis showed that patients undergoing 3-4 weeks of corticosteroid treatment showed a significant improvement in their tissue to red blood cell perfusion ratio when compared to patients undergoing 3-4 weeks of bronchodilator ($p < 0.05$), indicating more efficient perfusion of gas into red blood cells with corticosteroid treatment. The cystic fibrosis analysis showed that there was not a significant difference in Tissue to red blood cell ratios in Cystic Fibrosis patients who were solely taking Trikafta when compared to healthy patients ($p > 0.05$), indicating efficient gas exchange function of their lungs.

Presentation #68

The safety & efficacy of brolocizumab in resistant neovascular age-related macular degeneration

Claire C. Thomas, Justin Shortell, Christine Hill, and Travis Peck

Neovascular age-related macular degeneration (nAMD) is a leading cause of severe vision loss worldwide. Currently, standard nAMD treatment involves repeat intravitreal injections of vascular endothelial growth factor (VEGF) inhibitors, often delivered at 8-week intervals. Though VEGF inhibitors improve clinical outcomes for many with nAMD, a subset of patients continue to show suboptimal response. The therapeutic injection interval also places a significant burden on patients and finite healthcare resources. Brolocizumab, a recently FDA-approved VEGF inhibitor, may address both concerns, as it has shown unprecedented therapeutic efficacy on a 12-week injection interval. In this retrospective review, we assess the functional and anatomical outcomes of brolocizumab treatment in a real-world population of 168 patients with nAMD refractory to treatment with current anti-VEGF therapies. In addition, we examine the incidence of intraocular inflammation (IOI) and retinal vasculitis to evaluate known safety concerns of brolocizumab. At 4–10 weeks post-injection, optical coherence tomography (OCT) imaging showed significant resolution of intraretinal and subretinal fluid. Despite anatomical improvement, visual acuity remained unchanged. The incidence of IOI was 3/168 (1.8%), and there were no cases of retinal vasculitis. Given its capacity to resolve intraretinal and subretinal fluid, brolocizumab shows promise in the treatment of resistant nAMD. Study results also support the safety of brolocizumab in the treatment of nAMD. Further study is encouraged to evaluate the impacts of the observed anatomical improvements on long-term ocular health and visual outcomes.

Presentation #69

Trusting Entrustment: Program Directors' Perspectives about the Utility of EPA Assessment Data in an UME-GME Learner Handover

Kassandra Tulenko

The purpose of our study was to understand if/how the inclusion of a statement in the Medical Student Performance Evaluation (MSPE) letter about an entrustment decision, a decision made through the aggregation of a student's performance of Entrustment Professional Activity (EPA) tasks at the end of the clerkship phase by an expert group of assessors, was useful to residency programs in the residency match process. Concerns about the value of information captured in the MSPE as well as the change to pass/fail scoring of USMLE step 1 has amplified the national conversation about what information should be included in the UME to GME education handover^{1,2}. A longitudinal EPA program was introduced at our institution in 2017³, and information about the summative entrustment decision was included on the 2020 MSPE. A Qualtrics questionnaire with questions regarding the utility of this information as well as what additional information would be useful distributed to the program leaders of the programs to which students from our institution matched through the 2021 Main Residency Match. Our results demonstrated that the addition of a statement related to summative entrustment of students was not used by the majority of PDs despite a majority of respondents reporting that EPAs are used in their medical schools. Participants stated that additional information about the entrustment-supervision ratings provided by assessors and how these ratings relate to a

learner's readiness for indirect supervision would be useful. Respondents also noted the value of including narrative comments from assessments and from the summative decision of the Entrustment Committee. Our research demonstrated that there is still a disconnect between the information included within the MSPE and what program directors consider useful tools for the screening and ranking of candidates during the GME match process. Future directions for this research could help to address the challenges related to learners' transition from UME-GME and to advance thinking about the value of a formal educational handover.

Presentation #70

Evaluating the Usefulness of a Wireless Video Indirect Ophthalmoscope System in Teaching Binocular Indirect Ophthalmoscopy

Tuyet-Minh Tran, Steven Makkar, Arjun Dirghangi, MD, MHS

Background: Binocular indirect ophthalmoscopy (BIO) is fundamental to examine the eye, yet challenging to teach. BIO education commonly utilizes a teaching mirror, which attaches to the indirect ophthalmoscope and reflects a portion of light, allowing for the fundus to be viewed simultaneously by the instructor and trainee. However, image quality with the training mirror is subject to glare and often requires uncomfortable posturing. Video indirect ophthalmoscopy (VIO), consisting of a camera mounted to an indirect ophthalmoscope, could provide a better means to facilitate real-time examination feedback because of its ability to digitally capture and project the examiner's view to a connected device. VIO is commonly used in screening for retinopathy of prematurity in infants but has not yet been adopted for teaching BIO, possibly due to the wired nature of existing devices, which limits mobility and creates safety hazards.

