RUSH

RUSH UNIVERSITY

TRAINEE RESEARCH DAY

ABSTRACT BOOK

MARCH 21, 2024

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Welcome from Interim President

Welcome to Trainee Research Day!

This is a great opportunity for us to feature the tremendous research taking place every day at RUSH, focusing on the creativity and hard work of our students and other trainees. It is also a time to recognize the many faculty members who provide the training and mentorship to this next generation of leaders.

I invite you to page through this booklet of abstracts. I know that you will be as impressed as I am.

Please also stop in on Thursday, March 21 to support and interact with the presenters. Both oral and poster presentations are an important part of the education of our trainees, and by attending and interacting with presenters you can assist in this process and learn a lot as well.

Please also join us for the Room 500 reception to follow where we can celebrate our trainees and come together as a community.

I look forward to seeing you there.

Larry Goodman, MD
Interim President, Rush University

Acknowledgements

During the Trainee Research Day please take a moment to say "thank you" to everyone who helped organize this event.

Deans:
- Jason S. Turner, PhD, MAE, Interim Dean, College of Health Sciences
- Christine M. Kennedy, PhD, RN, FAA, Dean, College of Nursing
- Cynthia Brincat, MD, PhD, FACOG, Acting Dean, Rush Medical College

Vice Deans for Research:
- Lauren M. Little, PhD, OTR/L, Associate Dean of Research, College of Health Sciences
- Barbara A. Swanson, PhD, RN, FAAN, ACRN, Associate Dean for Research, College of Nursing
- Lena Al-Harthi, PhD, Interim Vice Dean for Research, Rush Medical College

RUSH Services:
- Antonio Mendoza, Quick Copy
- Room 500 Staff
- Laurie Ann Bender, Office of the Registrar
- RUSH Photo Group

Volunteers:
To our returning volunteers, especially to David Gerald, Stephanie McCarthy, and Charlene Gamboa, PhD and to all the new volunteers.

A huge "**thank you**" to Norma Sandoval! Norma makes Trainee Research Day happen and we are very grateful.

Trainee Research Day

Thursday, March 21, 2024
At-A-Glance

Time & Location	Sessions
9 a.m. - 12:15 p.m. Room 540 AAC	**Oral Presentation Awards** Jerenda Bond, PhD (CHS) Linda O'Kelley, MS, RNC-NIC (CON) Sneha Anand, BS (RMC) Michelle Ash, IBS PhD (RMC/DTS) Caroline Canning, MD, MBI (Clinical Resident) Jennifer Hong, BS (CHS) Madison Sheafe, MSN, RNC-NIC, CNL (CON) Lauren Chakraborty, BA (RMC) Stephanie McCarthy, IBS PhD (RMC/DTS) Alia Obeidat, PhD (Post-Doctoral Research Fellow)
12:30 – 2:30 p.m. Searle Conference Center	**Poster Viewing**
2:30 - 4:30 p.m. Searle Conference Center	**Poster Presentations** 2:30 - 3:30 p.m. (Odd posters #'s) 3:30 - 4:30 p.m. (Even poster #'s) **People's Choice** Attendees will have an opportunity to vote for the top three presenters of their choice by placing a sticker on their poster card.
5 - 6:30 p.m. Room 500, Main Lounge	**Award Ceremony Reception** Pizza and drinks will be served.

Visit the Trainee Research Day webpage for the most up-to-date information. Event information can also be found in the Rush Research Calendar.

For questions, contact Norma Sandoval.

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William Assan, MPH

William Assan (Rush), Shirlene Paul (Rush), Chelsea McPeek (Rush), Lisa Stempel (Rush), Mia Levy (Rush), Dipti Gupta (Rush), Rosalinda Alvarado (Rush)

BREAST CANCER DETECTION RATES IN PATIENTS UNDERGOING SUPPLEMENTAL BREAST IMAGING

INTRODUCTION: Cancer is a leading cause of death in the United States, with breast cancer incidence greatest among all new cancer cases in 2022 at 15%. In the secondary prevention of breast cancer, false negative screening in the diagnosis of breast cancer remains a concern, especially in screening mammography as the first-line modality. Among those with an increased risk of developing the disease, such as women with a personal history of breast cancer (PHBC), supplemental imaging modalities including automated breast ultrasound (ABUS) and magnetic resonance imaging (MRI) may yield superior detection benefit. These screening modalities at Rush were compared to screening mammography by their respective cancer detection rates (CDRs) per 1000 patients.

METHODS: Data from 07/20/2020 to 03/31/2023 were extracted from the Epic EMR. Patients were stratified by those with or without a PHBC and were further grouped by those who had a screening mammogram, supplemental ABUS, and/or screening MRI. Overall CDR was calculated for each modality in addition to group CDR calculations based on PHBC status.

RESULTS: 126,576 imaging studies were counted from 42,431 patients. The overall CDRs for screening mammogram, supplemental ABUS, and screening MRI among qualifying patients were 8.6, 1.7, and 15 respectively. For those without a PHBC, CDRs were 4.7, 0.7, and 8.28 for screening mammogram, supplemental ABUS, and screening MRI.

CONCLUSION: Screening MRI is the most sensitive imaging modality for breast cancer and is of greatest interest in next steps. Future work will involve calculating and comparing CDRs between the following groups who received a screening MRI: patients with a known genetic mutation (KGM) for breast cancer, patients with a PHBC, and patients identified as high-risk using the Rush Breast Cancer Risk Assessment Tool (CRA).

Shalini Atluri, BS

Shalini Atluri (Rush), Shirlene Paul (Rush), Chelsea McPeek (Rush), Mia Levy (Rush), Rosalinda Alvarado (Rush), Lisa Stempel (Rush), Dipti Gupta (Rush)

ASSESSING ELIGIBILITY IN BREAST IMAGING PATIENTS TO RECEIVE ADDITIONAL HEALTH SCREENINGS

INTRODUCTION: Medical tests such as cancer screenings are shown to be correlated with lower mortality. However, a suboptimal percentage of women are receiving eligible health screenings. This could be due to a lack of health literacy and knowledge surrounding the importance of timely screenings. In this retrospective study, we analyzed the uptake of osteoporosis screening in women who presented for breast cancer screening.

METHODS: Data from January 2020-July 2023 at an academic breast imaging center was extracted from electronic health records. Eligibility for osteoporosis screenings was determined through clinical data analysis and the National Osteoporosis Foundation. Data variables such as race, primary language, and whether eligible patients underwent an osteoporosis screening were analyzed. Chi-square tests were performed to determine the statistical significance of the results.

RESULTS: 56,945 patients presented to the breast imaging center between July 2020-July 2023. Of those patients, 22,443 (42.6%) were aged 65 and older indicating eligibility for a DEXA scan. 61% of these patients who were eligible for a DEXA scan received at least one scan, while 38.9% of them who met criteria did not receive a scan. Within racial groups, the Hispanic population had the highest uptake with 2318 (68.8%), followed by African American 5624 (62.5%), Asian 508 (60.3%), White 6151 (58%), and Other 322 (51.5%). Within the identified primary language, 187 (70.57%) of the Bilingual, 1101 (66.7%) Spanish, Other (66.03%), English (59.9%) received a DEXA scan. Statistically significant Results (p < 0.0001) indicated that bilingual patients were more likely to have a DEXA scan than English as primary language patients. The differences between demographics and receiving a DEXA scan were statistically significant for all analyses (p <.0001).

CONCLUSION: The main variables that influence the decision to complete a DEXA scan are a non-White race and non-English primary language, possibly due to the presence of adequate interpretation services, culturally competent care, and available education material. Nearly 40% of patients who were eligible for a DEXA scan did not receive one, suggesting the need for interventions to increase uptake. More research is needed to assess the differences in disparities.

Emily Bilenduke, MA

Emily Bilenduke, MA (Rush University Medical Center); Esha Kumar Nikore, PhD (Rush University Cancer Center); Pallavi Babu, PhD (Rush University Cancer Center); Yasmin Asvat, PhD (Rush University Cancer Center); Lauren Rynar, PhD (Rush University Cancer Center); Patricia Fank, PsyD (Rush University Cancer Center)

ARE SOCIODEMOGRAPHIC FACTORS ASSOCIATED WITH HEMATOPOIETIC STEM CELL TRANSPLANT (HSCT) PATIENT PROMIS-29 SCORES AT DISCHARGE?

INTRODUCTION: Hematopoietic stem cell transplant (HSCT) impacts physical, social, and emotional functioning across the transplant continuum. Transplant recipients frequently report increased symptoms of anxiety, depression, delirium, posttraumatic stress reactions, sleep disruption, and social functioning concerns. These factors, along with demographic factors, may influence HSCT outcomes. Few studies have examined the interplay between psychological well-being and demographic factors throughout the transplant process. Thus, this study examines the predictive utility of sociodemographic factors on Patient Reported Outcomes Measurement Information System (PROMIS-29,V2.1) scores of HSCT patients.

METHODS: Retrospective chart review was performed for 71 adults who underwent HSCT at an urban tertiary cancer center in 2023. Patients completed the PROMIS questionnaire upon discharge from the inpatient transplant admission. T-scores for each PROMIS domain were analyzed using multiple regression to predict scores based on treatment type and sociodemographic factors (transplant type, marital status, insurance type, education, language, ethnicity, race, sex, and age). Additional data across the transplant continuum will be analyzed to determine the relationships between key variables.

RESULTS: Transplant types include allogeneic (29.6%), autologous (60.6%), CAR-T (9.9%). Participants reported mild impairment in physical functioning; however, anxiety, depression, fatigue, sleep disturbance, participation in social activities, pain interference, and cognitive function were within normal limits. The multiple regression models were not statistically significant in predicting PROMIS domains with treatment and demographic information.

CONCLUSION: High patient distress tolerance, multidisciplinary program effectiveness, adequate access to supportive resources, or data limitations in capturing the complexity of physical and mental health consequences related to demographic factors may explain the findings. Given the vital role of patient well-being in HSCT outcomes, factors contributing to variance in physical, social, and mental health should be clarified. Future research could explore the present results across the transplant course and mechanisms underlying the multidisciplinary program's ability to address known sociodemographic influences on HSCT and well-being.

Rachel Chang, BS

Rachel C. Chang, BS, Elise K. Brunsgaard, MD, David C. Reid, MD   Rush University Medical Center, Chicago, Illinois

RURAL-URBAN SURVIVAL DIFFERENCES AND HEALTH DISPARITIES IN MERKEL CELL CARCINOMA: A NATIONAL CANCER DATABASE ANALYSIS

INTRODUCTION: Current studies on the epidemiology and population-specific differences of merkel cell carcinoma (MCC) are limited, and no studies have investigated care of MCC based on rural versus urban patient residence. Due to multiple potential barriers, we hypothesized that differences exist in treatment of MCC based on rural versus urban residence location.

METHODS: The National Cancer Database was used to identify adult patients diagnosed with MCC from 2016 to 2020. Differences in comorbidity indices, facility type for treatment, and survival rates were analyzed. Binomial test was performed for categorical variables and ANOVA was performed for continuous. Survival differences were examined with Cox proportional hazards models and Kaplan-Meier curves.

RESULTS: 9742 patients (mean 74.5 years) met inclusion criteria. Rural patients traveled farther for treatment and were from areas characterized by lower income ($p < 0.001$) and education ($p < 0.001$). Patients in urban areas traveled an average of 26.6 miles for care, in contrast to rural patients who traveled an average of 62.9 miles.   In terms of facility type, urban patients were more likely to be treated at an academic/research facility (47.8% vs 40.7%, $p < 0.001$), whereas rural patients were more likely to be treated at a community cancer program (12.0% vs 3.6%, $p < 0.001$). Being treated at an academic/research program is associated with decreased risk of mortality relative to being treated at a community cancer program (Hazard ratio 0.68, 95% CI 0.58-0.80).   Patients in rural areas were more likely to have a Charlson-Deyo score of ≥3, indicating a higher number of comorbidities compared to urban patients (8.4% vs 7.0%, $p < 0.05$). Survival probabilities for rural patients with MCC were worse at 3 years (63.7% vs. 65.4%, $p < 0.01$) and 5 years (49.7% vs. 53.6%, $p < 0.001$) compared to urban patients.

CONCLUSION: Disparities exist in health outcomes and access to care for MCC between rural and urban patients, with rural-residing patients facing more significant barriers to treatment access, higher comorbidity rates, and worse survival probabilities.

Sara Chitlik, MD Candidate

Shirlene Paul (Rush); Chelsea McPeek (Rush), Dr. Rosalinda Alvarado (Rush); Dr. Lisa Stempel (Rush); Dr. Dipti Gupta (Rush); Dr. Mia Levy (Rush)

EVALUATION OF THE CANCER RISK ASSESSMENT TOOL UPTAKE AT RUSH

INTRODUCTION Breast cancer (BC) is the leading cause of premature mortality among women, with a 13% average lifetime risk. Several validated BC risk calculation tools are available but are not routinely used in clinical practice, limiting the opportunity to identify BC early in higher-risk individuals. To mitigate this, RUSH launched the Cancer Risk Assessment (CRA) tool, a questionnaire that assesses breast imaging outcomes in patients between the ages of 25 and 75. In this study, we analyze the lack of CRA uptake in ambulatory women and in which departments they presented to optimize CRA administration and uptake.

METHODS Retrospective data between July 20, 2020 and July 20, 2023 was collected from EPIC EMR. Inclusionary and exclusionary criteria were comprised of women between 25-75 years old presenting to mammogram-ordering departments who consented to have their CRA taken and those who have a known hereditary cancer mutation and/or have a personal history of breast cancer, respectively. The opportunity cohort was then selected, identifying women who are eligible for CRA but have not received it. Demographics such as race and age were assessed. Data from which mammogram-ordering departments saw more than 1000 women was collected and analyzed.

RESULTS Out of the 152,797 women who presented to mammogram-ordering providers at RUSH between July 20, 2020 and July 20, 2023, 121,547 (79.5%) women have never completed a CRA. Of these women, 43% were between the ages of 25 and 39 and 57% were between 40 and 75. Regarding racial demographics, the Black population presented with the highest percentage of uptake (31.6%), followed by Hispanic (19.8%), White (16.5%), Asian (15.4%), and Other (12%) populations. One hundred mammogram-ordering departments saw more than 1000 women, with PCP and OB/GYN treating most patients.

CONCLUSION There was a substantial increase in CRA uptake in women after age 40, which parallels the recommended yearly mammogram initiation in average-risk women. A higher uptake percentage in most non-White populations may indicate physician diversity and increasingly equitable care. However, based on the almost 80% of eligible women not receiving CRA, further research is indicated to identify barriers to care and better implement CRA in other departments.

Allie Heller, MS

Allie Heller, Boris Yang, Zeng-jie Yang

CHROMOSOMAL TRANSLOCATION OF PROTAMINE 1 LEADS TO A PATCHED 1 DEFICIENCY DURING MEDULLOBLASTOMA TUMORIGENESIS

INTRODUCTION Pediatric medulloblastoma (MB) is a cerebellar brain tumor namely characterized by its origination in early development, as early as embryogenesis. MB is thought to originate from the highly heterogeneous granular neuron precursor (GNP) cell population that resides within the rhombic lip of the dorsal hindbrain region, and is particularly susceptible to the oncogenic effects of Sonic Hedgehog (SHH) signaling pathway. Patched 1 (Ptch 1), typically a tumor suppressor gene encoding the antagonizing receptor for SHH ligand, is mutated in 20% of MB cases, otherwise known as SHH-group MBs. This mutation in MB presents as a loss of heterozygosity (LOH), where the wild type allele of Ptch 1 is silenced. Ptch 1 receptor silencing activates downstream target proteins such as proto-oncogene Smoothened (Smo), which allows for the initiation of tumorigenesis. However, the molecular basis for Ptch1 LOH in MB remains elusive.

METHODS We have discovered a cancer-testis antigen, Protamine 1 (Prm 1), that is ectopically present in the Ptch 1 locus in SHH-group MB tumors. By utilization of the RNAscope technique, we confirm mRNA expression of Prm 1 in cerebellar tumor tissue, predominantly from tumor cells, but not in stromal cells.

RESULTS These studies reveal that tumor cells express Prm 1 by highjacking the Ptch 1 promoter, thereby promoting tumor progression.

CONCLUSION These findings establish the mechanism for Ptch 1 LOH in SHH-group MB, and provide the rationale to define the cell of origin for SHH group MB based on Prm 1 expression.

Waddell Holmes, Masters degree

Waddell Holmes1, Shreya Patel1, Marcus Winogradzki1, Ahmad H. Othman2, Alan Blank3, Ryan Ross1, and Jitesh Pratap1
1 Department of Anatomy and Cell Biology, Rush University Medical Center, Chicago, IL,
 2 Northwestern University, Chicago, IL, 3 Section of Orthopedic Oncology, Rush University Cancer Center

REGULATION OF DIFFERENTIAL EXPRESION AND SPATIAL DISTRIBUTION OF THE ENDOSOMAL PROTEINS IN OSTEOBLAST

INTRODUCTION Recent transcriptomics and proteomics studies with differentiating osteoblasts (OB) revealed endosomal proteins as the most prominent upregulated cluster. The endosomal pathway regulates the fate of the internalized molecules to the plasma membrane, trans-Golgi network, or the lysosome. Endosomes also serve as a platform to control the growth factor signaling output. However, the regulation of expression and subcellular distribution of endosomes during osteoblast differentiation are currently unknown.

METHODS Here, we utilized multiple OB models to examine the levels and subcellular distribution of the endosomal pathway-related genes via qRT-PCR, western blotting, and confocal microscopy. We found upregulation of mRNA and protein levels of Syntaxin 6 (STX6) and Rab5 in differentiating mouse IDG-SW3 osteoblasts. We found significant upregulation of mRNA levels of early endosomal antigen-1 (EEA1) and Rab7 while protein levels remain unchanged. Next, to understand the regulation of expression levels and subcellular distribution, we examined the role of Runx2, a master regulator of osteoblast differentiation. We utilized WT and Runx2 knockout (KO) calvarial osteoblasts and found a significant reduction in EEA1 and increased levels of Rab11 in Runx2 KO cells.

RESULTS The distribution and trafficking of endosomes depends on the stability of microtubules (MTs). Therefore, we treated OB with MT-targeting agents and found that stabilizing MTs via docetaxel treatment increases the endosomal protein levels. Interestingly, MT depolymerization via vinblastine or nocodazole resulted in the aggregation of EEA1 puncta in Runx2 KO cells without changing the protein levels. Stabilization of MTs via tubacin treatment also yielded endosomal aggregation. These results indicate that changes in the MT dynamics and Runx2 levels can differentially regulate endosomal distribution. Data analysis of Runx2 ChIP-seq studies revealed Runx2 recruitment on STX6 promoter, suggesting a novel Runx2 target gene. Next, to determine the effect of nutritional stress on endosomal proteins, we examined the serum- and glucose- starved OB and found reduced levels of Rab5 and Rab7. Taken together, our studies identified the key changes in the endosomal landscape during osteoblast differentiation.

CONCLUSION Our findings suggest a novel regulation of OB differentiation via endosomal pathway proteins. Runx2 alters endosomal protein expression and subcellular distribution. Inhibiting Runx2 decreases immunofluorescent staining of early endosomal markers EEA1, and Rab5

Malia Leifheit, BS Health Science and Biology

Malia E Leifheit (Rush), Gunnar Johnson (Rush), Hyun Yun (Rush), Kajal Gupta (Rush), Amanda L Marzo (Rush)

USING GILTERITINIB TO TARGET FLT3 SIGNALING IN COMBINATION WITH mTOR INHIBITORS AS TREATMENT FOR FLT3+ ACUTE MYELOID LEUKEMIA PATIENTS

INTRODUCTION Acute myeloid leukemia (AML) is a major type of cancer attacking the bone marrow linage of cells, causing a massive health risk to the afflicted individual if left untreated. AML accounts for about one third of leukemia diagnoses annually and after treatment, around 50% of patients experience disease relapse. FMS-like tyrosine kinase 3 (FLT3), a member of the receptor tyrosine kinase family, is overexpressed on the majority AML blasts. FLT3 mutations are the most common genetic alteration in AML and is subdivided into the internal tandem duplication (ITD) in 25% of patients and point mutations in the tyrosine kinase domain (TKD) in around 5% of patients. Gilteritinib, a FLT3 inhibitor (FLT3i), targets both forms of the mutation and causes significant cell death after treatment. However, many patients experience relapse after FLT3i treatment. The FLT3 mutation Results in downstream signaling of the mammalian target of rapamycin (mTOR) pathway. Thus, targeting FLT3 signaling through the use of small molecule inhibitors, such as gilteritinib and mTOR inhbitiors (mTORi), is an attractive therapeutic strategy.

METHODS FLT3+ITD+ MOLM-14 AML cells were treated with various concentrations and combinations of gilteritinib, rapamycin and a rapamycin analog (mTORC1 inhibitors), and JR-AB2-011 (mTORC2 inhibitors) for 48 hours. Donor PBMCs were rested for 24 hours before co-culturing with pre-treated MOLM-14 cells for an additional 24 hours. Cells were stained and analyzed using flow cytometry.

RESULTS A combination of gilteritinib, mTORC1, and TORC2 inhibitors significantly decreases cell viability (****$p < 0.0001$) compared to gilteritinib alone. The novel combination significantly increased CD107a expression (***$p < 0.001$), coupled with enhanced expression of perforin and granzyme B (****$p < 0.0001$) after 48 hours of treatment. NKG2D expression was significantly decreased (***$p < 0.001$) compared to gilteritinib after 48 hours of treatment.

CONCLUSION A combination of gilteritinib, mTORC1, and mTORC2 inhibitors decreases AML cell viability, enhances NK cell activation by signaling through NK cell activating receptor NKG2D, and enhances NK cell deregulation indicated by elevated surface CD107a expression.