Objective: This study aimed to explore the usefulness of teaching BIO using a wireless video indirect ophthalmoscope attachment in comparison to a teaching mirror.

Methods: Ophthalmology residents utilized BIO to visualize the optic nerve, vortex veins, ora serrata, vessels, and ciliary nerves in a volunteer. Attending physicians obtained a view of the fundus using either a teaching mirror or Scanoptix, a wireless imaging adaptor that allows for real-time VIO, to provide feedback. The ability to visualize each structure was recorded, and participants were surveyed regarding their experience using the two systems for examining peripheral retinal findings.

Results: In comparison to usage of a training mirror, tailoring BIO examination feedback based on footage from the VIO system yielded a significant improvement in residents' ability to visualize several structures in the eye, including the vessels, vortex veins, and ora serrata. Participants preferred VIO for its ability to easily project a shared view of the fundus, which streamlined the process of receiving real-time feedback.

Conclusion: Our findings reinforce the utility of a wireless VIO system in BIO education. Using VIO can help build a structured approach to learning indirect ophthalmoscopy while ensuring trainees are visualizing peripheral retinal pathology through real-time faculty guidance. Further utility of the technology includes augmented exam documentation, aiding communication on hospital consult services, and asynchronous telemedicine consults for abnormal screenings.

Presentation #71

Ultrasound Guided Injection of Botulinum Toxin A in the Treatment of Digital Ischemia in Patients with Raynaud Phenomenon

Thoai T. Vu, Michael T. Perry, James T. Patrie, Jennifer L. Pierce

Objective: Landmark-based injection of botulinum toxin A (BTX-A) has been established to effectively treat Raynaud Phenomenon (RP) of the hand, though it carries a known risk of hand weakness from inadvertent intrinsic muscle injection. The purpose of this report is to evaluate the potential efficacy of reducing intrinsic muscle weakness by administering perivascular BTX-A injections under ultrasound (US) guidance in the treatment of RP.

Materials and Methods: Eligible patients who underwent US-guided injection of BTX-A were compared to patients reported in the literature who underwent landmark-based injection regarding outcomes of hand weakness, pain relief, and soft tissue healing.

Results: 3.3% of US-guided injections and 15.3% of landmark injections ($p < 0.001$) had weakness. Pain relief was reported in 68.2% of US-guided and 82.2% of landmark-based injections ($p = 0.149$). Soft tissue healing was reported in 90.9% of US-guided and 85.0% of landmark injections ($p = 1.00$).

Conclusion: RP-associated digital ischemia of the hand can be treated with US-guided injection of BTX-A. Compared to traditional landmark-based injection, injection of BTX-A under direct US visualization may reduce the risk of intramuscular injection and subsequent intrinsic hand muscle weakness.

Presentation #72

A Comparison of Return to Sport measures between complicated and uncomplicated ACL Reconstructions

Wahl Alexander, Holum Parker, Thompson Xavier, Hart Joe, Brockmeier Stephen, Diduch David, Gwathmey F. Winston, Miller Mark, Werner Brian

Intro: Anterior cruciate ligament (ACL) injuries affect more than 120,000 individuals every year and may lead to long-term consequences including but not limited to the inability to return to previous sport or activity level, chronic pain, knee instability, and osteoarthritis. Current rehabilitation and return to sport guidelines following ACL reconstruction (ACLR) are based on data and literature obtained from studies only focusing on patients with uncomplicated ACL injuries. This study aims to investigate return to sport measures including limb symmetry and strength, and patient reported outcomes in a population of patients who have undergone ACLR following a complicated ACL injury or with a postoperative complication.

Methods: The study included data from participants who suffered complicated ACL injury or surgical complications following ACLR and matched participants 1:3 with those who underwent primary, unilateral, and uncomplicated ACLR. Limb Strength Index (LSI), calculated as $LSI = (\text{involved limb} / \text{uninvolved limb}) * 100$, was measured for strength and hop testing at scheduled post-operative study visits. Patient reported outcome measures (PROMs), including the

International Knee Documentation Committee (IKDC) questionnaire and the Knee Injury and Osteoarthritis Outcome Score (KOOS), were collected via patient survey.