Philip Papayanis, MD

Philip Papayanis (Rush) - presenting author   Taha Alrifai (Rush)

HEMOGLOBIN TARRANT: A CASE REPORT ON A RARE HIGH OXYGEN AFFINITY HEMOGLOBIN VARIANT CAUSING ERYTHROCYTOSIS

INTRODUCTION   High oxygen affinity hemoglobinopathies are a rare type of genetic disease that can cause an isolated erythrocytosis. As the name would suggest, in these diseases a patient's hemoglobin binds O2 more strongly meaning less O2 delivery to tissues at normal hemoglobin levels thus leading to erythrocytosis. These diseases are usually inherited in an autosomal dominant fashion, though heterozygous may have milder disease than homozygous. While this is commonly asymptomatic is can cause complications such as hyperviscosity or thrombosis. When a patient presents with erythrocytosis, the differential diagnosis includes primary causes such as polycythemia vera as well as secondary causes such as COPD, smoking, or OSA. Less commonly there may also be hereditary causes of erythrocytosis such as high oxygen affinity hemoglobin variants, but more common causes should be ruled out before making a diagnosis. For lab workup for high for high oxygen affinity hemoglobinopathies, hemoglobin electrophoresis may give you abnormal findings but not detect a specific abnormality. A decreased P50 and more specialized hemoglobin or genetic testing can help confirm the diagnosis. Treatment options are not well established and the role for treatments used for primary polycythemia such as phlebotomy or anti-platelet therapies are unclear.

CASE DESCRIPTION   In this case we discuss a patient who initially presented with asymptomatic erythrocytosis. The patient was not having any signs of thrombosis such as vision changes or dyspnea. Initially workup including JAK2 testing was unrevealing. In terms of differential diagnosis this patient was not a smoker, did not live at a high altitude, and was low risk for OSA. Initial electrophoresis showed an unspecified abnormality and further testing revealed the patient had a rare high oxygen affinity hemoglobin called Tarrant. Of note, our patient does have a grandmother and father who receive regular phlebotomy but is unsure of why. Our patient is currently being evaluated for whether or not treatment would be beneficial.

DISCUSSION Overall, our case can help contribute to the literature on rare high oxygen affinity hemoglobinopathies which should be considered in a patient with isolated erythrocytosis if initial workup is unrevealing. Future areas of research could include treatment options and if they are beneficial.

Shreya Patel, MS

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MICROTUBULE DYNAMICS IN BONE METASTASIS OF BREAST CANCER.

INTRODUCTION Bone metastasis (BM) remains a major cause of morbidity in advanced cancer patients. Median survival rates of the two most common BM cancers, breast and prostate, range from 19-25 months and 12-53 months, respectively. Treatment strategies usually rely on surgical resection of tumors, combined with radio- and/or chemotherapies like paclitaxel, which target microtubules (MT). The efficacy of these approaches is diminished by tumor recurrence and drug resistance. Growing evidence points to dysregulated expression of tubulin isotypes as a major driver of chemoresistance. MTs are composed of heterodimers of α- and β-tubulins. Tubulin β3 has been most studied for its resistance to taxanes and vinca alkaloids, with high expression correlating to poor patient outcomes. Tubulin isotypes are distinguished by their c-terminal domain and a variety of post-translational modifications (e.g., acetylation) that facilitate specific protein interaction. Currently, little is known about how microtubules change during bone metastasis.

METHODS   RNA-Seq analysis-set of bone metastatic and a set of non-metastatic breast cancer cell lines (n=10)   Immunohistochemistry of BM tumors from breast cancer patients. Mass spectrometry and immunoprecipitations   Cell lines- MCF10A, MCF7, Parental MDA-MB-231, Bone derived MDA-MB-231.

RESULTS AND CONCLUSION   RNA-Seq analysis revealed differential expression of tubulin β isotypes with increased expression for tubulin β2a, β2b, and β6. Protein levels of tubulin β2 were higher in the aggressive MDA-MB-231 compared to MCF7 breast cancer cells. Immunohistochemistry of BM tumors shows increased β2 and acetylated α-tubulin (Ac-α-Tub) staining compared to matched primary tumors. Ac-α-Tub promotes microtubule stability and supports vesicular trafficking. Together these findings suggest specific microtubular changes during cancer cell adaptation to the bone. We and others have reported that Runx2 promotes bone metastasis. Inhibiting Runx2 in MDA-MB-231 leads to decreased Ac-α-Tub as well as tubulin β2. Mass spectrometry and immunoprecipitations suggest that Runx2 regulates the interaction of MT-associated proteins and HDAC6 with α tubulin, preventing its deacetylase activity. Loss of Runx2 sensitized these bone metastatic cells to docetaxel and vinblastine treatment, as well as reduced secretion of IL-6. In summary, our results suggest specific changes in microtubule cytoskeleton during BM, as well as novel therapeutic targets that may lead to more effective chemotherapeutics to inhibit tumor growth in bone.

Esther Yoon, PhD, MPH, MS

Esther Yoon, PhD (Rush University Medical Center) Sophia Weiner-Light, MS (Northwestern University Feinberg); Pallavi Babu, PhD (Rush University Medical Center); Yasmin Asvat, PhD (Rush University Medical Center); Patricia Fank, PsyD (Rush University Medical Center); Lauren Rynar, PhD (Rush University Medical Center)

COMPARATIVE EVALUATION OF IN-PERSON VS. TELEHEALTH UTILIZATION OF PSYCHIATRY AND PSYCHOLOGY SUPPORTIVE ONCOLOGY SERVICES AT A TERTIARY CANCER CENTER

INTRODUCTION: Throughout the pandemic, teletherapy supported essential continuity of care for cancer patients who were unable to attend in-person (i.e., F2F) visits; however, little is known about how teletherapy utilization has shifted post-pandemic. We sought to explore trends and sociodemographic differences in utilization of teletherapy versus F2F visits among cancer patients in these later stages of the pandemic.

METHODS: Service utilization and sociodemographic data were extracted from the electronic medical record for patients referred to the Cancer Center's Psychology or Psychiatry/Collaborative Care from Jan 2023 to Sept 2023 and completed at least one encounter. Descriptive statistics, chi-square analyses, and ANOVA tests were conducted.

RESULTS: 210 patients were referred and completed at least one encounter. Median age was 54 years (range 19 - 93). Racial distribution was diverse (52.9% White, 27.1% Black, 20.0% Other). Majority were female (82.9%), non-Hispanic (77.6%), and lived within 20-miles from the Cancer Center (77.6%; median 8.7, range 0 - 100.6). Visits were conducted via F2F-only (35.7%), telehealth-only (46.7%), and hybrid (17.6%). Visit modality was significantly associated with age (p=0.01), race (p=0.01), distance from the Cancer Center (p<0.001), provider specialty (p<0.001), and total encounters (p<0.001). Compared to F2F-only, patients using telehealth-only or hybrid modalities were typically younger and completed a higher number of visits. Patients using telehealth-only generally identified as White or resided further from the Cancer Center. Patients seeing psychiatry and psychology (versus one service alone) were more likely to use hybrid visits.

CONCLUSIONS: Telehealth services continue to be utilized by cancer patients post-pandemic. Telehealth is more likely to be used by patients who are younger or live further from the Cancer Center and may reduce attrition rates for mental health services. These findings suggest that telehealth remains a popular and viable option for delivery of supportive oncology services, particularly for vulnerable populations who may otherwise face psychosocial barriers to receiving care.

Lauren Chakraborty, B.A

Lauren Chakraborty (Rush), Carlos H. Pereira (Rush), Edward Ouille (Rush), Suraj Desai (Rush), and Kathrin Banach (Rush)

PAK1 SIGNALING IS REQUIRED FOR RECOVERY FOLLOWING PATHOLOGICALLY INDUCED CARDIAC ATROPHY

INTRODUCTION: The heart lacks the ability to regenerate or grow by cell division, relying on modulation of cardiomyocyte size to adapt to metabolic or load changes. Cardiac atrophy occurs from nutritional deficits, inflammation, and cancer. Little is known about physiological cardiac plasticity that allows cardiac recovery from atrophy. Our group previously demonstrated p21-activated kinase (Pak1) signaling is cardioprotective and regulates cardiomyocyte growth. In skeletal muscle, Pak1 is a prerequisite for recovery from atrophy. In this study we aimed to determine the role of Pak1 in cardiac/atrial recovery following colitis and fasting induced atrophy.

METHODS: Wild type (WT) and Pak1-/- (FVBN) mice were used for the study. Active colitis was induced by Dextran sulfate sodium (DSS: 3.5%, 7 days), followed by a three-week recovery. The fasting model involved three days of fasting (H_2O ad libitum) followed by six-days refeeding. Model induced disease activity (DA) was quantified as body weight. Heart weight (HW) was normalized to tibia length. Isolated atrial myocytes were characterized by area using Di-8-ANEPPS. Treatment induced changes are presented normalized to control (%).

RESULTS: During peak DA DSS treated mice exhibited a 14.6% (±6.78%, n=16) and fasted mice a 16.9% (±1.73%, n=14) loss of initial body weight. Animals regained weight 21 days and 6 days after peak DA, respectively. During active colitis, WT and Pak1-/- hearts exhibited comparable decreases in HW (WTDSS: 20.84±3.33%, PakDSS: 17.74±4.82%, p-value=0.332). After recovery, WT HW was similar to Ctrls (WTDSS 0.26±6.95%, p-value=0.938), while Pak-/- HW remained significantly lower than Ctrls (PakDSS: 15.49±4.40%, p-value=0.010). Similar changes were found in fasted mice: fasting induced comparable decreases in WT and Pak1-/- HWs (WTFast: 22.96±5.98%, PakFast: 20.32±5.45%, p-value=0.544) with Pak1-/- HW failing to recover following refeeding (WTFast: 6.10±2.77%, p=0.474; PakFast: 30.97±4.57%, p=0.014). Both WT and Pak1-/- groups saw declines in atrial myocyte area compared to controls (WT: 39.40±14.57%, p-value<0.001; Pak: 27.32±18.45%, p-value=0.006) demonstrating that loss in HW was the consequence of cellular catabolism.

CONCLUSION: The data show for the first time that Pak1 is a prerequisite for cardiac recovery from atrophy, and that attenuated Pak1 signaling reduces cardiac plasticity thereby increasing strain and the risk for pathophysiological remodeling.

Megan Grobelny, RN, BSN

Dr. Martha Siomos (Rush University)

IMPLEMENTATION OF A PATIENT TRACKING REGISTRY TO IMPROVE FOLLOW UP IN PATIENT WITH ABDOMINAL AORTIC ANEURYSM

INTRODUCTION Patients with abdominal aortic aneurysm (AAA) require routine surveillance to safely monitor aneurysm size, advise when surgical intervention is warranted, and identify potential complications to reduce aneurysm-related morbidity and mortality. Loss to follow (LTF) up can result in potential delays in care, surgical intervention, and possible poor health outcomes. **PURPOSE** The purpose of the project was to reduce the number of patients LTF with a diagnosis of AAA that had established care within the institution's vascular surgery department.

METHODS A retrospective chart review was conducted from January 1, 2020 to December 31, 2022 to identify patients within a large, academic, tertiary medical center's vascular surgery department with a diagnosis of AAA. A clinic patient tracking registry was developed and implemented to track patient adherence to surveillance imaging and clinic follow up appointments. Beginning January 1, 2023, patients were added to the registry in real time. Clinic RNs maintained the registry and facilitated communication among patients, office staff, and vascular providers on a monthly basis. Patients were contacted by telephone to schedule and provide reminders regarding follow up appointments and imaging. The primary outcome measures were completed or scheduled surveillance imaging, provider follow up, and subsequent procedures scheduled related to AAA diagnosis.

RESULTS During the prospective study period (January 1, 2020, to December 31, 2023), 166 patients with a diagnosis of AAA within the institution's vascular surgery service were identified. 28 patients had no documented instructions for AAA follow up and 39 patients were identified as LTF. Of the 39 patients identified as LTF, 17 were then categorized as adherent to follow up after implementation of the patient tracking registry with an additional 4 patients scheduled for a vascular procedure related to their AAA diagnosis.

CONCLUSION The development and implementation of a AAA patient tracking registry successfully improves LTF rates. The project confirms that close coordination of care is an important factor that influences follow up in accordance with Society for Vascular Surgery guidelines.

Hiroki Kittaka, PhD

Hiroki Kittaka (RUSH), Andres F Pelaez (RUSH), Carlos H Pereira (RUSH), and Kathrin Banach (RUSH)

ATRIAL ELECTROPHYSIOLOGICAL REMODELING INDUCED BY ACTIVE COLITIS

INTRODUCTION: Patients with ulcerative colitis exhibit an increased risk for atrial fibrillation (AF) during the active disease phase and show signs of atrial electrophysiological remodeling even in remission. AF is characterized by a rapid irregular heart rate triggered outside the sinus node or reentry of excitation. Goal of the current study was to determine the basis for colitis-induced changes in atrial excitability.

METHODS: In a mouse model (C57BL/6; 3-6 months old) of dextran sulfate sodium (DSS) induced active colitis (DSS: 3.5%, 7 days), changes in atrial function were quantified in vivo by ECGs, in the Langendorff perfused heart by field potential recordings, by patch clamp recordings and intracellular calcium imaging from isolated atrial myocytes, and by RNAseq analysis of left atrial tissue.

RESULTS: DSS-treated mice exhibited altered atrial electrophysiological properties with decreased P-wave amplitude (Ctrl: 0.10 ± 0.01 V; DSS: 0.078 ± 0.02 V; n=23/42; p<0.0001), prolonged P-wave duration (Ctrl: 25.87 ± 1.49 ms; DSS: 30.56 ± 3.46ms; n=23/42; p<0.001) and PR interval (Ctrl: 40.72 ± 2.86 ms; DSS: 43.43 ± 4.58 ms; n=23/42; p<0.02). Decreased atrial conduction velocity (Ctrl: 62.32 ± 10.33 cm/s; DSS: 52.40 ± 12.80 cm/s; n=19/28; p<0.007) supported attenuated atrial excitability. Cellular action potential (AP) showed that while maximal upstroke velocity (Ctrl: 149.4 ± 45.1 mV/ms; DSS: 124.3 ± 39.5 mV/ms; n=21/19; p=0.071) and amplitude (Ctrl: 33.0 ± 10.6 mV; DSS: 29.6 ± 9.7 mV; n=21/19; p=0.29) were unchanged, the AP threshold was more depolarized (Ctrl: -62.7 ± 2.2 mV; DSS: -59.4 ± 3.4 mV; n=15/17; p=0.003). V1/2 values of voltage-gated Na+ current activation (Ctrl: -52.1 ± 1.4 mV; DSS: -48.2 ± 1.5 mV; n=22/15 p<0.0001) and inactivation (Ctrl: -84.5 ± 2.8 mV; DSS: -87.2 ± 2.4 mV; n=22/16 p<0.0053) were shifted. Systolic intracellular calcium transients were reduced (Ctrl: 2.12 ± 1.20; DSS: 1.43 ± 0.76; p=0.028, n=24/30). RNAseq revealed decreased expression of the Na+-channel SCN5A (log2FC: -2.19, p=3.2x10-9; n=3/3) and its regulatory beta-subunit SCN4B (log2FC: -2.03, p=1.8x10-7; n=3/3).

CONCLUSION: Our data show that active colitis decreases Na+-channel and systolic calcium activity, thereby attenuating atrial excitability, increasing dispersion of excitation, and increasing the risk for reentry.

Serafino LaGalbo, B.S.

Serafino LaGalbo, B.S.(Rush), Nicholas Rigler, M.D. (Rush), Braedon Urie, B.S.(Rush), Sean Swearingen, M.D. (Rush)

RELATIONSHIP BETWEEN ECHOCARDIOGRAPHY FINDINGS AND EXERCISE CAPACITY IN THE NON-ATHLETE

INTRODUCTION: The cardiovascular systems of elite athletes are a common focus of study. Depending on the mode of sport or other activity athletes participate in, various findings such as changes in left ventricular (LV) size, changes in resting heart rate, and systolic and diastolic indexes that differ from those who do not participate in rigorous physical activity have been widely documented. The purpose of this study was to investigate the relationship between echocardiographic variables obtained as part of a routine diagnostic workup and maximal exercise stress test performance in the less-studied non-athlete population. Given that there is an inverse correlation between exercise stress test performance and cardiac-related morbidity and mortality, prognostic indicators based on non-invasive imaging findings alone have potential to be used as a marker of cardiovascular fitness.

METHODS: This was a retrospective electronic medical record review performed on patients that underwent both transthoracic echocardiogram (TTE) and exercise stress testing at RUMC for various chief complaints unrelated to the study. Subjects included both males and females with demographic data outlined in table 1. Exercise stress tests were carried out using the standardized Bruce protocol. TTE variables that were included in the study were based on previous research surrounding echocardiograms performed on highly trained athletes and are illustrated in table 2. Correlations between echocardiogram variables and maximum METs achieved during exercise stress test were investigated using univariate linear regression analysis and are reported in table 2.

RESULTS: Univariate linear regression correlation coefficients between maximum METs achieved and echocardiography variables are outlined in table 2. The strongest statistically significant relationships between imaging findings and exercise stress test performance were noted in LVEDV index (r = 0.293, p<0.05), LVESV index (r = 0.272, p<0.05) and LAV index (r=0.273, p<0.05).

CONCLUSION: Although modest, LVEDV and LVESV indexes in addition to LAV index showed the strongest statistically significant correlation to stress test performance. Our data suggests that that in conjunction with other findings, these non-invasive imaging findings can be used as indicators of cardiovascular fitness. In addition, these findings illustrate that "normal" imaging findings may have more value than initially thought in this patient population.

Molly Mehta, Bachelors of Science

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PREVALENCE OF UNDIAGNOSED STAGE B HEART FAILURE IN THE EMERGENCY DEPARTMENT

INTRODUCTION: Heart failure (HF) is a chronic condition with high morbidity and mortality. Early intervention can improve outcomes. While most screening occurs in the outpatient setting, many patients utilize the emergency department (ED) as their primary source of healthcare due to disparities in primary care access. Therefore, many of these patients may experience delays in diagnosis and missed opportunities for preventative care. This study aimed to identify the prevalence of undiagnosed presymptomatic (Stage B) HF among ED patients with HF risk factors.

METHODS: This was an IRB-approved, prospective, observational study conducted among ED patients aged ≥45 years with ≥1 HF risk factor (hypertension, diabetes mellitus, obesity, history of cardiotoxic chemotherapy, family history of HF, and coronary heart disease). Patients were excluded if they had signs or symptoms of acute HF, known history of HF, history of valvular disease, current atrial fibrillation, clinical instability, or did not speak English. Ultrasound fellowship-trained physicians obtained short video loops of the heart in parasternal long-axis, parasternal short-axis, apical four-chamber, and apical two-chamber views. Diagnosis of systolic dysfunction was defined as a systolic ejection fraction <50% on visual assessment or an E-point septal separation ≥10 mm. Diagnosis of diastolic dysfunction was defined as E/A ratio <0.8, or if ≥2 of the following were present: 1) septal e' <7 cm/sec or lateral e' <10 cm/sec; 2) average E/e' ratio >14; or 3) left atrial volume index >34 mL/m2. We calculated the point prevalence with 95% confidence intervals (CI).

RESULTS: 88 patients were enrolled with 3 excluded due to inadequate images, leaving 85 total for analysis. The mean age was 62 years, with 55% women, and a mean BMI of 29 (SD: 6). Of these, 50 (59%; 95%CI: 48%-69%) had Stage B HF. 7 patients (8%; 95%CI: 3%-16%) had systolic dysfunction and 43 (51%; 95%CI 40%-61%) had isolated diastolic dysfunction.

CONCLUSION: Approximately two-thirds of ED patients with cardiovascular risk factors had evidence of undiagnosed Stage B HF visualized on bedside cardiac ultrasound. This highlights an important potential role for the ED to screen at-risk patients for Stage B HF to facilitate early detection and intervention.

Prakriti Mehta, Bachelor of Science in Cell and Molecular Biology

Prakriti Mehta, M3, Rush Medical College (presenting) Dr. Laith Ali, Cook County Hospital Dr. Rami Doukky, Cook County Hospital Dr. Samriddh Dhungel, Cook County Hospital Dr. Minki Jung, Cook County Hospital Dr. Carlos Alvarez-Florimon, Cook County Hospital Lillian Hallmark, M3, Rush Medical College

ANTI-NEUTROPHIL CYTOPLASMIC ANTIBODY (ANCA)-ASSOCIATED VASCULITIS AND AORTIC REGURGITATION IN A PATIENT WITH RHEUMATOID ARTHRITIS

INTRODUCTION: ANCA-associated systemic vasculitides (AAV) are a collection of immune diseases causing inflammation of small blood vessels. Presenting diversely, these autoantibodies often affect the kidneys, lungs, or sinuses. Though AAV may cause MI, cerebrovascular disease, or cardiac arrhythmias, isolated valvular disease, particularly of the aortic and mitral valves, is exceedingly rare.

CASE PRESENTATION: We present a case of a 55-year-old African American female with asthma, MDD, and rheumatoid arthritis who presented to the ED with for progressive shortness of breath. When hospitalized for progressive dyspnea earlier in October of 2023, she was told that she had valvular regurgitation and treated with IV diuretics. An echocardiogram done December 2023 evinced diastolic dysfunction with mild aortic stenosis, mild aortic regurgitation, and mild mitral regurgitation. Her rheumatoid arthritis was diagnosed in early 2023 and the patient denied taking prescribed hydroxychloroquine. She was a never smoker, minimal drinker, and denied all other substance use. Her family history was unremarkable.   In the ED, the patient's chest x-ray evinced bilateral haziness and pulmonary vascular congestion. Her EKG showed first degree AV block. Upon physical exam, JVD was perceived, and a systolic murmur could be heard at the second left ICS with a diastolic murmur at the right second ICS. Labs displayed troponin elevation at 0.048.   While awaiting the results of a TTE, AA amyloidosis secondary to rheumatoid arthritis was explored as etiology. TTE revealed LVEF of 50% with severe aortic regurgitation, moderate-severe mitral regurgitation, and small pericardial effusion. The cMRI did not display the characteristic global subendocardial late gadolinium enhancement or septal thickening. Instead, the aortic valve leaflets and annulus, aortomitral curtain, and anterior mitral leaflet appeared diffusely thickened, raising the possibility of non-bacterial thrombotic endocarditis. Concurrent rheumatology panels displayed increased p-ANCA levels, steering the discussion to AAV. Isolated valvular disease in AAV causing severe aortic and mitral regurgitation is exceedingly rare, positing this case as a singular presentation of AAV lacking renal or pulmonary involvement.

CONCLUSION: This case illustrates the differential diagnosis process in characterizing the etiology of acute severe aortic regurgitation in a patient with rheumatoid arthritis and no other cardiovascular risk factors.

Marco Metry, Bachelors of Science

Marco Metry (Rush); James O'Brien (Rush); Evelyn Schraft (Rush); Daven Patel (Rush); Molly Mehta (Rush); David Vayngart (Rush); Stanley Rozentsvit (Rush); Julio Roque Buenrostro (Rush); Sophie Irmak (Rush); Hunter Jenkins (Rush); Conner Merriman (Rush); Aylin Ornelas Loredo (Rush); Michael Gottlieb (Rush)

ACCURACY OF ARTIFICIAL INTELLIGENCE FOR DETECTING HEART FAILURE IN THE EMERGENCY DEPARTMENT

INTRODUCTION: Many patients utilize the emergency department (ED) as their main source of care, forgoing outpatient preventative screening services. Early detection and intervention can improve outcomes of heart failure (HF), and artificial intelligence (AI) can facilitate diagnosis of HF among less advanced users. This study aimed to examine the sensitivity and specificity of AI in detecting HF in the ED.

METHODS: This was an IRB-approved, prospective, observational study of ED patients aged ≥ 45 years with risk factors of HF. Patients with known valvular disease, current atrial fibrillation, high suspicion or known HF, clinical instability, and those who did not speak English as a primary language were excluded. Ultrasound fellowship trained physicians used an ultrasound machine with existing AI software and obtained parasternal long axis, parasternal short axis, and apical 4 chamber views of the heart. Systolic dysfunction was defined as ejection fraction (EF) < 50% using visual assessment or E-point septal separation > 10mm. Diastolic dysfunction was defined as an E:A < 0.8, or ≥ 2 of the following: septal e' < 7 cm/s or lateral e' < 10 cm/s, E:e' > 14, or left atrial volume > 34 mL/m2. AI was subsequently used to measure EF, E, A, septal e', and lateral e' velocities.We calculated the sensitivity and specificity of the AI in determining systolic and diastolic HF with 95% confidence interval (CI).

RESULTS: We identified 88 patients, of whom 3 excluded from the due to inadequate images and one was excluded only from systolic assessment due to inadequate AI capture. The mean age was 62 years (55% women) with a mean BMI of 29 (SD: 6). AI was 43% (95%CI 10%-82%) sensitive and 92% (95%CI 84%-97%) specific for systolic dysfunction. AI was 86% (95%CI 73%-94%) sensitive and 77% (95%CI 60%-90%) specific for diastolic dysfunction.

CONCLUSION: When compared with expert users, the AI model had high specificity for systolic dysfunction as well as acceptable sensitivity and specificity for diastolic dysfunction. AI may have a potential role to help expand HF detection by ED physicians with limited ultrasound training.

Samuel Miller, BSc

Samuel Miller (RUSH), Garrett Jimmerson, Ghaith Al- Tibi (Einstein School of Medicine)

POSITIVE RURAL PATIENT PERCEPTION OF CHRONIC CARE PROGRAM FOR CARDIAC PATIENTS

INTRODUCTION: Medicare's Chronic Care Management [CCM] is a team-based approach that aims to improve health outcomes for patients with at least 2 long term health conditions, through regular monitoring, prevention, self-management, and the coordination of healthcare services. CCM plays a crucial role in the care of older adults and patients in rural, medically-underserved areas.

METHODS: A survey was sent out via email to patients over 65 years old enrolled in the CCM program of a rural clinic. Patients responded to questions on a 5-point Likert scale about CCM satisfaction (Q1) as well as how well they agree with the following statement (Q2): "Services provided by Chronic Care Management are an excellent continuation of clinical care outside the walls of a traditional clinical setting in an approachable manner." Patients were also able to express opinions through open-ended responses. Percentages of patient satisfaction and agreement were calculated based on patient responses.

RESULTS: 5 (Extremely Satisfied / Strongly Agree) 4 (Satisfy / Agree) 3 (Neutral) 2 (Unsatisfied / Disagree 1 (Extremely Unsatisfied / Disagree)   Question 1   5 = 54.86% (n = 237)   4 = 37.04% (n = 160)   3 = 7.18% (n = 31)   2 = 0.69% (n = 3)   1 = 0.23% (n = 1) N = 432   Question 2   5 = 47.20% (n = 202)   4 = 39.25% (n = 168)   3 = 11.21% (n = 48)   2 = 0.23% (n = 1)   1 = 2.10% (n = 9)   N = 428

CONCLUSION: The majority (91.9%) of patients responded positively about satisfaction with the CCM program. Patient's acknowledged the role that CCM plays in their healthcare and echoed this through open-ended comments. In the opened ended responses, patient's described more comfort in the status of their health through having someone to reach out to when health concerns and needs arose. Patients felt like CCM bridged the gap for them between their homes and the cardiology clinic. In conclusion, we found that the majority of older adults living in the rural US have a positive perception of the Medicare CCM and acknowledge its benefits as it relates to their medical care.

Yuriana Oropeza-Almazán, PhD

Yuriana Oropeza-Almazán and Lothar A. Blatter Rush University

ROLE OF MITOCHONDRIAL ROS FOR CALCIUM ALTERNANS IN ATRIAL MYOCYTES

INTRODUCTION Atrial calcium transient (CaT) alternans is defined as beat-to-beat alternations in CaT amplitude and is causally linked to atrial fibrillation (AF), the most common form of cardiac arrhythmia. Mitochondria play a significant role in cardiac excitation-contraction coupling and Ca signaling through redox environment regulation. However, the relationship between mitochondrial ROS (ROSm) production and the susceptibility of atrial cells to develop CaT alternans is poorly understood.

METHODS Single left atrial myocytes were enzymatically isolated from male rabbit hearts and studied with fluorescent microscopy (CaT alternans alone: fluorescent indicator Cal-520AM; simultaneous measurements of ROS and CaT alternans: CM-DCFDA and Cal-590AM). CaT alternans was induced by increasing the pacing frequency until stable CaT alternans was observed. CaT alternans was quantified as the alternans ratio (AR = 1 − S/L, where S/L is the ratio of the small to the large amplitude of a pair of alternating CaTs). Data are presented as mean±SEM and statistical analysis was determined by ANOVA, paired Student's t-test or Mann-Whitney U test.

RESULTS In isolated rabbit atrial myocytes ROS production is enhanced during CaT alternans. Exogenous ROS (tert-butyl hydroperoxide) enhanced CaT alternans, whereas ROS scavengers (dithiothreitol, MnTBAP, quercetin, tempol) alleviated CaT alternans. While inhibition of cellular NADPH oxidases did not affect CaT alternans, interference with ROSm production had profound effects: 1) the superoxide dismutase mimetic MitoTempo diminished CaT alternans and shifted the pacing threshold to higher frequencies; 2) inhibition of cyt c peroxidase by SS-31, and inhibitors (S1QEL1.1 and S3QEL2) of ROSm production by complexes I and III of the electron transport chain decreased AR, and 3) impairment of mitochondrial antioxidant defense by inhibition of nicotinamide nucleotide transhydrogenase with NBD-Cl and thioredoxin reductase-2 with auranofin enhanced CaT alternans.

CONCLUSIONS We conclude that ROSm production, and thus the mitochondrial redox environment, are key determinants of the pathogenesis of pro-arrhythmic CaT alternans. Therefore, modulation of the mitochondrial redox status represents a potential avenue for targeted therapies against alternans-associated cardiac arrhythmias, including AF.

Carlos Pereira, PhD

Carlos Henrique Pereira (RUSH); Andres Pelaez (RUSH); Edward Ouille (RUSH); Hiroki Kittaka (RUSH); Kathrin Banach (RUSH)

ACTIVE COLITIS INCREASES THE PROPENSITY FOR VENTRICULAR ALTERNANS

INTRODUCTION: Ulcerative colitis (UC) is an inflammatory bowel disease and has been linked with electrophysiological changes and an increased risk for ventricular arrhythmia during UC. In this study, we aimed to determine the mechanism of colitis-induced changes in ventricular excitation-contraction coupling (ECC) and the increased propensity for ventricular arrhythmia.

METHODS: In a mouse model of dextran sulfate sodium (DSS) induced active colitis (DSSA: 3.5%, 7days) cardiac electrophysiological and contractile properties were quantified in isolated ventricular myocytes (VMs) by current clamp recordings of action potentials (AP), cell shortening, and fluorescent measurements (Fluo-4/AM 10µmol/L) of intracellular Calcium ([Ca]i). Fluorescent measurements of Di-8-ANEPPS (5µmol/L) and DCFH (10µmol/L) were used to assess t-tubule density and reactive oxygen species (ROS) production.

RESULTS: DSSA VMs exhibited attenuated field stimulation-induced calcium transient (CaT) amplitude (ΔF/F0: Ctrl: 1.87±0.82; DSSA: 1.28±0.45; p=0.001; n=27/32) and sarcomere shortening (Ctrl: 0.104±0.04µm; DSSA: 0.057±0.05µm; p=0.017; n=15/16). Alterations in CaT kinetic included a prolonged CaT upstroke velocity (Ctrl: 56.73±24.60a.u./s; DSSA: 39.23±13.37a.u./s; p=0.001; n=27/22) and decay constant τ (Ctrl: 0.37±0.08s; DSSA: 0.47±0.10 s; p<0.0001; n=27/32). However, no changes in AP were determined. Di-8-ANNEPS staining revealed a decrease in t-tubular density during active colitis (Ctrl: 38.21±1.65%; DSSA: 23.21±7.39%; p=0.022; n=5/5), that coincided with decreased cell capacitance (Ctrl: 168.3±44.73pF; DSSA: 130.8±34.98pF p=0.001; n=27/27. Changes in the CaT amplitude, sarcomere shortening and τ coincided with attenuated mRNA levels of junctophilin-2 (logFC=-1.88, p<10-4) and sarcoplasmic reticulum ATPase 2 (SERCA2) (logFC=-1.22, p=0.002). Beta-adrenergic stimulation (Isoproterenol: 100 nmol/L) eliminated the differences in CaT upstroke velocity (Ctrl: 170.5±51.4a.u./s; DSSA: 133.1±44.4a.u./s; p=0.090; n=9/12), CaT amplitude (ΔF/F0: Ctrl: 5.73±1.70; DSSA: 4.39±1.48; p=0.070; n=9/12) and sarcomere shortening (Ctrl: 0.223±0.05µm; DSSA: 0.193±0.06µm; p=0.017; n=9/12). However, τ remained prolonged (Ctrl: 0.115±0.0s; DSSA: 0.129±0.01s; p=0.028; n=9/12). DSSA VMs were more likely to develop alternans during pacing and exhibited an increased alternans ratio (Ctrl: 0.053±0.18a.u.; DSSA: 0.413±0.45a.u.: p=0.022; n=12/12). Increased alternans inducibility coincided with increase ROS production (ΔF/F0: Ctrl: 1.21±0.09; DSSA: 1.45±0.10; p<0.0001; n=15/9).

CONCLUSION: Our data support that active colitis-induced downregulation of junctophilin-2 attenuates ECC and contractile function and that the prolonged CaT because of SERCA2 downregulation and increased ROS facilitates the occurrence of ventricular alternans and arrhythmia.

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SVC SYNDROME: WHEN EDEMA IS NOT CAUSED BY AN ALLERGIC REACTION.

BACKGROUND   Superior vena cava (SVC) syndrome is considered an oncologic emergency and can present with facial swelling. Malignancy is the predominant cause of SVC syndrome and causes obstruction of blood flow from the SVC to the right atrium.

CASE PRESENTATION   A 62-year-old male with extensive smoking history and recently discovered left upper lobe pulmonary mass presented with worsening dyspnea and cough. CT angiogram of the chest was negative for pulmonary embolism but showed an enlarging mass in the left upper lobe with surrounding consolidation and opacities. Extensive mediastinal and hilar lymphadenopathy with associated rightward tracheal deviation were noted. He underwent image-guided left subclavicular lymph node biopsy, and the diagnosis of metastatic small cell carcinoma was made. Oncology initiated chemotherapy with carboplatin and etoposide, followed by etoposide alone on day 2 that he tolerated without any issues. On day 3, 18-hours after his second etoposide infusion, he developed marked periorbital and facial swelling. He had worsening dyspnea, voice changes and pooling of secretions. Due to concern for an allergic drug reaction to etoposide, the third dose was held. He was promptly administered epinephrine, diphenhydramine, methylprednisolone. He was placed on supplemental oxygen and transferred to the MICU. Laryngoscopy showed left vocal cord paralysis with generalized laryngeal edema, and he was started on Decadron. The decision was made to intubate him. The patient's cuff leak did not improve the following day and the angioedema persisted. Given unclear etiology for the angioedema and concern for an allergic drug reaction, the allergy service was consulted.

DISCUSSION   Suspicion for a type-1 (immediate), IgE-mediated hypersensitivity reaction was lower in our differential given prominent isolated, unremitting facial and laryngeal edema without skin manifestation. Additionally, the temporal relationship between administration of etoposide and the development of marked facial swelling was not consistent with an IgE-mediated reaction. Suspicion for hereditary or acquired angioedema was also lower in our differential, and C4 complement returned normal. Allergy recommended ruling out SVC syndrome. CT imaging confirmed SVC syndrome.

CONCLUSION   A high index of suspicion for SVC Syndrome is required in patients with intrathoracic malignancies presenting with facial (including periorbital) and upper extremity swelling.

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Paige Adams (Rush); Parul Goyal (Rush)

EVALUATION OF THE PRESCRIBING PATTERNS OF ORAL ISOTRETINOIN BETWEEN PATIENTS WHO CAN BECOME PREGNANT AND PATIENTS WHO CANNOT BECOME PREGNANT

INTRODUCTION   Oral isotretinoin is the most effective treatment option available for acne vulgaris and is the first-line treatment option for severe, scarring acne. Due to teratogenicity, all patients prescribed oral isotretinoin must meet requirements on iPLEDGE, a government-mandated risk-management program, to receive the medication. Patients who can become pregnant have more requirements on iPLEDGE compared to patients who cannot become pregnant, and prior studies have demonstrated that males are more likely to be prescribed isotretinoin compared to females.

METHODS   We sought to further investigate the prescribing patterns of oral isotretinoin based on reproductive potential. In this retrospective cohort study, 82 males, 85 females, 2 females with tubal ligation, and 2 transgender patients with female reproductive organs who were prescribed oral isotretinoin for acne vulgaris at Rush University between 2013-2019 were analyzed. Patients were grouped by reproductive potential: patients who cannot become pregnant (n=84) and patients who can become pregnant (n=87). The number of office visits patients attended and the number of alternative medications patients tried and failed prior to initiating oral isotretinoin therapy were compared.

RESULTS   Patients who can become pregnant attended an average of 2.5 office visits prior to initiating oral isotretinoin therapy while patients who cannot become pregnant attended an average of 3 office visits (P=0.16). On average, patients who can become pregnant were prescribed 6 alternative acne medications before oral isotretinoin therapy while patients who cannot become pregnant were prescribed an average of 5 alternative medications (P=0.17).

CONCLUSION   Our data suggests that there is no significant difference in the number of office visits attended or the number of alternative medications prescribed prior to oral isotretinoin therapy between patients of different reproductive potential. These findings indicate that iPLEDGE requirements may not influence the prescribing patterns of oral tretinoin based on the reproductive potential of the patient.

Christian Casteel, D.O.

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ASSESSING STAFF PERCEPTIONS OF TRAUMA PREPAREDNESS AND PREFERENCES FOR A NEW TRAUMA PROTOCOL AT AN EMERGENCY DEPARTMENT WITHOUT A TRAUMA CENTER DESIGNATION

INTRODUCTION: Effective trauma care in the Emergency Department (ED) is essential for patient safety and improves clinical outcomes. This is especially true at non-trauma center designated EDs, where it is estimated that nearly 30% of all moderate-to-severe traumatic injuries are treated. This study aimed to understand current ED staff perceptions of department preparedness for treating trauma patients and to assess staff preferences for a newly implemented trauma algorithm.

METHODS: We conducted a survey of ED staff at a single academic tertiary care medical center without a trauma center designation. A total of 109 staff responses were recorded which included: attending and resident physicians, nurses, advanced practice providers (APPs), pharmacists, and patient care technicians. The survey consisted of four statements that respondents graded via Likert scale. In addition, participants were asked in a free response format what they would like to see in a newly implemented ED trauma process.

RESULTS: 37% of respondents identified as physicians/APP, 42% as nurses, and 21% as other/unspecified staff. Results showed a majority of respondents (63%) reported favorable (agree or strongly agree) perceptions of the ED's efficiency in transferring trauma patients and understanding their specific roles in trauma cases (77.8%). Perceptions were mixed on the effectiveness of trauma patient evaluation, with 40.7% expressing favorable views and 37% expressing unfavorable views (disagree or strongly disagree). In terms of employing a multidisciplinary team, 27% reported unfavorable perceptions.   Regarding preferences for a new trauma process, a few themes emerged: staff members expressed a strong desire for a more algorithmic approach to trauma care, emphasized the importance of clear role identification during trauma resuscitations, and continued education in the evaluation of the trauma patient.

CONCLUSION: Understanding ED staff perceptions of trauma preparedness and preferences for a new trauma protocol is crucial for enhancing trauma care. This study highlights the importance of building on existing strengths in trauma care while identifying areas for improvement. By incorporating staff feedback and insights, the development of a new trauma process can better align with the needs and expectations of ED personnel, while improving patient outcomes and staff confidence in managing trauma cases.

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GRANULOMATOSIS WITH POLYANGIITIS CLINICAL MANIFESTATIONS AND OUTCOMES: A RETROSPECTIVE COHORT ANALYSIS OF 136 PATIENTS FROM RUSH UNIVERSITY MEDICAL CENTER

INTRODUCTION Granulomatosis with polyangiitis (GPA) is the most prevalent anti-neutrophil cytoplasmic antibody (ANCA) associated vasculitis. Clinical presentation includes distinct features such as pulmonary capillaritis marked by hemorrhage, necrotizing glomerulonephritis, ocular vasculitis, and recognizable necrotizing granulomatous inflammation evident on biopsy. Despite existing studies detailing clinical manifestations and outcomes, there remains a need for further investigation to enhance our understanding of this complex disease. This study aims to characterize the clinical manifestations and outcomes within a specific cohort of GPA patients at Rush University Medical Center (RUMC).

METHODS Retrospective cohort analysis of GPA patients at RUMC from 1/1/2010-12/31/2021. Clinical characteristics, treatment, and outcome were analyzed, using Fisher's Exact Test and Chi-Square Test to perform comparisons.

RESULTS The cohort included 136 patients with GPA. 70% were female, 63% were Caucasian, and mean age at diagnosis was 56.8 (+/- 17.1). 78% were ANCA positive. There was a statistically significant higher prevalence of neurologic involvement in ANCA negative GPA patients in comparison to ANCA positive GPA patients (6/30 vs 6/106). There was a statistically significant higher prevalence of renal involvement (52/106 vs 9/30), ILD (13/100 vs 0/29), and steroid therapy (105/106 vs 26/30) in ANCA positive GPA patients in comparison to ANCA negative GPA patients. 30% had ILD. There was a statistically significant higher prevalence of renal involvement (24/40 vs 32/94), respiratory failure (8/40 vs 3/94), cyclophosphamide therapy (23/40 vs 30/94), and ICU admission (14/40 vs 12/94) in GPA with ILD in comparison to GPA without ILD.

CONCLUSION This analysis outlines the clinical features, treatment, and outcomes within a cohort of RUMC patients diagnosed with GPA. Our findings highlight elevated rates of renal involvement in ANCA-positive GPA patients, consistent with existing research. ANCA-negative cases predominantly manifest as limited disease, primarily impacting the upper and lower respiratory tracts without affecting the kidneys. In contrast to earlier studies noting a higher prevalence of neurologic involvement in ANCA-positive GPA patients, our investigation reveals a statistically significant increase in neurologic involvement among those with ANCA-negative GPA.

Evangelina Cedeno, MD

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UNDETECTABLE PTHrP AND ELEVATED IL-6 IN A 51-YEAR-OLD MALE WITH CLEAR CELL RENAL CARCINOMA, COMPLICATED BY PARANEOPLASTIC HYPERCALCEMIA.

INTRODUCTION: Malignant hypercalcemia as a paraneoplastic syndrome is very common in lung and kidney cancers. Traditionally, humoral hypercalcemia of malignancy (HHM) is linked to excess PTHrP production, but other possible contributors, such as interleukin-6 (IL-6), have been identified. We present a case of HHM with undetectable PTHrP and elevated levels of IL-6. CASE: 51yo male with RCC presented with symptomatic hypercalcemia (polyuria and polydipsia), found during a pre-op visit. Initial tests were consistent with non-parathyroid-mediated hypercalcemia: adjusted Ca 13.2 (9.1-11.2 mg/dL), iCal 1.69 (0.95-1.32 mmol/L), iPTH <4.0 (8.0-85.0 pg/mL), 25-OH-Vit D 41(30-80 ng/mL), 1,25-OH D 64.7 (24.8- 81.5pg/mL), PTHrP undetectable (<2.0 pmol/L), SPEP and UPEP without abnormalities. CT showed large 15x12x14 cm partially necrotic mass arising from the right kidney, consistent with malignancy. The patient was treated with isotonic IV fluids and underwent a right nephrectomy with subsequent complete resolution of hypercalcemia 24 hours post-surgery. Adjusted Ca and iCal normalized. iPTH from initial 4 improved to 30.1 (8.0-85.0 pg/mL), IL-6 was found to be high to 62.5 (0.0-13.0 pg/mL). Final pathology was consistent with clear cell RCC. The patient was discharged, with normal laboratory values on follow-up.