Results: The two groups were similar in age, height, and mass. There were no significant differences in any LSI variables and the groups reported similar function via PROMs. KOOS Pain scores were affected by time post-surgery ($p = 0.02$), but not graft type ($p = 0.06$) or complication status ($p = 0.06$). There was an interaction in KOOS Symptom scores between groups, time post-surgery and graft type ($p = 0.01$).

Discussion: There were no differences in LSI outcomes between patients with complicated ACLR and patients with uncomplicated ACLR and only minor differences in PROMs, suggesting patients having undergone complicated ACLR are not necessarily at increased risk for delayed limb strength recovery or negative patient reported outcomes. More patients with complicated ACLR should be included in ACLR outcome studies as it creates more generalizable results for patients who tear their ACL and undergo complicated ACLR.

Presentation #73

Radiation Oncology Head and Neck Cancer Treatment and Adaptive Replanning Cost Using Time-Driven Activity-Based Costing

Robert Walls, BSE¹; Christopher McLaughlin, MD²

Head and neck cancers treated with radiation therapy pose a challenge to radiation oncologists due to a number of factors, including rapid shrinkage during radiation and patient weight loss from treatment side-effects. In turn, this causes the radiation target to shift, and thus a need for re-evaluation of the treatment plan, which precipitates additional time, resources, and cost. However, the true added cost of providing adaptive replanning for patients receiving head and neck cancer radiation therapy at UVA is largely unknown. Thus, in this study, we calculated the costs per minute for labor, space, and equipment and then utilized time-driven activity-based costing (TDABC), a cost accounting tool, to estimate the total cost and expense breakdown associated with head and neck cancer radiation therapy at the UVA Emily Couric Cancer Center. We found that the total costs to provide standard radiation versus radiation with adaptive replanning were \$12,216.39 and \$14,705.14, respectively. The costs for both the standard treatment and the adaptive replanning were primarily driven by space and equipment expenses, which comprised over 50% of the total cost for each arm. We hope to use these findings to investigate more efficient adaptive replanning workflows, in order to deliver more value in this setting.

Presentation #74

Generation of a Porcine Mesothelioma Model and Treatment Using Magnetic-Focused-Ultrasound Surgery (MRgFUS) and Radiofrequency Ablation (RFA)

Jack B. Yang¹, Marcia Costa², Carolina Fernandes², Matt Eames³, Arik Hananel³, John P. Mugler III¹, Jhosep Huaromo¹, Jaime Mata¹

Background: Malignant pleural mesothelioma (MPM) is an aggressive cancer that is associated with the exposure of asbestos [1]. Traditional therapies include surgery and chemotherapy but both cause collateral damage and lack the ability to eliminate residual disease [2]. New treatments in development include Radiofrequency Ablation (RFA) and Magnetic-Resonance-Guided Focused Ultrasound Surgery (MRgFUS). RFA utilizes thermal energy delivered through an electrical needle. MRgFUS utilizes a high frequency ultrasound beam that can concentrate thermal energy within a deep tissue target. Accordingly, the purpose of this investigation was to determine the feasibility of utilizing RFA and MRgFUS for the thermal debulking of MPM.

Methods: For this study, 13 Yorkshire female pigs were used. Initially, two control animals were used to generate a prototype tumor model. Animals were immunosuppressed with cyclosporine; MSTO-211H mesothelioma cells, were injected into the right lower hemithorax. Following successful development of the mesothelioma model after 3 months, the other 11 animals were inoculated in similar fashion. Animals were imaged using MRI (1.5 Tesla Siemens Avanto) at baseline and followed up every 4 weeks post-inoculation. Five animals were then treated with percutaneous RFA, utilizing an RF-3000 radio frequency generator and the other surviving four animals were treated with MRgFUS, using an ExAblate 2000-OR system.

Results: All animals developed pleural effusions following cell inoculation. Furthermore, pleural adhesions were identified in most pigs, with seven pigs having abnormal lung tissue, thickened diaphragm, and pericardium. Within the RFA treatment cohort, ablations were about or larger than 2.5 x 2.5 cm² in size. MRgFUS treatment was also successful, with an escalation study generating ablations up to 4.2 x 2.5 cm² in size.

Conclusion: This study demonstrates the possibility of generating a mesothelioma model and ablation of the lung parenchyma utilizing both RFA and MRgFUS. MRgFUS does not require incisions, thus lowering the probability of infection, encouraging faster recoveries, and creating a potentially less expensive procedure.