CONCLUSION: Hypercalcemia is the most common paraneoplastic complication of RCC, and approximately 17% of all patients with RCC will develop hypercalcemia. Although usually mediated by PTHrP, evidence points towards other possible contributors. IL-6 has been hypothesized to be a possible mediator of malignant hypercalcemia in paraneoplastic syndromes[1]. Our patient had undetectable levels of PTHrP in the setting of RCC and was later found to have elevated IL-6, pointing to the latter as a possible culprit. In conclusion, our case supports IL-6 as a possible contributor to the pathogenesis of malignant hypercalcemia in RCC patients, literature is spars on PTHrP independent HHM, and rare case reports demonstrated this phenomenon not just in RCC but also in other malignancies like ALL. There are some hypotheses implicating IL-6 influencing tumor growth as well as bone metastasis. Our case adds a valuable contribution to this limited database. Further studies are warranted to understand the role of IL-6 in HHM as well as anti-IL6 agents as a potential therapeutic option for treatment-resistant hypercalcemia.

Hao Chen, BS

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THE IMPACT OF AN INTERPROFESSIONAL DELIRIUM PREVENTION PROTOCOL ON PATIENT OUTCOMES: A QUASI-EXPERIMENTAL STUDY IN A MEDICAL-SURGICAL UNIT

INTRODUCTION: Delirium, a common neuropsychiatric syndrome in hospitalized older adults, often leads to negative outcomes. The absence of delirium prevention protocols on medical-surgical units at Rush University Medical Center (RUMC) prompted a 2.5-month pilot project on the 7N medical unit. The investigation of adverse delirium consequences and the impact of a delirium prevention protocol aims to advocate for institution-wide implementation by improving outcomes for patients and improving key hospital metrics.

METHODS: Spanning 10 weeks (07/05/2022 - 09/13/2022), this IRB approved quasi-experimental study consisted of pre-intervention (4 weeks), intervention (2 weeks), and post-intervention (4 weeks) phases. The intervention introduced a multidisciplinary delirium prevention protocol, including a delirium precautions order and delirium education to providers and nursing staff. The order emphasized patient reorientation, addressing hearing and visual impairment, and mobility. Demographic data, delirium rates, length of stay (LOS), fall rates, patient mobilization, discharge disposition, and frequency of delirium precaution order placement were examined across all phases.

RESULTS: Over the 2.5-month period, 430 patients were admitted; 82 (19.07%) had delirium. Patients with delirium had a longer LOS (13.06 vs. 7 days), higher fall rate (6.10% vs. 1.44%), and lower home discharge rate (23.17% vs. 60.34%) than patients without delirium. The intervention phase trended towards an increase in delirium precaution orders placement, 85.71% vs 47.37% (intervention vs post-intervention), reduced fall rates, 1.22% vs 1.60% and 3.75% (intervention vs pre-intervention and post-intervention), and a shorter LOS, 7.32 days vs 8.29 days and 8.42 days (intervention vs pre-intervention and post-intervention).

CONCLUSION: This was the first study looking at delirium rates on 7N and it aligns with the literature showing an increase in LOS and falls and a decrease in home discharge. Implementing a delirium prevention protocol trended towards improved outcomes, suggesting the value in early identification of delirium and implementation of delirium prevention and mitigation strategies. We coupled delirium with increased mobility protocols but were limited by challenges in mobility documentation. Despite challenges, this study paved the way to standardize mobility documentation by nursing staff, led to a mobility tech pilot on 7N, and is leading to implementation of formal delirium screening protocols house wide.

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RATES OF PARENTERAL NUTRITION ASSOCIATED CHOLESTASIS

INTRODUCTION: Neonatal infants are at risk for developing parenteral nutrition (PN) associated cholestasis (PNAC). The purpose of this study is to investigate the prevalence of PNAC after 14 days of PN among patients admitted to the neonatal intensive care unit who received either a soybean-based lipid emulsion or mixed-oil lipid emulsion.

METHODS: A retrospective, case-control study design was utilized. Patients who were born with a GI complication and started on a mixed-oil lipid emulsion due to anticipation of a lengthy PN course were identified. This group was matched 2:1 on gestational age, sex, and reason for PN to infants who received soybean-based lipid emulsion. For both groups, PN was started within the first 5 days of life. The dose of macronutrient delivered via PN and direct bilirubin levels were recorded for the first 14 days the patient received PN. PNAC was defined as direct bilirubin of > 2mg/dL.

RESULTS: A total of 30 infants were included; 10 received a mixed-oil lipid emulsion and 20 received a soybean-based lipid emulsion. Overall, the average gestational age was 36 weeks,   60% of the sample was male, and gastroschisis was the most common reason for starting PN (67%). No difference in sex, gestational age, or reason for PN were observed between the two groups. During the first 14 days of PN, patients who received a mixed-oil lipid emulsion were provided less dextrose (9% versus 12%, p=0.02) and more lipid (2.7 grams/kg versus 1.7 grams/kg, p<0.001) compared to infants who received a soybean-based lipid emulsion. A non-significant difference in direct bilirubin level was observed between the two groups (mixed-oil lipid emulsion: 1.0 + 0.9 versus soybean-based lipid emulsion: 1.3 + 1.7 mg/dL, p=0.057). Within both groups, 20% of patients developed PNAC after 14 days of PN.

CONCLUSION: These preliminary results suggest that the rate of PNAC after 14 days of PN exposure is similar between infants who received either a mixed-oil lipid or soybean-based lipid emulsion.. Additional research is needed to determine if the rate of PNAC is similar among infants who receive the same dose of mixed-oil lipid or soybean-based lipid emulsion.

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PERCEPTIONS OF RESIDENT PHYSICIANS AND HOSPITALISTS ON HANDOFF DOCUMENTATION QUALITY DURING PATIENT TRANSITIONS FROM MICU TO WARD

INTRODUCTION: The transition from the ICU to hospital ward is a high-risk time for patient care, in part due to clinician communication failures. Studies find that lack of standardized hand-off practices compromise transfer safety. Resident surveys at various academic hospitals identified frequently omitted information in ICU handoffs; responses informed the development of a trainee-centered transfer tool: ICU-PAUSE. Studies have yet to evaluate attending physician perspectives regarding the quality of non-standardized handoff communication. We aimed to compare hospitalist and resident perceived problems around ICU transfer communication.

METHODS: At a single academic medical center, we surveyed internal medicine residents and hospitalists to characterize handoff communication during ICU-ward transfer. Participants anonymously indicated the inclusion frequency of specific handoff domains, such as goals of care and access. The analysis emphasized transfer communication quality as characterized by hospitalists compared to residents.

RESULTS: Of 180 eligible participants, 74 responded, yielding a response rate of 41%. The breakdown included 45 of 120 invited residents, 7 of 60 attendings, and 22 unspecified. Across all survey domains, there were no statistically significant differences observed between attending and resident feedback. Information often missed encompassed access and hardware, adjusted home medications, and anticipatory guidance. ICU readmission risk was the most frequently neglected detail, with 29 total respondents (39%) including 3/7 attendings noting its consistent absence and 31 (42%) marking "rarely - less than once monthly." (Figure 1). The mean rating for "Overall Quality of Handoff" was 2.6 amongst attendings and 2.4 amongst residents: 1 being "excellent," 2 "satisfactory," 3 "bare minimum," 4 "needs improvement," and 5 "unacceptable." In terms of handoff efficiency, 4 of 7 attendings indicated an average of 30-60 minutes spent doing "rework" compared with 33 of 74 residents indicating 15-30 minutes of "rework."

CONCLUSIONS: At our single academic medical center, current written ICU-to-ward handoffs fail to reliably communicate essential information. Both hospitalists and residents held comparable views regarding the quality of written ICU handoffs. Given that this survey was conducted before the initiation of ICU-PAUSE in July 2023, a subsequent survey will assess whether there are perceived enhancements in handoff quality for both residents and hospitalists after implementation of this standardized tool.

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Johanna Gandelsman, Rush Medical Student   Iris Kuo, Rush OBGYN Resident

INCREASING HUMAN PAPILLOMAVIRUS (HPV) VACCINATION VIA AN EMR DROP DOWN PROMT

INTRODUCTION: The goal of this project is to determine if the inclusion of a drop down menu in standardized clinic notes increases the rate of HPV vaccination in patients presenting to an OBGYN clinic for postpartum, colposcopy and Loop electrosurgical excision procedure (LEEP) visits. Human papillomavirus (HPV) is associated with more than 90% of cervical cancers diagnosed in the United States, as well as various other cancers. While the rate of vaccine uptake has gradually risen amongst teens, rates are still lower than the 2030 goals set by the US Department of Health especially in populations eligible for catch-up vaccination. The postpartum period, colposcopy and LEEP visits are often a missed opportunity for HPV vaccination.

METHODS: We conducted a retrospective chart review to determine baseline rates of discussions surrounding HPV and HPV vaccination rates for all patients who attended a postpartum, colposcopy or LEEP visit over a three month period. We then introduced a standardized EMR prompt in clinic notes which addressed HPV vaccination. A second chart review was performed to see if there was a difference in the rates of discussions surrounding HPV and HPV vaccination rates. Themes for reasons for HPV vaccine refusal were also collected.

RESULTS: 193 pre-intervention and 191 post-intervention charts were reviewed. The frequency in which providers discussed vaccination was higher after implementation of the EMR-prompt (8.2 v. 23.0%). Vaccination rates were also higher (4.1% vs 8.9%). Reasons for refusal included "declining in the past," "will consider the vaccine," and "not being able to recall if previously vaccinated," "not being sexually active," and being over the age limit for vaccination or current pregnancy.

CONCLUSION: Implementing an EMR standardized prompt in postpartum, colposcopy and LEEP clinical visits improved rates of discussion surrounding HPV vaccination and HPV vaccination rates. Prompts about HPV vaccination in standardized clinic notes are a cost effective way to improve HPV vaccination. Work is needed to further increase HPV catch-up vaccination rates.

Brian Goldberg, BS

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QUALITY IMPROVEMENT IN TRAUMA TRANSFERS FROM THE RUSH UNIVERSITY MEDICAL CENTER EMERGENCY DEPARTMENT

INTRODUCTION: This ongoing quality improvement project investigates the dynamics and implications of trauma transfers from the emergency department at Rush University Medical Center, a non-trauma center, to Level 1 Trauma Centers, with a focus on enhancing patient outcomes and ensuring quality assurance. The study aims to comprehensively collect and review trauma transfer data, shedding light on the patterns, indications, and clinical considerations that influence the trauma transfer process. By analyzing the process, from the initial evaluation to transfer by ambulance to the trauma centers, this project seeks to identify opportunities for improvement in patient care.

METHODS: Beginning in July 2023, an Epic electronic medical records report was run each month to identify patients who were transferred from the Rush Emergency Department to a different receiving hospital in the previous month. Patients with a trauma related chief complaint were identified and their age, sex, chief complaint, mode of arrival, total time in the emergency department, and receiving hospital were documented.

RESULTS: During the period of July 2023 through December 2023, 40 patients were transferred to four different hospitals, with John H. Stroger, Jr. Hospital of Cook County receiving the most transfers (n=37). The two most common mechanism of injury were gunshot wound (n=9) and motor vehicle collisions (n=9). Twenty-five of the patients underwent some form of imaging while in the Rush Emergency Department. Fifteen of those patients received an x-ray, two received CT scans and eight received both an x-rays and CT scans.

CONCLUSION: Quality assurance is a critical aspect of ensuring appropriate trauma transfers. By continuing to monitor these transfers we can identify areas of improvement in the transfer process, implement measures that enhance the quality of care, minimize errors, and contribute to improved patient outcomes. Ultimately, the findings of this project have the potential to inform evidence-based guidelines, protocols, and metrics for trauma transfers, ensuring that patients receive timely, appropriate, and high-quality care while optimizing the utilization of resources.

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RATE OF MALNUTRITION IN PRETERM AND NEONATAL INFANTS

INTRODUCTION: Preterm infants are at an increased risk for malnutrition due to their premature birth and underdeveloped physiological systems. Malnutrition in these infants can have profound and lasting consequences on their growth, development, and overall health. The purpose of this study was to report the rate of malnutrition in preterm and neonatal infants using the recommended primary indicators of decline in weight-for-age z-score and weight gain velocity.

METHODS: A retrospective, observational study was conducted to determine the rate of malnutrition in all infants who received neonatal care in 2021. Infants were excluded if they were born at an outside facility and transferred for further care or received neonatal care for less than 21 days. Sex, gestational age, and birth weight, length and head circumference were recorded. For each infant, weight, weight-for-age z-scores, and weight gain velocity at day 28 were recorded from the electronic medical record. Infants with a decline in weight-for-age z-score of 0.8 or more were considered to have malnutrition. Infants with a percent expected rate of weight gain lower than 75% were considered to have malnutrition.

RESULTS: A total of 128 infants were included (males=70, females=58). The average gestational age at birth was 30.8 weeks. The average birth weight was 1532 grams. At day 28 the sample size decreased to 113 infants (males=61, females=52). The average weight was 1899 grams and the average weight-for-age z-score was -1.0. The average change in weight-for-age z-score was 0.0; 3 infants was considered to have malnutrition based on decline in weight-for-age z-score at day 28. At day 28, the average percent expected rate of weight gain was 100%; no infants were considered to have malnutrition based on average percent expected rate of weight gain at day 28.

CONCLUSION: Based on one year of retrospective data, only a few infants were found to have malnutrition using change in weight-for-age z-score at day 28. Future work in this area should continue to monitor rates of malnutrition and identify predictors of malnutrition among preterm and neonatal infants.

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AS GOOD AS GOLD: REINFORCING THE IMPORTANCE OF THE NEONATAL GOLDEN HOUR

INTRODUCTION: The Golden Hour (GH) is the first hour of life for very low birth weight (VLBW) infants with focus on stabilization and completion of the admission efficiently and safely. GH stemmed from adult trauma medicine. GH includes euthermia, antibiotic and surfactant administration, and more. Studies assessing GH protocols demonstrate improved admission processes. There was a drift away from practicing GH in our NICU, increasing the risk of adverse events. The admission process includes a provider placing orders in the electronic medical record (EMR). The earlier these orders are placed, the sooner medications are administered. Prior to January 2022, 18% of admission orders were placed ≤ 20 minutes post-birth (average 31 minutes). The goal of this quality improvement (QI) project was to decrease the time to admission order placement to ≤ 20 minutes for 90% or more of inborn VLBW infants by June 2023.

METHODS: An inter-professional QI team was formulated to reinvigorate the GH process in May 2021. Plan-do-study-act (PDSA) cycles were implemented at 1-2 month increments, starting in January 2022. Continuous review of cycles drove change elements for subsequent cycles. The primary interventions included pending charts in the EMR, pending admission orders and incorporating a pre-delivery team huddle to discuss the anticipated admission plan. Data abstracted from the EMR included time to admission orders, empiric antibiotic administration and surfactant administration for infants intubated at delivery. A data collection form was completed after each VLBW admission and reviewed at monthly meetings.

RESULTS: Between January 2022 through May 2023, admission order placement at ≤ 20 minutes post-birth increased to 35% (average 26 minutes). The average time to empiric ampicillin administration decreased from 126 to 99 minutes, empiric gentamicin administration decreased from 146 to 138 minutes and surfactant administration decreased from 101 to 86 minutes.

CONCLUSION: Standardizing the GH admission process for the inter-professional team enhances efficient completion of admission orders and medication administration. These results highlight the importance of evidence-based practices and inter-professional communication focusing on QI. Sustainability planning includes on-going analysis of data and developing further PDSA cycles to enhance the VLBW admission process.

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VITAMIN D DEFICIENCY IN PERSONS WITH BLEEDING DISORDERS - A SINGLE CENTER EXPERIENCE

INTRODUCTION: Vitamin D is a common, treatable vitamin deficiency in the United States. Overall, 15% of the pediatric population and 35% of the adult population has Vitamin D deficiency. No studies have described Vitamin D deficiency in Persons with Bleeding Disorders (PWBD: Hemophilia A (HA), Hemophilia B (HB), and Von Willebrand Disease (VWD)) in Chicago.

METHODS: We performed a descriptive, cross-sectional study including 254 patients ages 1 to 76 years from Rush Hemophilia and Thrombophilia Center. Data were obtained on type of bleeding disorder, Age, Race, Vitamin D Supplementation prescription, and Vitamin D levels from 11/23/2010 - 3/2/2023. ANOVA analysis was performed. Vitamin D deficiency was defined as: Severe: <10 ng/mL, Moderate: 10-<20 ng/mL, Insufficient: 20-30 ng/mL, and Normal: >30 ng/mL.

RESULTS: Patient mean age was 26.5 ± 16.4 years; 199 (78.3%) were male. Our population was 165 Caucasian (64.9%), 49 Black or African American (19.3%), 7 Asian (2.8%), 1 Hawaiian/Alaskan Native (0.4%) and 33 Other/Unknown (13.0%). 145 (57.1%) had HA, 27 (10.6%) had HB, 62 (24.4%) had VWD. A prescription for Vitamin D was given to 176 (69.7%) patients - all of those who were not Normal. Mean 25(OH)D level was 25.5±12.4 ng/mL among all bleeding disorders; 21 (8.30%) had severe deficiency, 78 (30.83%) moderate, 77 (30.43%) insufficient, and 78 (30.43%) were normal. In those with moderate and severe deficiency, 57 (65.5%) had HA, 6 (6.9%) HB, and 24 (27.6%) VWD. There was no association between age or race and vitamin D status (p = 0.745). There was also no difference between type of bleeding disorder and vitamin D deficiency (p= 0.214).

CONCLUSIONS: The majority of our bleeding disorder patients (69.6%) have low vitamin D levels. An association with race, age, and prescription for Vitamin D was not demonstrated in deficient patients. As our bleeding disorder patients are at significantly increased risk of developing osteoporosis and osteopenia due to hemophilic arthropathy made worse by vitamin D deficiency, we suggest providers screen all PWBD for Vitamin D Deficiency, treat with supplementation if needed, and monitor Vitamin D Serum titers throughout their care. Further evaluation of Vitamin D status is needed in this population.

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THE SOCIOPOLITICAL LENS IN TRAUMA-INFORMED CARE

INTRODUCTION Despite the global prevalence of trauma(1), the American Association of Medical Colleges has not established a standardized approach on teaching trauma-informed care (TIC).(2) Rush Medical College (RMC) had previously incorporated TIC in its curriculum, however information on legal policies that impacts the provision of patient care was limited.(3,4) Often student organizations work to fill experiential gaps for medical students outside of the core curriculum. RMC medical students developed a workshop to educate students on the TIC framework, as it relates to patient consent, disclosures, and mandatory reporting, while also discussing state policies that affect patient care in the context of trauma.

METHODS Thirty-nine students attended a one-hour session centered around three clinical vignettes involving sexual assault, a minor seeking an abortion, and intimate partner violence. These were discussed in small- and large-group settings, followed by information on policies and Illinois laws related to sexual assault examination kits and nurse examiners, minors and their rights, and consent. Pre- and post-test surveys were used to assess comfortability when responding to these disclosures.

RESULTS Paired t-tests were used, which all showed statistically significant improvements. There was a statistically significant increase ($p < 0.001$) in learners' comfortability. Using a five-point Likert scale, students reported high satisfaction ($\mu = 4.48$) and high relevance ($\mu = 4.7$) to their future role as resident physicians. Learners provided feedback that they would like more time to discuss this topic, specifically with additional vignettes and more practice utilizing trauma-informed language.

CONCLUSION The incorporation of policy into a workshop was well-received by students, providing real-world applicability to clinical care. After our session, RMC faculty noted a policy gap in core courses, and the workshop was incorporated into the Advocate Curriculum, which is a part of our core preclerkship curriculum. For medical schools seeking to incorporate TIC into their curriculum, including local, state, and federal policies may lead to improved learner engagement. This study showcases how law and health care intersect, providing an avenue to incorporate policy into the medical school curriculum. Faculty and students realized that state policies directly impact how students will practice medicine as future physicians.

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PILOT DEMONSTRATION FOR PHYSICIAN COMPENSATION INCENTIVES TO IMPROVE DIAGNOSTIC SPECIFICITY IN CLINICAL DOCUMENTATION

INTRODUCTION Omissions in clinical documentation can lead to diagnostic delays and medical errors. Physician behaviors are influenced by compensation incentives, especially when measures are controlled by clinicians and of value to patients. This pilot assessed whether compensation incentives can improve the specificity of free text documentation to improve the diagnostic process and reduce medical errors.

METHODS We identified six common medical diagnoses which often have significant omissions in documentation: DVT/PE, CVA, CKD, CHF, COPD, and smoking. For each diagnosis, we identified 2-3 clinically significant details via literature review and expert discussion. We disbursed a $20,000 compensation incentive pool among primary care clinicians for each medical diagnosis documented in outpatient progress notes that included all clinically significant details for that diagnosis. We used ICD10 codes to extract progress notes during a 12-week incentivized period and a preceding 6-week baseline, unincentivized period. Progress notes were reviewed and scored by blinded research assistants. We analyzed performance as the proportion of documented diagnoses that included all clinically significant details when the diagnosis was addressed during the visit. We performed descriptive statistics of clinician characteristics and performance. We performed a paired t-test to compare baseline and incentivized performance. We then used a generalized linear mixed model with binomial distribution to compare baseline and incentivized performance with adjustment for clinicians' years in practice and office location.

RESULTS From eight office locations, all 32 eligible clinicians participated (25 MD/DO, 7 NP/PA; 21 IM, 11 FM). Average years in practice was 17.8 (SD 9.9) and average clinical FTE was 0.87 (SD 0.14). There were 12,991 visits during the incentivized period and 6,401 baseline visits. There were 673 diagnoses with all clinically significant details documented during the incentivized period (56/week; $29 incentive paid per diagnosis) compared to 200 at baseline (33/week). Incentivized performance (mean proportion±SD) was 46.5%±23.6% compared to 32%±20.7% at baseline (p=0.01). In our adjusted analysis, incentivized performance was 48.2% and baseline performance was 35.6% (p<0.0001).

CONCLUSION Compensation incentives produced a modest improvement in clinicians' free text documentation of clinically significant medical information. Incentivizing free text documentation may be apt for indicating medical complexity while also improving the diagnostic process and reducing medical error.

Laura Owczarzak, MD

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POST TRANSFUSION PURPURA: A CASE REPORT AND BRIEF LITERATURE REVIEW

INTRODUCTION Post transfusion purpura (PTP) is a rare phenomenon that develops five to ten days after transfusion, marked by severe thrombocytopenia and varying degrees of mucosal bleeding and purpura. Here, we present a unique case of a 69-year-old male that developed PTP four days after his index transfusion with an unusual physical presentation and alloantibody.

CASE REPORT A 69-year-old male is admitted to a tertiary medical center with refractory cardiogenic shock. Four days after he received one unit of packed red blood cells, his platelet count plummeted from 147 k/dL to < 2 k/dL within hours. Notable physical exam findings included hematuria and femoral catheter oozing. Extensive thrombocytopenia workup, including an initial platelet antibody screen, was unrevealing. The patient was treated with supportive transfusions, dexamethasone, and intravenous immunoglobulin with rapid platelet recovery. Post transfusion purpura panel testing identified HPA-5b antibodies, confirming the diagnosis.

CONCLUSION This report presents an unusual course and presentation of post transfusion purpura in an elderly male including patient age, sex, hyper-acuity of thrombocytopenia, lack of prior transfusions, exam findings, identification of a less common alloantibody, and negative initial platelet antigen screening. When reviewing the significant morbidity and mortality of severe thrombocytopenia, post transfusion purpura should be considered in any person with recent transfusion of blood products with acute thrombocytopenia not otherwise explained.

Evan Patel, MS

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TRENDS OVER TIME IN OTOLARYNGOLOGY MEDICAL MALPRACTICE: A COMPREHENSIVE LITERATURE REVIEW

INTRODUCTION: The field of otolaryngology, like many specialized areas of medicine, is not immune to the complexities and challenges of medical malpractice. Understanding the trends and patterns of malpractice claims over time is crucial for enhancing patient safety, improving physician practices, and informing policy and educational reforms. This literature review uniquely dissects the landscape of medical malpractice in otolaryngology by examining data across different decades. Our objective was to identify evolving trends, key factors contributing to malpractice claims, and the potential impact of changing healthcare policies over time. A decadal analysis provides a comprehensive overview, offering insights into how historical contexts and advancements in otolaryngology have influenced the nature and frequency of malpractice claims. This study aims to provide a temporal perspective on malpractice issues within otolaryngology, thereby enabling a better understanding of how past trends can inform future practices and policy development.

METHODS: A systematic literature review was conducted in Covidence following PRISMA Guidelines. A search of PubMed, SCOPUS, and CINAHL for literature published through December 1st, 2023 identified an initial pool of 1457 articles. Two independent reviewers conducted a screening process, first evaluating titles and abstracts, followed by full-text reviews. Discrepancies were resolved by a third reviewer, resulting in 236 articles being selected for data analysis.

RESULTS: Included articles were categorized by subspecialty, country of origin (USA vs international), and year. When tracking publication trends over time, we found that three articles were dated from 1950 - 1959, eleven from 1960 - 1969, five from 1970 - 1979, twelve from 1980 - 1989, thirteen from 1990 - 1999, twenty-nine from 2000 - 2009, one hundred and twelve from 2010 - 2019, and forty-eight from 2020 - 2024. 71 articles were published in international journals, with 165 originating in the United States. The most implicated sub-specialty was Rhinology, followed by Head and Neck Surgery.

CONCLUSION: This review synthesizes existing literature to provide a clearer understanding of the malpractice landscape in otolaryngology. The findings highlight publication trends in this area by decade, placing them in the context of existing knowledge. These insights are crucial for healthcare providers, policymakers, and patients in comprehending and addressing malpractice risks in otolaryngology.

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PANCYTOPENIA IN A 3-YEAR-OLD FEMALE

INTRODUCTION Iron deficiency anemia (IDA) is frequently associated with thrombocytosis. Thrombocytopenia is rarely reported to be associated with IDA and resolves quickly with iron supplementation. Pancytopenia is not known to be associated with IDA.

METHODS A 3-year-old female presented with fever, severe pallor, irritability, poor oral intake and decreased urine output. The patient had been drinking excessive cow's milk daily and was eating toilet paper (PICA). There was no history of blood loss. Her past medical history was significant for ventricular septal defect. The mother had a history of anemia due to uterine fibroids. The patient's vital signs were significant for mild tachycardia. The physical exam revealed an irritable child with extreme pallor and a flow murmur. There was no jaundice, icterus, lymphadenopathy, or hepatosplenomegaly.

RESULTS Laboratory assessment revealed a complete blood count (CBC) - White blood cell (WBC) 1.58 K/uL, Absolute neutrophil count 332 K/ul, Hemoglobin (Hb) 2.4 g/dL, Mean corpuscular volume (MCV) 55.1 fL, Platelets 71 K/uL, Iron 18 ug/dL, Total iron binding capacity (TIBC) 417 ug/dL, Iron saturation 4%, Ferritin 20 ug/dL, and Reticulocyte count <0.50%. Lead level was <1.0 ug/dl. Hemoglobin electrophoresis revealed a low HbA2 consistent with IDA. Viral studies including CMV, EBV, and Parvovirus B19 did not reveal an acute infection. Abdominal ultrasound showed a normal sized liver with mild echogenicity and no splenomegaly or abdominal masses. Bone marrow biopsy and aspirate showed a normocellular marrow with trilineage hematopoiesis and no excess blasts. There was no significant dysplasia. Iron staining was absent. The patient received transfusions of a total of 22.8 ml/kg of red blood cells in multiple small aliquots. All three cell lines of the CBC improved with the administration of transfused red cells and then oral ferrous sulfate. The patient was discharged on oral ferrous sulfate and had a completely normal CBC on follow-up one month after initial presentation.

CONCLUSION The differential diagnosis of pancytopenia in a young child includes leukemia, solid tumor with metastasis to marrow, bone marrow failure syndromes, vitamin B12 deficiency, aplastic anemia, rheumatologic conditions, severe sepsis, and hemophagocytic lymphohistocytosis. An association of pancytopenia with IDA is exceedingly rare.

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PREVALENCE OF REFEEDING SYNDROME IN PRETERM INFANTS

INTRODUCTION: Preterm infants require nutrition support to promote growth. However, provision of parenteral nutrition and human milk can lead to refeeding syndrome, which is characterized by reduced phosphorus levels and associated with worse fetal outcomes. The goal of the current project was to report the prevalence of refeeding syndrome in preterm infants and determine in anthropometric factors and timing of nutrition support delivery influence refeeding syndrome.

METHODS: A retrospective, cross-sectional study was conducted for all preterm (born less than 1500 grams at birth and/or less than 33 0/7 weeks birth gestation) infants admitted to the neonatal intensive care unit in 2021. Sex, gestational age, and anthropometrics were collected. Timing to start parenteral nutrition and human milk was documented. All phosphorus levels for the first seven days of life were collected; refeeding syndrome was defined as any phosphorus level < 3.5 mg/dL within the first seven days of life.

RESULTS: A total of 151 patients were included. The average gestational age was 31 weeks and 60% were male. The average birth weight was 1656 ± 851 grams. The average birth length was 40 ± 6 cm and average head circumference was 28 ± 4 cm. All patients were started on parenteral nutrition upon birth and average days to initiate human milk was 4 days after birth. The average phosphorus level was 4.3 mg/dL. Overall, 24 infants developed refeeding syndrome. Patients who developed refeeding syndrome had a younger gestational age (30 versus 32 weeks, p=0.02), lower birth weight (1230 versus 1736 grams, p=0.007), decreased length (26 versus 29, p=0.001) and decreased head circumference (26 versus 29 cm, p=0.001) compared to patients with normal serum phosphorus levels.

CONCLUSION: Gestational age, birthweight and presence of IUGR may be important factors associated with risk of refeeding syndrome, but timing of feeding initiation did not influence refeeding syndrome in this sample. Additional research is needed to determine if dose of calorie, macronutrients, calcium, and phosphorus provided in the first week of life are predictors of refeeding syndrome in preterm infants.

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MEDICATION USE EVALUATION: DROPERIDOL USE IN ADULT EMERGENCY DEPARTMENT

INTRODUCTION: Droperidol, a recently approved antipsychotic and dopamine antagonist, has restricted use in our academic medical center's emergency department (ED) and psychiatric units. Limited to a single dose per patient per admission, its use is reserved for cases of rapid sedation due to agitation where non-pharmacologic de-escalation proves ineffective. Additionally, it is considered for patients with nausea and vomiting (N/V) and migraines.

METHODS: Our retrospective quality improvement project analyzed medication orders for IV and IM droperidol against established usage criteria and recommended dosing strategies on the order in the electronic medical record (EMR). The project aimed to describe its utilization and identify potential modifications to current restrictions. Data points encompassed patient demographics, length of stay (LOS), admission required, indication, total doses, administration route, time to verification, alternative agent post droperidol, and electrocardiogram (EKG) monitoring.

RESULTS: Between March-September 2023, 82 patients received droperidol, averaging 39 years, predominantly female (66%). Forty patients (49%) needed inpatient admission, with an average LOS of 54 hours. Droperidol was primarily used for N/V in 67 patients (82%), with an average dose of 1.8 mg (IV) and 3.1 mg (IM), and an average verification time of 6.6 minutes. In the 11 cases (13%) of agitation, average doses were 3.3 mg (IV) and 4.6 mg (IM), with a verification time of 2.3 minutes. There were 4 migraine cases (5%) which received an average dose of 2.2 mg (IV) with a verification time of 10.3 minutes. In our study population, 19% of N/V, 18% of agitation, and 25% of migraine cases required different agent within one-hour post-droperidol. Three patients (4%) received 2 doses of droperidol. EKG monitoring was performed within 1-hour prior to droperidol in 18% of cases and within 1-hour post-droperidol in 16% of cases.

CONCLUSION: This quality improvement project demonstrates droperidol is used for only the approved indications in our ED and orders follow institutional dosing recommendations. However, the EKG monitoring in only 32% of cases suggests a potential avenue for improvement particularly in cases requiring alternative agents associated with EKG changes. In patients requiring alternative agents, additional doses of droperidol may be beneficial and should be assessed in the future.

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REDUCING THE INCIDENCE OF UNPLANNED EXTUBATIONS IN THE NEONATAL INTENSIVE CARE UNIT THROUGH THE USE OF AN AIRWAY MAINTENANCE BUNDLE

BACKGROUND Approximately 25% of infants in a neonatal intensive care unit (NICU) undergo intubation, putting them at risk for unplanned extubations (UE). This is associated with adverse events and prolonged hospital stays. The unit goal for UE rate is 0.5/100 ventilator days. Pre-implementation rate for UE was 0.71/100 ventilator days. OBJECTIVE The objective of this project was to reduce the UE rate in the NICU to at or below the goal of 0.5/100 ventilator days, enhancing the safety and well-being of intubated infants. The intervention was the implementation of the Airway Risk Assessment Score (ARAS) and in-depth training and education for all NICU staff.

METHODS A standardized interprofessional UE bundle was created to incorporate the following: ARAS for identifying UE risk, optimal patient positioning for x-rays, and electronic medical record (EMR) integration. All NICU staff received training and education on the bundle's components. Debrief forms were completed for each UE incident during the eight-week implementation. Plan-Do-Study-Act cycles were employed to increase adherence to the bundle. Weekly audits assessed compliance with ARAS scoring, EMR documentation, x-ray positioning, and tube securement. Post-implementation data were analyzed to identify UE trends to guide future improvements.

RESULTS Unit champions played a pivotal role in disseminating knowledge, ensuring consistent adherence to the bundle's components. Debrief forms and continuous feedback informed iterative improvements during the implementation phase. Post-implementation analysis revealed an overall UE rate of 0.64/100 ventilator days with six of eight weeks without UEs. Compliance with bundle components improved to 90% by the end of the intervention period.

CONCLUSION The implementation of an integrated UE bundle in the EMR, with staff education following Plan-Do-Study-Act cycles led to a reduction in UE rate within the NICU. This achievement underscores the importance of evidence-based practice, interprofessional collaboration, and continuous monitoring for enhancing patient safety. This success highlights the potential for similar interventions in NICUs nationwide. The critical role of standardization of care and staff education in reducing adverse events emphasizes improved quality of care for intubated infants. Sustainability plan includes ongoing data collection and interprofessional debriefing of UEs to bring the unit to goal.

Craig Simmons, BA Spanish and Portuguese

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THE GUT MICROBIOME AND THICKENED LIQUIDS

INTRODUCTION: Converging evidence regarding diet and the gut microbiome has highlighted their importance in the health of multiple body systems. However, effects of modified diets or thickened liquids, common management tools for patients with dysphagia, on the gut microbiome are not well established. This narrative review describes the current state of the literature in this emerging area.

METHODS: Keyword search combining gut microbiome and either dysphagia, thickened liquids, modified diet, or related terms was conducted in PubMed, CINAHL, and Scopus. No publications were identified. Subsequently, the terms dysphagia and modified diet were eliminated from the key words; a new search was conducted to identify any study involving one or more additives found in common thickened liquids and the gut microbiome. Thickening agents/additives investigated included xanthan gum, modified corn starch, guar gum, and maltodextrin. Keyword search produced 182 articles. All were reviewed for applicability and relevance, resulting in 7 xanthan gum, 3 modified corn starch, 6 guar gum, and 8 maltodextrin articles. Results were synthesized and potential health effects were identified.

RESULTS: No studies have investigated relationships between thickened liquids and the gut microbiome in people with dysphagia. However, evidence suggests that thickening agents may have both positive or negative effects, depending on host factors like baseline immune profile and gut microbiome composition. For example, xanthan gum, guar gum, and modified corn starch may select for certain strains of flora and significantly alter microbiome composition. Similarly, xanthan gum and modified corn starch may increase or decrease intestinal inflammation; and they may also affect short-chain fatty acid production, strengthening or weakening the intestinal barrier. Maltodextrin may increase inflammation and negatively affect microbiome diversity.

CONCLUSION: No current literature exists describing the effects of thickened liquids on the gut microbiome in persons with dysphagia. However, common thickening additives may significantly impact the gut microbiome in some people, which may be of medical relevance to people with dysphagia. Before any definitive conclusions can be made about the relationship between thickened liquids and the gut microbiome, research in people with dysphagia is needed.

Manvita Tatavarthy, MD, MS

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OUTPATIENT FOLLOW UP IN PATIENTS DIAGNOSED WITH HYPERTENSIVE DISORDERS OF PREGNANCY

INTRODUCTION Hypertensive disorders of pregnancy (HDP), which include gestational hypertension, preeclampsia-eclampsia, chronic hypertension, and chronic hypertension with superimposed preeclampsia-eclampsia, affects 8-10% of pregnancies in the United States. Evidence suggests that women diagnosed with HDP are at increased risk for cardiovascular disease (CVD) later in life, with 2-3 times higher rates of ischemic heart disease, stroke, and death when compared to their normotensive pregnancy counterparts.   While there is agreement that women diagnosed with HDP should undergo early screening for CVD risk factors, the exact timing and modality is still not standardized. Furthermore, as many of these women are otherwise healthy, they are often lost to follow up. The goal of this study is to determine what proportion of women diagnosed with HDP at our medical center follow up within the first year after delivery and are assessed for CVD risk factors.

METHODS The charts of patients who were admitted to labor and delivery with a diagnosis categorized as HDP (as defined above) between 1/1/2019-12/31/2021 were retrospectively reviewed from the time of delivery to one year postpartum. Data was collected regarding demographics, follow up with a cardiologist, obstetrician, or primary care provider, and whether they were screened for CVD risk factors including blood pressure, lipid profile, and hemoglobin A1c.

RESULTS Of the 314 patients who were reviewed, 47.7% were seen in the first 6 weeks, usually by an obstetrician. Within the first year, 64.97% of patients were seen by a cardiologist, obstetrician, or primary care provider. Of those who were seen, 99.01% were screened with blood pressure, 21.57% with lipid profile, and 23.53% with hemoglobin A1c.

CONCLUSION Less than half of the patients with HDP were evaluated in the outpatient setting within the first 6 weeks. Few were seen within the first year if they were not already seen in the first 6 weeks. Of those who were evaluated, most had blood pressure screening. If patients received laboratory evaluation, they likely received both a lipid profile and a hemoglobin A1c. Despite awareness surrounding the importance of follow up, many patients in this at-risk group remained without follow up.

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RAPID EVALUATION OF PULSATILE TINNITUS USING AMBIENT PRESSURE TYMPANOGRAPHY

INTRODUCTION: Pulsatile tinnitus (PT), described as a rhythmic sound or whooshing in the ear(s), is a common complaint seen in audiology and otolaryngology offices. Ambient pressure tympanography (APT) can be an important diagnostic tool in patients experiencing PT to evaluate for pathology of the vasculature surrounding the middle ear.

METHODS: Pressure in the middle ear cavity is measured under ambient conditions using APT with no external alterations in pressure. Reflex decay testing uses APT to measure changes in middle ear cavity volume in correlation with tympanic membrane (TM) movement. APT was utilized, specifically using reflex decay settings and GSI TympStar Pro equipment, to measure TM movement and changes in middle ear cavity volume over a 15 second interval.

RESULTS: Three patients presented to clinic complaining of PT. They were rapidly evaluated with APT using reflex decay settings which revealed fluctuating changes in middle ear cavity volume that correlated with their heart rate. Vascular imaging of the temporal bone was then obtained in each patient that demonstrated findings of which their PT could be attributed to. These findings included dehiscence of the left internal carotid artery into the left eustachian tube, motions of the posterior fossa dura transmitted to the middle ear space secondary to right acoustic neuroma resection, and focal dehiscence of the left sinus plate including a small focal defect and a diverticulum.

CONCLUSION: APT is a safe and efficient clinical tool to evaluate PT. If a rhythmic change in admittance is noted on APT that corresponds with the patient's heart rate, further imaging of the temporal bone for a possible cause may be warranted to guide help diagnosis.

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MUSLIM PATIENT NEEDS IN AMERICAN HOSPITALS: FINDINGS FROM A NATIONAL SURVEY

INTRODUCTION: Hospital care provided without attending to patients' religious/spiritual needs contributes to healthcare inequities. The objective of this study was to assess Muslim Americans' views on the importance and accessibility to religious resources in the hospital setting.

METHODS: A self-administered online survey was distributed in-person at community events and online to self-reported Muslims over 18 years old. The survey contained measures of religiosity, importance and availability of specific religious/spiritual resources, and conventional sociodemographic descriptors. Bivariate and multivariate analyses utilized chi-squared tests and regression models to test associations between participant characteristics and views on importance and availability of religious/spiritual resources in hospitals.

RESULTS: Of the 1317 respondents, majority (68%; n=896) were women and immigrants (56%; n=691). A significant proportion were South Asian (38%; n=503) or Arab (37%; n=484). Almost all (94%; n=1233) felt it was important to have their religious needs met in the hospital. The most important resources rated by participants were halal food (92%; n=1217), a neutral prayer space (92%; n=1207) and medications without pork or alcohol (92%; n=1209). Participants who regularly attended congregational prayer services (OR 1.23, p<0.01) had greater odds of placing importance on the availability of Islamic resources during hospital stays. A minority found such resources available in their stays: halal food (17%; n=115), prayer space (26%; n=175), and medication without pork/alcohol (9.3%; n=62). While almost all (92%, N=1210) felt comfortable identifying as Muslim in the hospital, few (27%, N=177) had been asked about religious affiliation. However, those who felt comfortable identifying as Muslim (OR 1.46, p<0.1) and those asked about religious affiliation (OR 2.28, p<0.01) had higher odds of believing their religious/spiritual needs were met.

CONCLUSION: It appears that Muslim Americans have substantial unmet religious and spiritual resource needs in hospital settings. Patient-centered care requires providers inquiring about and mobilizing resources to attend to patients' religious/spiritual needs.

Delia Alkhatib, PhD IBS

Delia Alkhatib

ACTIVATING MUTATIONS IN LRP5 DO NOT IMPROVE THE PERIODONTAL PATHOLOGY IN THE HYP MOUSE MODEL OF XLH

X-linked hypophosphatemia (XLH) is caused by loss of function mutations in the PHEX gene, which decrease bone and teeth mineralization. XLH patients suffer from periodontitis due to defective formation and mineralization of the alveolar bone. Our laboratory has reported that sclerostin antibody (Scl-Ab) improves the mass and mineralization of alveolar bone using Hyp mice model of XLH. To confirm effects of Scl-Ab are dependent on LRP5-mediated canonical Wnt signaling, the current study tested the hypothesis that crossing Hyp mice with mice harboring an activating mutation in LRP5, the high bone mass (HBM) mouse, would increase the alveolar bone mass and mineralization. Heterozygous male HBM mice were bred with female heterozygous Hyp mice to obtain male and female wild-type (WT), Hyp, HBM, and HypxHBM littermates. Mice were sacrificed at 6 weeks of age and the right mandibles were collected for micro-computed tomography analyses (Scanco µCT50, 70 kVp, 114 µA, 500 ms, 6.0µm voxels). Alveolar bone was analyzed between the first molar roots. The outcome variables were the alveolar bone volume fraction (BV/TV) and tissue mineral density (TMD, mgHA/cm3). Genotype effects were compared using a one-way analysis of variance followed by post-hoc T-tests. Hyp and HypXHBM mice had significantly decreased alveolar BV/TV when compared to both WT and HBM littermates of both sexes. However, the BV/TV of HypxHBM mice did not differ when compared to Hyp mice in either males or females. Similarly, both male and female Hyp and HypXHBM mice had decreased alveolar TMD when compared to WT and HBM littermates. However, TMD levels did not differ between Hyp and HypXHBM mice in either males or females. Despite our previous findings with Scl-Ab, the current study failed to detect similar effects by genetically suppressing sclerostin activity using HBM model. Future work is necessary to determine non-redundant sclerostin binding partners, are involved.

Ethan Belnap, BS

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UNREPORTED HYPERTENSION AND DYSLIPIDEMIA IN A FOOD INSECURE POPULATION

INTRODUCTION Cardiovascular Disease (CVD) is the leading cause of death in both the United States as well as globally. Hypertension and dyslipidemia are established risk factors for CVD and accurate predictors of cardiovascular events. Individuals with lower socioeconomic status and food insecurity are predisposed to having a higher risk for CVD as well as an increased incidence of risk factors such as blood lipid levels and hypertension. Despite the relative importance of controlling these risk factors, many adults are unaware of their hypertension and dyslipidemia. This study aims to examine the prevalence of unreported / undiagnosed hypertension and dyslipidemia in a food insecure population.