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Presentation #75

Anterior Mediastinal Ectopic Parathyroid Adenoma Mimicking Metastasis – Utility of ^{99m}Tc-sestamibi Scans

Jack B. Yang¹, Prem Batchala²

Background: Patients with chronic renal disease can develop renal osteodystrophy and secondary hyperparathyroidism, resulting in parathyroid hyperplasia. The hyperplastic tissue can become autonomous and grow into a parathyroid adenoma, referred to as tertiary hyperparathyroidism. Parathyroid tissue is most commonly located around the thyroid gland but can also be found in ectopic sites. Imaging is required to identify the abnormal tissue and location is surgically important to avoid treatment failure. Multimodality approach is common such as US + ^{99m}Tc-sestamibi SPECT/CT or US + 4D-CT. ^{99m}Tc-sestamibi is a radiopharmaceutical that accumulates in mitochondria rich tissue and is used to study myocardial perfusion, but may also be used to identify abnormal parathyroid tissue.

Case Presentation: We present a 46-year-old male with end-stage renal disease being evaluated for renal transplant. He has a history of renal cell carcinoma treated with nephrectomy, and subtotal parathyroidectomy for tertiary hyperparathyroidism. He underwent a CT exam for oncology evaluation, which revealed an enhancing mass in the anterior mediastinum, raising suspicion for renal cell carcinoma metastasis. A PET/CT was recommended for further evaluation. However, a recently performed ^{99m}Tc-sestamibi cardiac perfusion test showed radiotracer uptake in the anterior mediastinum, corresponding to the nodule seen on CT chest and consistent with parathyroid adenoma. Parathormone (PTH) level was also significantly elevated at 1201 pg/mL, supporting a diagnosis of tertiary hyperparathyroidism rather than metastasis.

Discussion/Conclusion: Embryologically, the inferior parathyroid descends with the thymus, making the anterior mediastinum one of the most common locations for ectopic tissue. Our index patient had a recent ^{99m}Tc-sestamibi myocardial perfusion scan, revealing the ectopic parathyroid in the anterior mediastinum. This explains the persistent hyperparathyroidism following prior subtotal parathyroidectomy (surgical failure). Due to the perfusion test, the recommended PET/CT scan was redundant and not required for clinical diagnosis. This case highlights the importance of reviewing prior imaging that may contain relevant information. In a retrospective study of 1006 imaging studies with recommendations for additional imaging and/or interventions (RAIs), Doshi et al demonstrated that 4.1% of RAIs were avoidable with attention to available prior imaging studies. Comparison with prior imaging is effective and can grow into a cost saving health care strategy.

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Presentation #76

Metastatic Melanoma Presenting as ‘Crazy-Paving’ Patterns on CT-Scan

Jack B. Yang⁴, Luke Lancaster, MD¹, Elizabeth M. Gaughan, MD², Alejandro A. Gru, MD³, Prem P. Batchala, MD¹

Background: ‘Crazy-paving’ patterns seen on CT scan are scattered or diffuse ground glass opacities with superimposed interlobular and intralobular septal thickening. ‘Crazy-paving’ patterns are non-specific findings seen in multiple conditions but are very rarely described for pulmonary metastatic melanoma and have only been reported in a few cases [1,2]. Melanoma is one of the most aggressive cancers and frequently metastasizes through the vasculature and lymphatics. In particular, the lungs are a common location for metastasis and early pulmonary metastasectomy of malignant melanoma has been associated with a survival improvement to 18-39% compared to a 3-5% 5-year survival for those who received non-surgical treatments [3]. As such, timely identification of metastatic melanoma is important for clinical prognosis.

Case Presentation: We present a 69-year-old man with history of early-stage malignant melanoma managed with surgical excision in 1994, who presented in July 2021 with 2-months of increasing fatigue, 20-pound weight loss, and shortness of breath. CT pulmonary angiogram was negative for pulmonary embolism but demonstrated bilateral ‘Crazy-paving’ pattern and subpleural sparing. Clinical and radiological suspicion was towards atypical pneumonias. VATS-guided biopsies were conducted and revealed diffuse interstitial infiltration from malignant epithelioid cells that corresponded to the ‘crazy-paving’ pattern seen on CT. On immunohistochemical (IHC) staining, the malignant cells were positive for SOX 10, MART-1, and BRAF (V600E mutation), and negative for p63, TTF-1, MOC-31, CD45, CD56, and synaptophysin, supporting a diagnosis of metastatic melanoma.

Conclusion: On CT scan, metastatic melanoma to the lungs typically appears as a solid nodule, with well-defined borders and smooth margins [4]. It is rare that metastatic melanoma appears as ‘Crazy-Paving’ patterns. Recognizing the clinical and radiological presentation of malignant melanoma with ‘crazy-paving’ pattern is extremely important for timely diagnosis with tissue sampling, and confirmation of diagnosis can be completed with IHC staining for BRAF mutation and PD-L1 expression.