METHODS This is a retrospective study based in West Chicago. The patients include 31 males and 39 females that attended a Cardiometabolic Health Initiative at Beyond Hunger food pantry screening event between August 2023-January 2024. The screening collected patient medical histories, blood pressures, and complete lipid panels (including LDL, HDL, triglycerides, and total cholesterol). The existence of hypertension (systolic blood pressure (SBP) >130 and/or diastolic blood pressure (DBP)>80) and dyslipidemia (LDL >100, HDL<40 men, HDL<50 women, Triglycerides >200, and/or total cholesterol >250) was compared to self reported conditions.

RESULTS Of the 70 total patients screened, 55 did not report a history of hypertension. Out of the 55, 36 (65%) were hypertensive upon screening; 14 presented with stage 1 hypertension (SBP >130 and/or DBP >80) and 22 presented with stage 2 hypertension (SBP >140 and/or DBP >90). Of the 63 patients who completed cardiometabolic screening, 37 did not report a history of dyslipidemia, yet 24 (64.9%) of these patients had dyslipidemia.

CONCLUSION Our data suggests that there is a large prevalence of undiagnosed hypertension and dyslipidemia amongst food insecure adults in West Chicago . Hypertension and dyslipidemia are responsible for the majority of cardiovascular events; however, they can be readily managed with medication and lifestyle modification. This suggests the importance of preventative screening and counseling on lifestyle modification within food insecure populations as a means of preventing cardiovascular events.

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PERCEPTIONS OF SUPPORT STAFF ON BARRIERS AND SUPPORTS TO SUCCESSFUL AND SUSTAINED HOUSING TRANSITION

INTRODUCTION Transitioning out of homelessness is accompanied not only by client factors (Herzberg & Petrenchik, 2010; Marshall & Rosenberg, 2014) but system and process factors as well, that exist within current programming (Black, 2018). Housing First (HF) models are considered best practices for ending homelessness (Tsemberis, 2010) and have a philosophy that basic needs, such as housing, must be met before greater goals can be achieved, such as managing chronic health concerns (Macnaughton et al., 2016). Chicago's homeless response embraces HF models and partners with over 100 organizations and individuals through the Chicago Continuum of Care and the Coordinated Entry System to connect people experiencing homelessness (PEH) to housing. To understand these frontline workers' perspectives this study's objective was to explore homeless service workers' perceptions of the supports and barriers to success and sustained housing for people experiencing homelessness.

METHODS This study's objective was to understand homelessness service workers' perceptions of the supports and barriers to success and sustained housing for PEH. To do so we performed semi-structured 1:1 interviews with three organizational staff members across two homeless service agencies. We used qualitative methods focusing on open-ended questions with probes related to the participant's experience of the homeless transition. The interviews were audio-recorded and to reduce bias, the interviews were transcribed using a 3-phase coding strategy.

RESULTS Four over-arching themes emerged with subthemes of staff perceptions of challenges and supports to PEH in successfully being housed. The four over-arching themes included "A broken system", "Lack of respect", "Meeting the clients where they are at", and "Overlooked needs".

CONCLUSION These findings can serve to target meaningful systems change, provide intervention frameworks delivered by OT to fill service delivery gaps and promote a continued thread of research on how to best support PEH. More research is needed to understand how to support PEH as well as those service providers working in the transition process. There appear to be more shortages and gaps in services than bridges demanding change at the practice and policy level.

Sarang Chong, BA, MSN

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CAREGIVING APPRAISAL AMONG KOREAN AMERICAN DEMENTIA FAMILY CAREGIVERS

INTRODUCTION   Family caregivers' various emotions when caring for persons with dementia (PWD) may be pronounced among Korean Americans (KAs) who face significant barriers as an underrepresented population. It is essential to assess their caregiving perceptions for future intervention development of caregiver well-being and the quality of care they provide. This secondary analysis assessed the caregiving perceptions among KA family caregivers of PWD, a minority in the US.

METHOD This study was guided by Guided by Lawton et al.'s well-being and caregiving outcome models. We included those who self-identified as KAs who were primary caregivers of PWD and provided care for them at home. We used the Korean version of the Revised Caregiving Appraisal Scale, comprising five subscales, including burden, satisfaction, mastery, demands, and impact. We excluded the impact   subscale as the items didn't apply to several participants due to their cohabitant status. We calculated descriptive statistics based on the level of measurement and data distributions.

RESULTS Participants' average age was 64.5 (±11.9). Most were female (80 %) and adult   children (66.7%; in-laws included) of PWD. 60% were living with their care   recipients. On average, participants lived in the US for 41 (±10.4) years. The   average score for each subscale was as follows: burden: 25 (±5.95), satisfaction: 18.09 (±3.96), mastery: 19.33 (±3.24), and demanding: 7.4 (±3.09).

CONCLUSION   While our participants had moderate levels of perceptions about caregiving satisfaction, mastery, and demanding, their caregiving burden was slightly higher   than the moderate level. The findings suggest future interventions for KA family   caregivers should consider their caregiving burden.

Ishan Khosla, B.S. Neuroscience

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ASCVD RISK IN A FOOD INSECURE POPULATION

BACKGROUND Cardiovascular disease (CVD) is the leading cause of mortality in the US and the incidence of CVD continues to rise. The risk of mortality can be calculated via the Atherosclerotic Cardiovascular Disease (ASCVD) risk score, which provides the 10-year risk of major cardiovascular events. Low socioeconomic status (SES) and risk factors such as diabetes, hypertension, and dyslipidemia have been known to increase ASCVD risk. Food insecurity has been associated with these risk factors as well as additional adverse social determinants of health. Current literature is sparse on the impact of food insecurity on ASCVD risk and challenges such as lack of access to health care limits an accurate understanding of CVD in this population. Thus, a community based approach with point-of-care screenings provides a unique look at the risk of CVD in food insecure populations.

METHODS The Cardiometabolic Health Initiative (CHI) is an interdisciplinary team which organizes free point-of-care (POC) cardiovascular screenings and health coaching at a food pantry in the west side of Chicago. CHI screening consists of fingerstick lipid panels, A1c, blood pressure, and obtaining comprehensive demographic/medical histories. Data was collected from screenings between March 2023-January 2024. ASCVD risk was calculated using the American College of Cardiology calculator and the following cut-offs were used for risk stratification: 5% (low-risk), 5-7.5% (borderline risk), 7.5-20% (intermediate risk), and 20% (high risk).

RESULTS In total, 57 patients participated in the comprehensive cardiovascular screening. The mean ASCVD risk score was 11.92% with a standard deviation of 13.51 and a median of 5.85%. Patients above the 75th percentile had a score 17.80% and patients above the 95th percentile had a score 38.76%. The maximum ASCVD score recorded was 55.60%.

CONCLUSION Our data suggests that the ASCVD risk in this population varies drastically, however, 50% of the study population has a borderline to high ASCVD risk. This confirms the high prevalence of CVD risk in food insecure populations, and highlights the need for accessible community health strategies aimed at CVD prevention and health education in this vulnerable population.

Erin Seunghee Kim, MS

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ORAL HEALTH PERCEPTIONS IN THE HOMELESS POPULATION IN CHICAGO

INTRODUCTION Homeless patients experience intersecting physical, mental, and social burdens that significantly limit their access to proper health care. This decreased access to care contributes to overall worse health outcomes within the population, including oral health. This project aims to investigate the various psycho-social factors contributing to the disproportionate incidence of poor oral health within the Chicago homeless population.

METHODS Data was collected from the Center for the Underserved at Rush ENT (CURE) that serves the Chicago homeless population. For comparison, patients from the Rush University Sinus Clinic were surveyed. Patient data was collected using a 28-item survey measuring social demographics, past medical history, employment/insurance status, substance use, and oral health-related quality of life using the Oral Health Impact Profile survey (OHIP-14). The OHIP-14 questionnaire collects the following: The presence of teeth/mouth pain, trouble eating, embarrassment surrounding the teeth/mouth, and the impact of one's teeth/mouth on the ability to work and life satisfaction. Statistical analysis was performed using Python. Continuous variables were analyzed using t-tests and ANOVA, while discrete variables were analyzed using chi-square tests.

RESULTS Homeless patients attending the CURE clinic over 50 years old were significantly more likely to report oral health issues ($p<0.05$), painful mouth aching ($p< 0.05$), and deterioration in their sense of taste ($p<0.001$) than patients who were 50 years old or younger. Additionally, homeless patients who were uninsured were more likely to report dissatisfaction with their diet ($p<0.01$) and interruption while eating ($p<0.01$) due to poor oral health than insured patients. Data collected from the sinus clinic demonstrated no correlation between age and insurance status with aforementioned variables.

CONCLUSION Poor oral health, as measured by the OHIP-14 survey, correlated with increased age, lack of employment, lack of insurance, and lower education levels within the homeless population of Chicago. Many of these same factors did not significantly correlate with oral health within the more resourced population attending the Rush Sinus Clinic. This discrepancy indicates that accessible preventative oral health care and equitable public health interventions may improve oral health outcomes among Chicago's most at-risk homeless population.

Stephanie Kuwornu, Masters of Science in Nursing

Stephanie Kuwornu(Rush University College of Nursing)

RUSH ICARE VALUES: BUILDING AND SUSTAINING COMMUNITY PARTNERSHIPS

INTRODUCTION: The Chicago Lighthouse(CLH) for people who are blind or visually Impaired serves individuals with differing abilities and various programs. Participants of the seniors program are an important part of the CLH population. Masters nursing students at Rush University work with the Senior Program participants who are a diverse group of individuals from as far north as Glencoe and as far south as Bridgeport. Ethnicities are dynamic as are genders and it is a "safe space" for older individuals to be able to freely express themselves and learn from each other. The staff have worked with Rush students over many years to form a community partnership to champion wellness for all. A sustainable educational program accounts for the needs and wishes of program participants.

METHODS: Rush students interacted with stakeholders to include leadership, staff members, and participants to adapt the programming to the specific needs of this population. The Seniors were surveyed about the types of health topics they want to learn more about. Health education has been and continues to be provided on different topics over the course of the semester (per term of the Rush students) both in person and a remote format. During this time, participants were educated about wellness and increasing awareness of chronic conditions such as developing healthy coping strategies regarding sleep hygiene, hearing and vision loss, kidney disease, diabetes, the value of being vaccinated, and equally important, mental wellness. As well as the loneliness we might encounter as we age.

RESULTS: Participants were able to learn about health topics that matter to them. At the end of the sessions, participants were able to set SMART(Specific Measurable Achievable Relevant Timely) goals related to their health interests. We periodically touch based either in-person or remotely on their SMART goals and adjust the goals as needed.

CONCLUSION: We were able to provide participants with a rich learning experience that will facilitate developing lifelong healthy habits. Participants enjoyed the experience and were very engaged. Future masters students will be able to continue and sustain the work that we built through the blueprint that we left behind.

Narisse Martin, BS

Narisse A Martin (Rush), BS Clifvonne G Webb (Rush), BS Shelia A. Dugan (Rush), MD

THE INFLUENCE OF PARTNERSHIPS WITH RELIGIOUS INSTITUTIONS ON COMMUNITY BASED HEALTH INITIATIVES

INTRODUCTION   In Chicago, the zip code you live in determines your life expectancy. In neighborhoods experiencing increased rates of health adversity, such as East (EGP) and West Garfield Park (WGP), there is an 8-year decline in average life expectancy compared to the overall average life expectancy of the whole city. The West Side Walk for Wellness (WW4W) is an annual summer walking program aiming to close this life expectancy gap by focusing on these neighborhoods. WW4W strives to increase access to health education, bolster a sense of community, and promote health and wellness. In 2022, 11% of WW4W participants reported living in high hardship index neighborhoods. This year's project focused on increasing recruitment from target neighborhoods through partnerships with local churches.

METHODS   Ten local churches from EGP and WGP were contacted via email to participate in recruitment. Three were responsive and participated in recruitment . Within the affiliated churches the program was promoted via word of mouth. General promotion for the WW4W used flyers, shared digitally through social media platforms, the Rush Medical community, the American Medical Association community, EGP and WGP. A pre-survey was sent to participants to assess community member's trust in the medical field and religious leaders, and the influence of religious institutions on likelihood to enroll in WW4W.

RESULTS Participant numbers in EGP and WGP increased from 42 in 2022 to 45 in 2023 and decreased in total participant percentage by 0.82% (11.38%-10.56%). Of the high hardship zip codes (60651, 60623, 60632, 60612, and 60624) 17.61% (75/426) reported residing in those neighborhoods in comparison to 19.51% (72/369) in 2022. Eleven total participants reported being a member of an affiliated church.

CONCLUSION   Despite the 2023 increase in the number of participants from high hardship index neighborhoods, the overall percentage of participants in these communities decreased from 2022. These findings can be useful in analyzing the benefits of working with local churches to recruit community members in participation in community health initiatives. Additional insights for research and program coordination will come from methodology planning and qualitative interviews to discover barriers to participation of community members in health initiatives.

Lara Meschewski, Clinical Nutrition

Lara Meschewski (RU); Savannah Roberson (RU)

AVAILABILITY, PRICE, AND QUALITY OF FOODS BETWEEN LOW-HARDSHIP AND HIGH-HARDSHIP NEIGHBORHOODS IN CHICAGO

INTRODUCTION: Disparities exist regarding access to high nutritional quality foods among different populations. Current research suggests that non-Hispanic black households and those with a low income-to-poverty ratio have low access to supermarkets in their immediate neighborhoods. In addition, low access to supermarkets is associated with poor diet quality and overall health outcomes. The purpose of this study is to determine if there is a difference in availability, price, and quality of foods between high hardship and low hardship neighborhoods in Chicago, IL.

METHODS: This study used a cross-sectional study design. Researchers utilized the validated Nutritional Environment Measures Survey for Stores (NEMS-S) instrument to assess differences in the availability, price, and quality of foods across all grocery stores located in a high-hardship (Humboldt Park) and a low-hardship index neighborhood (West Town) in Chicago. These two neighborhoods differ significantly in terms of income, lifespan, and racial/ethnic composition, all contributing to the "Hardship Index". Researchers independently surveyed ten grocery stores using the NEMS-S protocol over a two-week period. The NEMS-S scores can range from -9 to 54, with higher scores indicating increased availability, better quality, and lower price. Mann-Whitney U tests were used to compare the mean NEMS-S scores between neighborhoods.

RESULTS: Humboldt Park contains three grocery stores, while West Town has seven. Per capita income is $23,524 in Humboldt Park and $73,244 in West Town. Life expectancy in Humboldt Park is 71 years and 79 years in West Town. Most Humboldt Park residents are Hispanic/Latinx (58.7%), and most West Town residents are non-Hispanic White (62.2%). There were no statistically significant differences in total NEMS-S scores (p=0.38) or price (p=0.51) between Humbolt Park and West Town. Both neighborhoods exhibited excellent quality fresh produce.

CONCLUSION: Although no statistically significant differences were observed in total NEMS-S scores and the subgroups of availability, price, and quality between the two neighborhoods, West Town had slightly higher scores in availability and price. A major limitation of this study is the small sample size, and the use of only grocery stores to assess the overall food environment. Further research needs to examine additional stores and neighborhoods for comparison.

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ASSOCIATION BETWEEN ETHYLENE OXIDE GAS EXPOSURE AND NEUROCOGNITIVE FUNCTION

INTRODUCTION: Ethylene oxide (EtO) gas is a widely used industrial chemical that poses a risk to human health. Multiple studies have determined (a) EtO exposure can be measured via hemoglobin adduct levels, and (b) EtO exposure increases the risk of cancer and neurocognitive deficits, especially with occupational exposure. Emerging studies indicate residents of neighboring communities may also be at risk of toxic effects due to chronic low-dose exposure. The purpose of this study is to examine the relationship between EtO hemoglobin adduct levels and cognitive and motor function using the Center for Disease Control and Prevention's (CDC) National Health and Nutrition Examination Survey (NHANES) dataset.

METHODS: This descriptive study drew its sample from NHANES, the publicly available and de-identified dataset representative of the U.S. population. The 2013-2014 NHANES measured (a) exposure to EtO gas using hemoglobin adduct levels in the blood, and (b) neurocognitive function using the CERAD, Animal Fluency, Digit Symbol Substitution, and grip strength tests. Data were uploaded into SPSS and associations analyzed using linear regression analysis.

RESULTS: A total of 10,175 individuals were sampled and 489 (cognitive) or 436 (motor) were included in the analyses. There was a significant inverse association between high EtO hemoglobin adduct levels and scores on the Animal Fluency and Digit Symbol Substitution tests.

CONCLUSION: While significant associations were found, they accounted for small percentages of the variance. Additional studies are needed to determine if other factors, such as age and socioeconomic status, moderate the association of EtO and neurocognitive function.

Camden Richter, BA

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DIABETES MELLITUS IN CHICAGO'S WEST SIDE POPULATION

INTRODUCTION In 2021, there were over 38 million patients across the United States living with diabetes mellitus (DM), 8.7 million of which were unaware of their diagnosis. While DM is a major risk factor for Cardiovascular Disease and the leading cause of death in the US, 90% of cases are preventable through lifestyle modifications. Unfortunately, low socioeconomic status and food insecurity are key barriers to DM management and prevention. Poor access to preventative screening measures perpetuates the high prevalence of undiagnosed DM. This study examines the prevalence of diabetes and prediabetes in an at-risk, food insecure population on the west side of Chicago, and assesses the need for prevention and education strategies within this population.

METHODS The Cardiometabolic Health Initiative is an interdisciplinary team of medical professionals, students, and community health workers that provides comprehensive cardiovascular screenings and treatment protocols at Beyond Hunger, a food pantry serving an underserved, food insecure population on the west side of Chicago. 69 patients were assessed using point-of-care A1c tests between August 2023 and January 2024. Additionally, medical history, including medications and prior diagnoses, was collected from each participant.

RESULTS Among the 69 patients assessed, 10 patients (14.5%) met criteria for DM, 27 patients (39.1%) met criteria for prediabetes (A1c between 5.7 and 6.4), and 34 patients (49.3%) had a healthy A1c (A1c below 5.7). Of the 10 diabetic patients, 7 patients had uncontrolled diabetes (A1c greater than 6.5) and 3 patients had controlled diabetes. One of the uncontrolled diabetics was not previously aware of their diagnosis. Further, 1 patient did not take any medications despite reporting having diabetes and having an A1c above 6.5.

CONCLUSION Diabetes mellitus is a key risk factor for cardiovascular disease and awareness of A1c level is imperative for prevention and monitoring. Our data suggests that there is a large percentage of food insecure patients across Chicago with A1c levels within the prediabetic range. Given this finding, preventative screenings and health education programs may decrease the prevalence of DM within this at-risk community.

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ADDRESSING OTOLARYNGOLOGIC HEALTHCARE NEEDS AMONG VENEZUELAN MIGRANTS IN CHICAGO

INTRODUCTION: Due to Venezuela's recent economic and political turmoil , there has been an increased number of Venezuelans fleeing the country. The United Nations High Commissioner for Refugees (UNHCR) estimates more than 7.7 million Venezuelans have left the country, finding new opportunities in other countries, including the United States (US). Venezuelans initially gravitated towards neighboring countries in Latin America, such as Colombia and Chile, but have redirected recently to the United States, with a significant portion of them crossing the US-Mexico Border. The influx of these migrants, many of whom experienced long, crowded journeys and are now living in overcrowded, unsanitary conditions, raises significant public health concerns, mirroring past instances in Europe where such conditions led to increased incidence of respiratory infections. This study examines the otolaryngologic healthcare challenges faced by Venezuelan migrants in Chicago, amidst the mass mobilization from Texas and Arizona due to recent changes in immigration policies.

METHODS: Our team deployed a unique methodology for providing targeted otolaryngologic care to this underserved population. The approach involved a student led organization generating biweekly mobile migrant clinics to emergency shelters at police stations across the city of Chicago. Data collected from the mobile clinics, including conditions diagnosed were analyzed. This study was approved by the Rush University IRB.

RESULTS: Of the 138 Venezuelan migrants residing at the shelters on the days of the clinics, twenty presented with otolaryngological complaints. There was a high prevalence of sinusitis, URI, and ear complaints (ETD, otitis externa, otitis media) (30%, 16.6%, and 16.6% of complaints respectively). Extrapolating to the 138 individuals residing at the emergency shelters, 4.3%, 3.6%, and 3.6% of the shelter population had complaints of sinusitis, URI, and ear complaints.

CONCLUSION: This study underscores the urgent need for targeted healthcare interventions for migrant populations, particularly in the field of otolaryngology. It demonstrates that specialized medical care, adapted to the unique challenges faced by migrants, can significantly improve health outcomes. The insights gained are vital for healthcare providers and policymakers in designing effective healthcare strategies for migrant populations.

Jany Sun, BS

Jany Sun (RMC), Angela DiMartino (Curry Senior Center), Phillip Gerson (Curry Senior Center), Anne Richards (Curry Senior Center)

THE IMPACT OF TECHNOLOGY TRAINING PROGRAM ON OLDER ADULTS IN A LOW-INCOME NEIGHBORHOOD DURING THE COVID-19 PANDEMIC

INTRODUCTION Loneliness and isolation are concerning consequences of social distancing and stay-at-home orders for older adults during the COVID-19 pandemic. The Technology and Connections at Home Program (TCHP) offered virtual group training to develop practical skills and comfort using internet technology. TCHP goals were to reduce loneliness and enable older adults in San Francisco Tenderloin District, which is home to the most vulnerable communities, to better manage their health and wellbeing through at-home internet access. This study explored the efficacy of TCHP aimed to reduce loneliness and improve healthcare self-management.

METHODS 26 participants (age 60+ years) were recruited to participate 14 biweekly virtual group trainings. They also received biweekly telephone-based technology support. Loneliness was examined through the 20 item UCLA Loneliness scale. The ability to manage one's own health is supported through increased healthcare knowledge and self-efficacy. Healthcare self-efficacy was assessed using a validated scale by Lee, Hwang, Hawkins & Pingree (2008). Increased healthcare knowledge was examined through using the Health Status Questionnaires.

RESULTS A national study conducted by the American Association of Retired Person used a score of 43 or above on UCLA Loneliness scale as an indicator of loneliness. At Baseline, 15 out of 26 (58%) participants scored above 43, and the average score was 52.1. At 12-month, 11 out of 26 (42%) participants scored above 43, and the average score was 48.3. For Baseline, the single self-efficacy score is 76%, and at 12-month, the single self-efficacy score is 87%. The number of participants searching the internet for health information increased from 10 participants (38%) at Baseline to 23 participants (88%) at 12-months. Also, at 12-month, 6 participants (23%) were able to access their medical record. 8 participants (31%) searched health education videos on YouTube.

CONCLUSION The results confirmed the existence of a beneficial effect of the technology training program on the wellbeing of older adults in term of reduced loneliness and improve healthcare self-management. The finding provided insights on strategies community organizations can employ to address loneliness and improve wellbeing for older adults. Future study could be conducted to identify barriers older adults experienced during the training to improve technology use.

Alexis Torres, MSN

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ASSESSING SYSTEMIC BARRIERS TO MEDICATION ADHERENCE IN THE REFUGEE POPULATION

INTRODUCTION: The purpose of this study was to identify the systemic barriers to medication adherence in the refugee population. Although clinical staff working with a community-based refugee program report poor medication adherence as a major problem, there is a research gap on the barriers to medication adherence specific to refugee populations in the United States. Still, the existing literature argues that medication non-adherence is multifactorial, often associated with low health-literacy, language barriers, and adjusting to a novel healthcare system and different culture. Research has also shown the need for culturally tailored care in closing knowledge gaps that enable medication non-adherence, highlighting the thoughtfulness required in making educational interventions.

METHODS: Interviews and questionnaires were conducted with healthcare providers, case managers, local pharmacists, and refugee patients. Respondents were asked descriptive research questions related to their expertise, current medication management workflows and services provided. Intelligent transcription was used to archive interview responses. The interviews and surveys were manually coded first with an open coding technique, and thematic content analysis was used to analyze the remaining data. A standardized set of quantitative research questions compiled from similar studies was asked of all participants, excluding the refugee patient category. Descriptive statistics were used to analyze the data from the surveys and interviews for the highest average ranking of reported barriers to medication adherence.

RESULTS: The greatest barriers to effective medication use in the refugee population are access to quality interpretation services, an overwhelmed healthcare system, low health literacy levels, and lack of collaboration between healthcare and community organizations. Interviewees included 4 refugee patients, 4 healthcare providers, 5 pharmacists and 4 case managers. Each of the identified barriers received the highest average rankings by respondents on a scale of 0-10 and were further validated by the frequent reoccurrence of themes related to the barriers in interviews.

CONCLUSION: Healthcare organizations can collaborate with community partners to identify refugees at high-risk and provide them with individualized medication counseling and support services in-house.

Amelia Troutman, MA

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THE IMPACT OF THE COVID-19 PANDEMIC ON PEDIATRIC VACCINATION RATES BY RACE AND ETHNICITY IN CHICAGO, IL.

INTRODUCTION Globally, pediatric vaccinations prevent 4 million deaths each year. Prior to the COVID-19 pandemic, uptake of Center of Disease Control (CDC) recommended pediatric vaccines was very high across the United States, and racial and ethnic differences in pediatric vaccination rates were mostly absent. Research suggests the COVID-19 pandemic led to an overall reduction in routine pediatric vaccination rates across the country, with non-Hispanic Black children being the least up to date on vaccines. This research aims to shed light on the impact of the COVID-19 pandemic on pediatric vaccine rates overall, as well as by race and ethnicity, in Chicago IL.

METHODS We conducted a retrospective data query through the Chicago Area Patient-Centered Outcomes Research Network (CAPriCORN) at Rush. CDC recommended vaccines from birth to 2 years of age were included, with a total of 24 possible vaccinations (this includes both distinct vaccines as well as the number required per series). Two cohorts were defined: Pre-COVID (those born June 1-30 of 2017, N=114), and post-COVID-restrictions (those born June 1-30 of 2021, N=101). Receiving primary care at RUSH/ROPH and having at least one follow-up at RUSH/ROPH following second birthday were inclusion criteria. Preliminary data was used to generate a total vaccine count out of 24 for each individual. Independent samples t-tests were run between cohorts for overall vaccine count, and by individual race and ethnicity.

RESULTS Overall, mean vaccine count was not significantly different between groups $t(199) = -0.1$, $p=0.9$. Mean vaccine count was also not significantly different between groups for Non-Hispanic Blacks; $t(59) = 0.4$, $p=0.7$, Non-Hispanic Whites; $t(40) = -0.7$, $p=0.5$, or Hispanic individuals; $t(82) = -0.1$, $p=0.9$.

CONCLUSION Given the small sample size generated by one month of data, it is possible that an effect is being missed, especially for the Non-Hispanic White group which showed the largest difference in mean vaccine count between groups; pre-COVID (N=22, mean=12.8), vs. post-COVID restrictions (N=20, mean=14.2). Differences between groups within race and ethnicity were looked at, but differences between races and ethnicity was not. Further research is needed to determine whether a difference between time points exists.

Charleen Yeager, MSN, BS

Charleen Yeager (Rush University); Shannon Halloway (UIC); Pamela Semanik (Rush University)

PHYSICAL ACTIVITY IN THE CONTEXT OF CARDIOVASCULAR DISEASE AND MENTAL HEALTH RISKS AMONG MOTHERS WITHOUT PARTNERS: AN INTEGRATIVE REVIEW

PROBLEM: Mothers without partners (WP) are at increased risk of cardiovascular disease (CVD) and mental health (MH) impairments, which can be mitigated by modifiable, adequate lifestyle physical activity (PA). However, little is known about this population's lifestyle PA behaviors.   PURPOSE: To describe mothers WP's lifestyle PA behaviors reported in the literature, and to explore the associations between PA behaviors and CVD risks and MH status.

SEARCH STRATEGY: CINHAL, PubMed, Scopus, and Google Scholar were systematically searched to identify relevant literature, dates unrestricted. Inclusion criteria: adult mothers WP, PA measurements, and CVD/ MH risks. Exclusion criteria: post-partum and pregnant mothers, non-mother caregivers, children-only outcomes, and disease-specific populations. Titles, abstracts, full-text articles, and inclusion/exclusion criteria were reviewed/evaluated by two authors.

RESULTS OF THE LITERATURE SEARCH: After removing duplicates and completing hand searches, 685 records were screened, identifying thirteen studies of descriptive and interventional quantitative, qualitative, and mixed methods designs. Publications were evaluated with the Mixed Methods Appraisal Tool.

SYNTHESIS OF EVIDENCE: Studies utilizing wide-ranging subjective PA measures yielded inconsistent results. Only five studies measured PA behaviors using devices. Results indicate mothers WP have decreased PA behaviors compared to partnered mothers. Results support previously noted associated risks for various CV/ MH conditions in this population. Interventional research did not focus on mothers WP.

IMPLICATION FOR PRACTICE: PA behavior literature on mothers WP suffers from dependence on unreliable subjective PA measures, with few studies utilizing gold standard device-measured PA. To facilitate future health promotion efforts, additional device-measured PA research is needed on mothers WP, who are at risk of negative health outcomes related to CVD and MH.

Ka Hei Tang, Masters of Science

Ka Hei Tang (RUSH)

FOOD SECURITY STATUS AND DIET QUALITY OF RUSH UNIVERSITY STUDENTS

INTRODUCTION:Food insecurity refers to the constrained access to adequate food due to economic and social conditions. Approximately, 12.5% of households across the United States experience food insecurity. Research suggests that college students have higher rates of food insecurity (10-30%). Food insecurity is significantly associated with poor diet quality, poor academic performance, and increased BMI. The purpose of this study is to identify the prevalence of food insecurity among Rush students and determine if there are any differences in diet quality, GPA, and BMI in food insecure versus food secure students.

METHODS: This study used a cross-sectional survey design. The 2-Item Food Security Screener was used to assess food security status, and the Short Healthy Eating Index was used to assess diet quality. The instruments are valid and reliable. Height, weight, and GPA were self-reported. The Fisher Exact test was used to identify the associations between food security status and GPA. The Mann-Whitney U Test assessed differences in BMI and diet quality scores between food-secure and food insecure participants.

RESULTS: The sample was 85.7% female (n=36) and 64.3% white (n=27), with 64.1% (n=25) classified as food secure. There was no statistically significant association between food insecurity status and GPA performance (p=0.059), though food insecure students did tend to have lower GPAs. There were no statistically significant differences in BMI (p=0.15) and total diet quality scores (p=0.09) between food-secure and food-insecure students. However, it was identified that food secure students consumed more servings of vegetables (p=0.02), and fewer servings of saturated fats (p=0.003) and added sugars (p=0.002) compared to food insecure students.

CONCLUSION: This study found that food insecurity prevalence at Rush is consistent with other universities in the United States. Food insecure students consumed fewer vegetables and more saturated fat and added sugar, all of which are associated with increased risk of chronic diseases. The results cannot be generalized to a larger population due to the small sample size, affecting its power to detect an association and differences. A larger sample size is needed to comprehensively understand how food insecurity affects student health and performance.

Anjali Venkat, Medicine

Anjali Venkat (Rush) Dr. Naomi Parrella (Rush) Dr. Raj Shah (Rush)

UNDERSTANDING MOTIVATIONS FOR WEIGHT LOSS THERAPY

INTRODUCTION Although obesity and chronic disease remains at the forefront of American illness, patients continue to struggle with weight loss and many PCPs do not feel they have the resources or training to properly treat these patients. The primary objective of this study is to identify the motivating factors behind seeking care at a weight loss clinic outside of surgery or their PCP.

METHODS This study used a grounded-theory qualitative research approach in which EPIC was accessed to obtain clinic schedules from RUMC and Rush Oak Park clinics for patient contacts. Interviews were then scheduled based on patient availability. An all-inclusive open-ended questionnaire was administered virtually to identify common themes related to patient motivations. Data was collected through call recording and transcription was done through OneDrive/Teams. Common themes were then identified and organized using transcript coding.

RESULTS Thirty-five patients were interviewed. Three themes were apparent from the initial analysis of transcripts: referrals were driven by PCPs after patients expressed frustration after repeated attempts for weight loss, health gave patients the final push over cosmetics to obtain care, and patients were interested in learning fact from fiction and wanted to be educated by professionals on their health. Most patients in the study were referred by their PCP and less were referred by bariatric surgeons or by friends. Health was every patient's primary driving force, although many expressed insecurity regarding physical appearance. Most patients stated that body image did not necessarily resolve after weight loss. Given increasingly inaccurate weight loss strategies on social media platforms from self-proclaimed health influencers, patients were keen on taking well-informed steps towards their health.

CONCLUSION The study showed that weight loss care is not only a medical practice, but also a therapeutic practice requiring a psychological component. There is currently a gap in the physician-patient role in both education and the emotional/mental management of weight loss. Patients are not receiving the education they desire, and physicians are unable to properly provide the multi-faceted care weight loss therapy entails. More expansive studies need to be performed to further analyze why such gaps exist in American healthcare.

Joshua Wilson, B.S. in Human Biology

Dr. Aloka Patel, M.D. - Professor, Department of Neonatology   Dr. Tricia Johnson, PhD - Professor, Department of Health Systems Management Dr. Melissa Holmes, M.D. - Assistant Professor, Associate Chief Medical Informatics Officer Joshua Wilson, B.S. - M2 at Rush Medical College

MOTHER'S OWN MILK PROVISION OVER THE 12 WEEKS: ANALYZING THE IMPACT OF GESTATIONAL AGE IN A U.S. COHORT

INTRODUCTION: Exclusive mother's own milk (MOM) feedings are recommended through age 6 months due to the known protective effects against infantile diseases. In preterm infants, MOM is also associated with reduced rates of necrotizing enterocolitis and improved neurodevelopment. However, there are no population-based studies in the United States reporting longitudinal rates of MOM feedings based on gestational age (GA) at birth. Our objective is to compare rates of MOM provision at 12 weeks of life based on infant's GA at birth.

METHODS: Data provided by the 2021 Pregnancy Risk Assessment Monitoring System (PRAMS) from 35 states were used for analysis (n=29098). Data were weighted to reflect the relative populations of each state prior to conducting analyses. Infants were categorized by birth GA (<27 weeks, 28-33 weeks, 34-36 weeks, 37+ weeks). Maternal characteristics included race/ethnicity, age, insurance, education, marital status, WIC use during pregnancy, delivery characteristics (mode, singleton/multiple), pre-pregnancy body mass index and cigarette smoking. Rates of 1) MOM initiation, and 2) continued MOM provision at 12 weeks conditional on initiation were then compared between GA groups. Population-weighted multivariable logistic regression models were used to examine the association between MOM outcomes and GA at birth, controlling for maternal characteristics. Adjusted predictions and marginal effects were calculated for GA groups. SAS version 9.4 and STATA version 17 were used for statistical analyses.

RESULTS: Sample characteristics differed significantly across GA groups (Table 1). The highest rates of MOM feeding initiation were found at the lowest GA category (<27 weeks) (Table 2). Late preterm infants (34-36 weeks) had the lowest rate of initiation at 81.8% (95% CI, 79.5-84.1). MOM provision at 12 weeks conditional on initiation was highest in term (37+ weeks) infants at 71.6% (95% CI, 70.7-72.6). The late preterm population was 4.4 percentage points less likely to initiate MOM feeding and 6.7 percentage points less likely to continue MOM provision at 12 weeks postpartum (95% CI, -9.9 to -3.5) compared to term infants (Table 3).

CONCLUSION: This demonstrates need for further outreach, education, and lactation support for mothers of late preterm infants to improve infant/maternal health and increase the likelihood of reaching national and international breastfeeding goals.

Farhan Ahmad, M.D.

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ANALYSIS OF VARIABILITY AND TRENDS IN MEDICAL SCHOOL CLERKSHIP GRADES

INTRODUCTION: Medical school clerkship grades are used to evaluate orthopedic surgery residency applicants, however, high interinstitutional variability in grade distribution calls into question the utility of clerkship grades when evaluating applicants from different medical schools. This study aimed to evaluate the variability in grade distribution among medical schools and look for trends in grade distribution over recent years.

METHODS: Applications submitted to Rush University's Orthopedic Surgery residency program from 2015, 2019, and 2022 were collected from the Electronic Residency Application Service. The percentage of "honors" grades awarded by medical schools for the surgery and internal medicine clerkships were reviewed.

RESULTS: The median percentage of honors given in 2022 was 36.0% (range 10.0 - 82.0) for the surgery clerkship and 33.0% (range 6.7 - 80.0) for the internal medicine clerkship. Honors were given 6.6% more in the surgery clerkship in 2022 compared to 2015 (CI 2.95 - 10.22, P < 0.001).

CONCLUSION: There is substantial interinstitutional variability in the rate that medical schools award an "honors" grade with evidence of grade inflation in the surgery clerkship. Residency programs using clerkship grades to compare applicants should do so cautiously provided the variability demonstrated in this study.

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DEBUNKING RACE-BASED MEDICINE: AN ASSESSMENT OF THE ADVOCATE ROLE SESSION ON MISUSE OF RACE IN MEDICINE FOR FIRST-YEAR MEDICAL STUDENTS

INTRODUCTION Race is a social construct, yet it continues to be used in clinical care. Race-based models are meant to aid in determining the appropriate treatment for an individual, but they exacerbate preexisting health disparities and reinforce race as a biological entity. This evaluation aims to examine the quality of a medical school class session regarding these algorithms and its capacity to influence the utilization of race-based medicine in the practice of future physicians.

METHODS First-year medical students participated in a mandatory session regarding race-based calculators. Clinical scenarios demonstrated how four patients with identical health metrics, but different social identities, were given varying treatment options. The session displayed how race-based algorithms may contribute to health disparities seen in maternal health, osteoporosis, renal disease, acute respiratory illnesses, and heart disease. At the conclusion, students evaluated the session via an anonymous voluntary survey.

RESULTS Out of the 140 students present, 12 students elected to complete the evaluation. The results were positive: 100% of students "strongly agreed" or "agreed" that the overall quality of the module was excellent. Feedback in the form of comments included that the session incorporated "very thought-provoking and relevant articles". Materials were found to be "informative" and provided "new and relevant information." Two responses desired more session time.

CONCLUSION The session feedback was overwhelmingly positive; however, an availability bias exists among the responses. Students who responded shared positive experiences, yet most chose not to participate. A requirement to complete the survey would improve external validity. In addition, survey questions that assess knowledge, skills, attitudes and confidence would provide more relevant feedback to determine the success of session objectives.   Race-based medicine has, in several ways, failed the populations it claims to assist. It is only by exposing the next generation to this issue and its clinical implications at the beginning of their medical education that we hope to generate awareness and gather advocates to improve care for medically stigmatized populations. Given this session's humanistic content, required surveys that assess session objectives would ensure that it was received well by all social identities and would provide important feedback to improve future sessions.

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THE M0 OPTION: AN ARGUMENT FOR COMPLETING THE MASTER OF PUBLIC HEALTH DEGREE IN THE YEAR PRIOR TO MEDICAL SCHOOL

INTRODUCTION: The ever-increasing overlap of medicine and public health prompts a closer look at medical school programs offering a Master of Public Health (MPH) dual degree; there is a need to accommodate this growing field and break down the silos in which these disciplines currently exist. This study reviews existing MD/MPH dual degree programs in the United States, as well as a survey on student experiences of Loyola University Chicago's (LUC) MD/MPH dual degree program.

METHODS: A list of medical schools in the United States offering MD/MPH programs was procured and reviewed using the Association of American Medical College's (AAMC) Medical School Admission Requirements database, an online catalog of U.S. and Canadian medical schools. A survey was then administered to those students who had graduated from or were currently enrolled in LUC's MD/MPH program (n=30) assessing opinions toward their MD/MPH program.

RESULTS: Of the 88 programs currently offered in the U.S., the MD/MPH program at LUC delivers the degrees in a unique format with the inclusion of an 'M0 year' dedicated to completing the MPH requirements prior to beginning the four years of medical school. Twenty-eight current students and graduates of LUC's MD/MPH dual degree program responded to questions evaluating the benefits and areas of needed improvement to the M0 year, LUC's dual degree program, and the dual degree, as a whole. With a response rate of 93.3%, the survey revealed the importance of knowledge acquired in the program as well as social and educational benefits of the M0 year f0r students matriculating to medical school. The need to reduce the financial burden of obtaining a dual degree, as well as and increase in dual-degree program marketing and school interconnectedness were highlighted as drawbacks.

CONCLUSION: The review highlighted the relative scarcity of the M0 year format in the U.S., and the survey responses revealed an overwhelmingly positive response toward the M0 year format of the MD/MPH dual degree program. Thus, the M0 year is recommended as a preferred design for institutions to utilize more frequently to optimize the delivery of this dual degree and further expand the interdisciplinary and invaluable MD/MPH workforce.

Charlie Fischer, MPH

Charlie Fischer, MPH (RMC); Taylor Stivali, MPH, MS (RMC); Ami Shah, MD (RUMC); Laurel Cherian, MD (RUMC)

RUSH ADVOCACY AND MEDICAL POLICY (RAMP) OP-ED WORKSHOP

INTRODUCTION Legislative and community advocacy are increasingly important to the role physicians play in society. It is important to understand how policy, advocacy, and legislative education enriches medical education and to understand how equipped medical students are to confidently enter these advocacy spaces. Rush Advocacy and Medical Policy (RAMP) is a new student organization in its second year at Rush Medical College with the goal of bringing students tangible advocacy experiences and education. We developed an op-ed writing session guided by student demand for actionable skills to advocate for topics of their choice.

METHODS The Op-Ed Workshop aims to provide both the education and confidence for future physicians to advocate for their patients and professions through written work. The workshop curriculum includes specific learning objectives that guide a one-hour interactive lecture on writing structure and submission strategies, including breakout brainstorming sessions for content development. Participants engage through group activities and opportunities to practice their writing skills. The workshop will be held at Rush Medical College on January 12th, 2024.

RESULTS The need for this session was evaluated through student feedback from the first RAMP meeting of the academic year on October 2nd, 2023. Attendance was 51 students, highlighting high student interest. The efficacy of this session will be evaluated using optional pre- and post-workshop surveys on Redcap to assess self-reported op-ed writing understanding, ability, and confidence using Likert scale questions. The survey was exempted by the RUSH IRB. The initial survey will be administered during the first five minutes at the start of the workshop. The same survey will be given during the final five minutes. We will not need to collect any identifying information as each attendee will be provided a Study Subject Number.

CONCLUSION We hypothesize that students will self-report increased advocacy knowledge, confidence, and ability after the targeted workshop. The session efficacy will guide future RAMP workshops and highlight the importance of actionable skills into advocacy curriculum for medical students. Medical students who are more confident and knowledgeable about ways to advocate will be better equipped as future physicians to advocate for their patients, peers, and health systems.

Elyse Fults, MD

Elyse Fults MD (Rush University); Jerome Martin MD (Rush University); Jessica Joyce (Rush University); Carolyn Clayton MD (Rush University); Sara Hock MD (Rush University)

SIMULATING DEATH SAFELY: RESTORING BASELINE EMOTIONAL STATE AFTER AN UNSUCCESSFUL SIMULATED CODE

INTRODUCTION Ending a cardiac arrest resuscitation is challenging, and it is a scenario that warrants practice. However, negative emotions stemming from poor medical outcome experiences may occur in simulated settings as well. We hypothesized that a paired code case training day of a negative outcome followed by a positive one may ameliorate negative emotions while still allowing simulated practice of critical elements of an unsuccessful code.

METHODS Two simulated cardiac arrest codes were facilitated during a scheduled emergency medicine resident simulation day. Cases occurred consecutively, with the first code ending unsuccessfully (terminated without ROSC) and the second code ending successfully (ROSC achieved). A survey of emotional dyad anchors of nervous-relaxed, upset-contented, sad-happy, and depressed-elated was given to residents before the first case, after the first case, and after the second case at the conclusion of the simulation day. Changes in moods between each case were analyzed using a paired sample t-test.