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Presentation #77

Clinical characteristics of patients with cervical cancer undergoing fertility-sparing surgery with cervical excision and lymph node evaluation

Zhang, Ashley

As cervical cancer screening becomes more widely available, cervical cancers are being diagnosed earlier. Furthermore, the emerging trend of later childbearing presents an immediate need for fertility-sparing treatments. The objective of our study is to examine the clinical characteristics of patients with cervical cancer who underwent cervical excision with lymph node evaluation. Using the Healthcare Cost and Utilization Project's Nationwide Ambulatory Surgery Sample, we conducted multivariable analysis between surgical treatment modalities for cervical cancer and patient demographic information. Ultimately, patients who had cervical excision with lymph node evaluation were found to be younger and healthier.

Presentation #78

The first case of pityriasis rubra pilaris following COVID-19 vaccination successfully treated with ixekizumab

Patricia Zhao BS¹, Corina A. Rusu MD², Olivia L. Schenck MD²

Pityriasis rubra pilaris (PRP) is a papulosquamous disorder of unknown etiology. Since the approval of novel vaccines against SARS-CoV-2, several cases of PRP following COVID-19 vaccination have been reported. We present here the first case of COVID-19 vaccine-related PRP successfully treated with the IL-17A inhibitor ixekizumab.

A 54-year-old female presented with a four-month history of a pruritic rash that appeared two weeks after receiving the COVID-19 booster vaccine. Physical examination showed a widespread eruption of large, orange-red plaques covering 70-80% body surface area, including the back, chest, abdomen, and extremities, with multiple islands of sparing. A biopsy revealed hyperkeratosis overlying an epidermis showing patchy hypogranulosis, moderate acanthosis, and mild spongiosis, consistent with a diagnosis of PRP. She was treated with ixekizumab, which led to near-complete resolution of the rash after two months.

PRP following COVID-19 vaccination was first reported in November 2021.¹ Since then, sixteen patients from nine different countries have been reported to have developed PRP following COVID-19 vaccination.^{1–10} The majority of these cases were treated with topical corticosteroids, oral retinoids, or methotrexate. However, the use of biologics in the treatment of PRP is increasing, and two cases of COVID-19 vaccine-related PRP showed improvement with the IL-12/23 inhibitor ustekinumab.^{3,4} To our knowledge, this is the first reported case of PRP following COVID-19 vaccination successfully treated with ixekizumab. While more information is still needed on the prognosis and most effective treatment regimen for this rare vaccine adverse effect, we present this case to raise awareness of this potential treatment option.

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Presentation #79

Scleromyxedema presenting with impressive livedo racemosa in the setting of monoclonal gammopathy of undetermined significance

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A 41-year-old female with monoclonal gammopathy of undetermined significance (MGUS) presented with a 1-year history of livedo racemosa that started on one arm and subsequently became more widespread after COVID-19 infection. She reported having one past miscarriage, but denied neurological symptoms, prior strokes, and personal or family history of bleeding or clotting disorders. Physical examination revealed impressive livedo racemosa predominantly over the extremities, but also involving the trunk and buttocks. She additionally had firm, skin-colored, waxy papules in a reticulated pattern on her dorsal forearms which linearized in areas.

Labs were negative for autoimmune conditions, antiphospholipid syndrome, and hypercoagulable disorders. Serum protein electrophoresis revealed an M protein spike with elevated Ig kappa free light chain consistent with her MGUS. A punch biopsy from her left forearm showed increased dermal fibroblasts and interstitial mucin, consistent with scleromyxedema. Intravenous immunoglobulin (IVIg) was initiated, with significant improvement in her cutaneous disease.

Scleromyxedema is a progressive cutaneous mucinosis often associated with paraproteinemias, such as MGUS.¹ It typically presents with dome-shaped or flat-topped papules on the hands, head, upper trunk, or thighs.² Other cutaneous manifestations may include redundant skin folds on the trunk (Shar-pei sign), a central depression over proximal interphalangeal joints (donut sign), sclerodermoid features, and leonine facies.^{2,3} Livedo racemosa is rare, with one study reporting its presence in only 3 of 33 patients.³ First-line treatment for scleromyxedema is IVIg.^{3,4} We present this case of widespread livedo racemosa in MGUS-associated scleromyxedema to raise awareness among clinicians of this presentation of scleromyxedema to facilitate timely diagnosis and treatment.

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