RESULTS A total of 23 emergency medicine residents participated in the paired code activity and completed surveys. The emotional dyads of upset-contented, sad-happy, and depressed-elated all showed a statistically significant ($p < 0.05$) pattern of decrease following the first code with a return to or increase from baseline following the second code. The nervous-relaxed dyad showed no change between the first and second code, but did show a statistically significant ($p < 0.01$) increase after the second code at the completion of the simulated activities.

CONCLUSION Our data suggests that participant moods are worsened following a simulation code with a negative outcome. However, by following an unsuccessful simulated code with a successful simulated code, participants are more likely to return to or exceed their baseline mood. These findings are relevant to the growing body of literature that suggests negative emotions can adversely affect learning in medical trainees.

MacKenzie Griffith, BA

Olivia Negris, MA (Rush Medical College); Pranvera Sulejmani, MS (Rush Medical College); Aliya Rodriguez, BS (Rush Medical College); MacKenzie Griffith, BA (Rush Medical College); Christopher Farkouh, BS (Rush Medical College); Vida Ehyaee, MD (Rush University Medical Center Department of Pathology); Maria Mihailescu, MD (Rush University Medical Center Department of Dermatology); Paria Mirmonsef, PhD (Rush Medical College Department of Microbial Pathogens and Immunity)

INTEGRATING EARLY DERMATOLOGY EXPOSURE INTO THE PRE-CLINICAL CURRICULUM: EXPANDING OPPORTUNITIES FOR FIRST YEAR MEDICAL STUDENTS

INTRODUCTION: Early exposure to dermatology is vital for medical students, offering significant educational and professional development benefits. Despite knowledge of the benefits of exposure to dermatology, many undergraduate medical programs do not offer robust early opportunities. Therefore, this initiative aims to evaluate the impact of a Dermatology Interest Day integrated into a first-year medical school curriculum.

METHODS: The event included interactive presentations, hands-on workshops, and direct engagement with faculty and residents. Pre-test surveys were administered to collect demographic information, assess students' baseline perceptions, familiarity with the specialty, and level of interest. The Dermatology Interest Day was conducted, followed by a post-test survey.

 RESULTS: Of participants (n = 14), there were equal numbers of males and females, and 35.7% self-identified as a race which is underrepresented in medicine. Participants felt, on average, 17.2% more familiar with the field and 18.6% more confident in their ability to find a role model in dermatology after the event. Participants were 15.6% more likely to agree dermatology serves a diverse patient population and 13.0% more likely to agree dermatology offers collaboration between specialties. Following the session, 6.6% more participants indicated they would like to pursue a career in dermatology and felt 8% more likely to be prepared to encounter dermatologic pathologies while shadowing and on clerkship rotations.

CONCLUSION: The implementation of a Dermatology Interest Day allows medical students equal access to early exposure in the highly competitive field of dermatology. By promoting inclusivity and diversity in content and providing a comprehensive understanding of dermatology, this event enhanced students' interests in and perceptions of this specialized field. This session increased student interest in the field and improved confidence and knowledge related to dermatology as a career.

Aaron Hendizadeh, MS

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ARTIFICIAL INTELLIGENCE ENGINES FACE OFF ON THE PLASTIC SURGERY INSERVICE TRAINING EXAMINATION: A COMPARATIVE ANALYSIS

INTRODUCTION: Recent advancements in artificial intelligence (AI) have led to further investigation of whether large language models (LLMs) serve a potential role in advancing the field of plastic surgery and medical education. We aim to provide a comparative analysis of the performance of ChatGPT-4, Microsoft Bing, and Google Bard AI on the Plastic Surgery Inservice Training Exam (PSITE) to determine whether LLMs can be utilized as a tool for resident education.

METHODS: Questions from the 2023 American Society of Plastic Surgeons Inservice Training Exam were input into three AI engines: Microsoft Bing, ChatGPT-4, and Google Bard. Questions with images and figures were omitted. Overall accuracy between AI engines was analyzed. Responses were further stratified by question category. Accuracy between categories was analyzed across each AI engine. A chi-square test with Bonferroni correction was performed for the univariate analysis. Multivariate logistic regression analysis was performed with R version 4.2.10 using "Bing" and the "Comprehensive" category as the reference level.

RESULTS: A total of 221 questions were analyzed. All three AI engines' accuracy significantly differed from one another, with Bing having the highest accuracy (74%), followed by ChatGPT-4 (59%) and Google Bard (57%) (p<0.001). When stratified by exam section, Google Bard's accuracy differed significantly according to category (p=0.01). ChatGPT-4 and Google Bard were associated with a decreased odds of answering a question correctly compared to Bing (OR 0.49; p=0.0006 and OR 0.45; p=0.0001). "Craniomaxillofacial" questions were associated with a decreased odds of being answered correctly compared to "Comprehensive" questions (OR 0.58; p=0.045).

CONCLUSION: The PSITE is an important benchmark used to evaluate a resident's knowledge of clinical and technical concepts of plastic surgery. This comparative analysis of various LLMs reveals the distinct capacities of each to interpret complex plastic surgery concepts, with Bing demonstrating superiority to serve trainees as a study tool compared to ChatGPT-4 and Google Bard. While LLMs provide an accessible, interactive learning aid, we caution trainees to acknowledge LLMs as supplementary tools, rather than substitutes for human knowledge.

Kellie Inouye, BS

Kellie Inouye (Rush); Mosmi Surati, MD MPH (Rush); Katarzyna Gore, MD FACEP (Rush)

DELIRIUM KNOWLEDGE AND ATTITUDES AMONG INTERNAL & EMERGENCY MEDICINE PROVIDERS

INTRODUCTION   Delirium, an acute cognitive disturbance common in older hospitalized adults, poses serious health risks, contributes to longer hospital stays, and increases mortality. Mitigating delirium is hindered by barriers such as limited awareness, inadequate education, and lack of prioritization among healthcare providers. This project aimed to gauge opportunities to improve the care of patients with delirium by surveying hospitalists and emergency medicine providers.

METHODS   An anonymous, IRB-approved Redcap survey was distributed to inpatient physicians (attendings, fellows, and residents) and advanced practice providers (nurse practitioners and physician assistants) within Rush Medical Center's Internal Hospital Medicine (IM) (N=157) and Emergency Medicine (EM) (N=93) departments. The survey assessed knowledge and attitudes about delirium identification, management, and prevention. Professional demographic information and free text responses were also collected.

RESULTS   Of 250 surveys distributed, 92 were completed (36.8% response rate). 72.8% were from the IM department and 53.2% were resident physicians. Providers showed an adequate delirium knowledge base (89.2% correct answers). Providers rated themselves as more confident in identifying than managing delirium (96.8% vs. 90.5% with "Fair" or above). No providers believed that delirium is impossible to prevent. 66% of providers reported that discerning delirium from other illnesses made it difficult to detect, and 31% thought that lack of medical prioritization was a barrier to care. While both IM and EM named environmental barriers and time constraints as major barriers to addressing delirium, 32.8% of IM providers pointed to differing management expectations between providers and nursing staff whereas EM providers frequently cited medication knowledge and lack of personnel. Both departments suggested systems-based solutions as an ideal starting point for future interventions.

CONCLUSION   Our survey revealed an overall good understanding of delirium identification, management, and prevention. Providers expressed relatively high confidence and positive attitudes regarding the importance of addressing delirium. Seeing a plurality of providers within both departments identify common barriers and offer solutions suggests there are potential next steps to improve patient outcomes, a sentiment shared at other institutions. There is a salient need to create systemic solutions to prevent and mitigate delirium in the inpatient hospital setting and emergency room.

Jessica Joyce, BS

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A REALISTIC, LOW-COST SIMULATED AUTOMATED CHEST COMPRESSION DEVICE

INTRODUCTION: Automated chest compression devices (ACCD) are commonly utilized in codes in the emergency department and by EMS as patients arrive in the ED. Prolonged simulated codes can be challenging to maintain proper chest compression depth and form. Resident learning may be enhanced during codes in the simulation environment by implementing the use of a simulated ACCD. This simulated ACCD was designed for use in simulation code cases involving emergency medicine residents, but would be applicable to other learners such as nurses, pharmacists, and medical students.

METHODS: We developed a cost-effective simulated ACCD for use in resuscitation simulation cases. An initial pilot session identified components of fidelity that were used to model the simulated ACCD after those utilized in clinical situations. Three simulated devices were created and then tested for efficacy during high-fidelity simulation with 25 emergency medicine residents. Visual analog scales were used to explore perceived realism and stress level of integration of the simulated ACCD in the code curriculum. Qualitative data were collected through open-ended learner feedback comments.

RESULTS: On visual analog scales, learners favored "more realistic" as a descriptor for the simulated ACCD as with an average rating of 74/100 on the scale and reported less stress with an average rating of 69/100. Thematic analysis of learner comments identified improved realism, better resource availability, and accurate environmental noise.

DISCUSSION: The simulated ACCD presented here was found to be effective, realistic, and practical for use by learners in a resuscitation curriculum. Our results suggest that implementation of a cost-effective simulated ACCD in high fidelity simulation code cases enhances perceived realism of the environment and offers physician learners a low-stress opportunity to practice the clinical application of ACCD in code resuscitation. The use of the simulated ACCD, specifically in a prolonged resuscitation, eliminated the need for physically demanding manual chest compressions and could have increased the feel of realism through improved psychological fidelity. Our simulated ACCD resembles the clinical device our department uses; we advise modifications as appropriate to allow a simulated ACCD created for other learners to also resemble their clinically used ACCD.

Evan Liu, BS

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ADVOCACY CURRICULA IN UNDERGRADUATE MEDICAL EDUCATION: A SCOPING REVIEW

INTRODUCTION Advocacy in medicine is an essential component of healthcare, fostering a holistic approach to patient care and public health. Recent years have seen a growing emphasis on integrating advocacy training into undergraduate medical education (UME). The purpose of this review is to systematically evaluate existing advocacy curricula for medical students and to synthesize current information into a resource for programs interested in developing advocacy curriculums.

METHODS A scoping review was conducted to identify articles published in English in the last ten years that describe advocacy curricula for undergraduate medical education trainees in the USA and Canada. Multiple databases were utilized including PubMed, Scopus, Embase, ERIC, and CINAHL using a tailored search string for each database. Keywords included advocacy, policy, legal, legislative education. Articles were uploaded to a review software (Covidence) and screened for relevance based on titles and abstracts by three independent reviewers following study inclusion and exclusion criteria. Subsequent full-text screening will also be performed by three independent reviewers, with data extraction to follow from all articles deemed relevant based on the study inclusion criteria.

RESULTS After reviewing 1,125 articles, 1,047 studies were deemed irrelevant by screening of titles and abstracts. This process left 78 full-text articles which met our inclusion and exclusion criteria. These studies varied in curriculum length and approach but collectively provide a comprehensive overview of the current advocacy-related educational initiatives in medical schools. The 78 articles will next go through a full-text screening by the independent reviewers.

CONCLUSION Preliminary findings suggest a diverse range of advocacy curricula within UME, along with a varied understanding of what defines advocacy. However, a full article review of these 78 studies and subsequent detailed analysis of the remaining studies is necessary to draw concrete conclusions about the learning objectives, educational content, teaching methods, and effectiveness of these programs. This review will highlight the state of advocacy in UME and will guide curriculum development to meet the growing demand for physician advocacy experience.

Cody Naughton, MD

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PSYCHIATRY RESIDENTS' ATTITUDES TOWARD NEUROSCIENCE EDUCATION AFTER INITIATION OF A MULTIMODAL CURRICULUM

INTRODUCTION In 1987 a 2 month requirement for clinical training in Neurology for Psychiatry Residents was instituted to improve Neuroscience education for General Psychiatry Trainees. Though recent studies have shown an overall agreement on the need for Neuroscience education, "neurophobia", remains a barrier. There have been mixed results on the preferred teaching methods. In this poster, we provide an overview of Rush's approach to addressing the need for Neuroscience training in its Psychiatry Residency. We describe the implementation of the curriculum and Resident attitudes toward it.

METHODS In 2019 Rush implemented the National Neuroscience Curriculum Initiative modules in 2 phases. The first phase included 8 neuroscience modules facilitated with PGY1-3 residents. After 1 year the curriculum was modified to four half-day sessions for PGY2-4s with broad topics relevant to clinical rotations. A pre and post survey was developed to examine resident attitudes and comfort with a variety of educational modalities and specific neuroscience topics.

RESULTS During the first phase of the curriculum, 19 PGY1-3 residents completed the presurvey and 11 completed the postsurvey. In the second phase, 22 PGY1-4 residents completed the presurvey and 13 completed the post-survey. In both phases, there was a statistically significant increase in Resident comfort level in role-playing as a teaching modality. In phase 2, there was a statistically significant increase in Resident comfort level in small group discussion, activity/exercise-based sessions, and bedside/rounds teaching. Additionally, there was a statistically significant increase in Residents' comfort in discussing neuroscience topics with Medical Students. In Phase 2, there was a statistically significant increase in Residents' comfort level with the neuroscience of functional neurological disorder, borderline personality disorder, depression, posttraumatic stress disorder, auditory hallucinations, and delusions.

CONCLUSIONS The survey shows overall increase in Resident comfort in multiple learning modalities. There is an increase in comfort with the neuroscience of multiple Psychiatric pathologies. Taken together these results suggest potential teaching modalities which may be helpful in improving neuroscience education for Residents. Limitations include the small sample size and observational nature of the survey, though it suggests a potential path for randomized studies examining specific learning modalities for neuroscience education in Psychiatry.

Haley Plattner, MD

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TRAINING RESIDENTS TO BE TEACHERS: TWO SIMULATION CASES TO IMPROVE RESIDENT COMFORT WITH ON-SHIFT TEACHING AND GIVING FEEDBACK TO MEDICAL STUDENTS

INTRODUCTION: A significant portion of medical students' education occurs while on shift under the supervision of attending physicians and residents. Residents are often expected to be teachers to medical students from the very beginning of intern year. Given that this is such an integral component of a resident's role at such an early stage, it is imperative to provide education to the residents themselves on effective ways to teach throughout their training.

METHODS: We developed two simulation communication cases wherein resident participants were placed in the roles of a simulated medical student and a simulated resident. The simulated student was then given a case presentation to give to the simulated resident who would then provide feedback and teaching on the case presented. Pre- and post- surveys were then given to participants to gauge comfort with teaching and providing feedback to medical students on shift. They were also asked to rank their perceived importance of a "Residents as Teachers" curriculum in their medical education. A paired T-test was used to assess differences before and after the cases. Qualitative data were collected through open-ended feedback comments.

RESULTS: Resident confidence in teaching medical students on shift increased from 3.65 to 3.9 (p=0.01) and confidence in giving critical feedback increased from 3.2 to 3.95 (p<0.001). The perceived importance of a "Residents as Teachers" curriculum was overall unchanged from 4.4 to 4.5 (p>0.2). Review of feedback comments demonstrated a consistent request to receive further training on how to be effective teachers.

CONCLUSION: There was a significant increase in reported resident comfort in teaching medical students and providing critical feedback after participating in our "Residents as Teachers" simulated communication cases. There was not a significant difference in the perceived need for a "Residents as Teachers" curriculum in training; however, the surveys indicated a pre-existing high level of importance prior to participating in the cases. Qualitative feedback also indicated overall satisfaction with the cases and a desire to use similar cases in the future. This shows that the use of simulation can be an effective tool in training residents in how to teach medical students on shift.

Anna Quon, MBA HM, BSN

Anna Quon (Rush)   Leah McClellan (Rush)   Sarah Ailey (Rush)

STAFF DISABILITY EDUCATION AND HEALTH-RELATED OUTCOMES FOR PERSONS WITH AUTISM: A SCOPING REVIEW

INTRODUCTION   Autism spectrum disorder manifests in various progressive, fluctuating, or static differences that may be disabling. This unique manifestation requires healthcare staff to provide individualized, culturally-competent care. However, staff are underprepared since disability curricula are not typically covered in undergraduate or graduate education, which contributes to staggering health disparities for persons with autism (PWA), including excess mortality, diagnostic overshadowing, and ableism. The Alliance for Disability in Healthcare Education (ADCHE) delineated core staff competencies on disability to help address such disparities. The purpose of this review was to describe what is known about education initiatives and health-related outcomes for PWA.

METHODS   Per the Johanna Briggs Institute methodology, the review included published research and non-research literature on disability education/training by any method delivered to any health personnel providing services to PWA of any age in any setting where healthcare services are delivered. Grey literature and articles not in English were excluded. In June 2023, the PubMed, Scopus, CINAHL, PsycINFO, ERIC, and Professional Development Collection databases were queried without data delimiters.

RESULTS   Of 3,396 screened reports, 221 full-text reports were reviewed, and 42 were extracted. Most articles originated in the United States and reported utilizing direct, interactive, and experiential strategies to deliver child-focused education for small samples of interprofessional staff in various settings. The medical model was prominent, as evidenced by numerous reports on behavior modification training. Training typically covered few, if any, ADHCE competencies and rarely involved collaboration with PWA. Positive outcomes, primarily reported by caregivers or staff, included improved functional health, behavior, and communication. Patient-reported outcomes, physical health, psychosocial health, experience with ableism, and costs are understudied.

CONCLUSIONS   The use of experiential teaching strategies and the inclusion of interprofessional staff from multiple settings is encouraging. However, future initiatives should involve scaled-up and global efforts, address core competencies across the lifespan, and establish connections with self-advocates and community partners. Increased patient-reported outcomes are recommended. Ultimately, outcome measures must be holistic and meaningful to the intended community.

Katherine Schafer, MSN

Katherine M. Schafer (RUSH College of Nursing) and Melinda Earle (RUSH College of Nursing)

EVALUATING SIMULATION USE IN A PRELICENSURE NURSING PROGRAM

INTRODUCTION Simulation provides safe and effective learning experiences for prelicensure nursing students while requiring significant resource investment to achieve intended outcomes. The organization's prelicensure nursing (GEM) program's simulation use has not been evaluated against simulation best practices and outcome objectives.

METHODS The International Nursing Association for Clinical Simulation and Learning (INACSL) Healthcare Simulation Standards of Best Practice™ and the Comprehensive Simulation Program Evaluation Model provide the benchmark and framework for this project. The INACSL Core Four criteria are derived from the Standards. A formative evaluation of eight GEM clinical courses to determine the degree of alignment with the INACSL Core Four criteria will be completed. Written records, existing student evaluations, faculty surveys, and faculty and simulation staff semi-structured interviews will be included in the evaluation. Evaluation success will be determined by addressing: (a) extent simulation is used within the GEM program, (b) extent existing GEM simulation activities align with the INACSL Core Four criteria, and (c) strengths and opportunities for the GEM simulation program.

RESULTS Eight GEM clinical courses will be evaluated against the INACSL Core Four criteria. The strengths and opportunities for improvement of the GEM simulation program will be described. Evaluation findings will be embedded into all GEM simulation activities and incorporated into the GEM program and simulation center self-study reaccreditation reports.

CONCLUSION Evaluation findings will guide strategic simulation use within the GEM curriculum.

John Simpson, Bachelors in Science

John A. Simpson (Rush Medical College), Evan A. Patel (Rush Medical College), Bryan A. Himmel (Rush Medical College), Nina Patel (Loyola), Ashok A. Jagasia (Rush Medical College)

EVALUATING THE IMPACT OF THE OTOLARYNGOLOGY FOR PRIMARY CARE PROVIDERS SYMPOSIUM ON KNOWLEDGE ENHANCEMENT

INTRODUCTION: The Rush University Otolaryngology for Primary Care Providers Symposium, conducted annually over the past two years, serves as a critical educational platform for primary care providers, including physicians, physician assistants, nurses, students, and other professions. This symposium aims to enhance knowledge and skills in otolaryngology, catering specifically to the needs and roles of primary care providers. Understanding the efficacy of this symposium with regard to knowledge enhancement and applicability in primary care settings is pivotal.

METHODS: To evaluate the symposium's impact, an anonymous post-event survey will be disseminated to previous May 2023 attendees via email. The survey inquires about the attendee's job title, reasons for attending the symposium, knowledge improvements, and overall experience. The survey, sent to 125 individuals, had a 15.20% response rate.

RESULTS: Results of the post-survey data demonstrated that 52.6% (10/19 respondents) were attending physicians, 21.1% (4/19 respondents) were nurse practitioners, 15.8% (3/19 respondents) were medical students, and 10.5% (2/19 respondents) were physician assistants. 73.7% of respondents indicated that their purpose for attending the symposium was to gain basic knowledge in the field of otolaryngology. 63.2% indicated that they sought to improve and inform their current medical practice and 57.9% attended to access up to date otolaryngological research. 84.2% strongly agreed that the symposium increased their awareness of otolaryngological conditions and 68.4% strongly agreed that they felt more confident treating otolaryngological conditions in their own practice following the symposium.

CONCLUSION: The Rush University Otolaryngology for Primary Care Providers Symposium has demonstrated significant efficacy in enhancing the knowledge and confidence of primary care professionals in managing otolaryngological conditions. The high rate of positive responses underscores the symposium's success in not only increasing awareness of otolaryngological issues but also in substantially improving the attendees' ability to apply this knowledge in their clinical practice. The findings highlight the importance of continued educational initiatives like this symposium in fostering interdisciplinary understanding and collaboration for better healthcare outcomes in otolaryngology.

Taylor Stivali, MS, MPH

Taylor M. Stivali, MPH, MS (RMC); Charlie Fischer, MPH (RMC); Ami Shah, MD (RUMC); Laurel Cherian, MD (RUMC)

DEVELOPING AN ADVOCACY AND HEALTH POLICY ORGANIZATION FOR MEDICAL STUDENTS: ONE YEAR IN REVIEW

INTRODUCTION   Today's healthcare landscape often calls upon physicians to be experts in medical advocacy and policy. Undergraduate medical education (UME) responded across the United States with advocacy curriculum initiatives that vary between institutions. However, current literature highlights a gap in the connection between education and action with limited metrics of efficacy. Rush Advocacy and Medical Policy (RAMP) is a novel student organization that was developed in response to student demand for actionable health policy, legislative, and advocacy training. RAMP's mission is to educate, activate. and empower future healthcare professionals while quantifying the efficacy of our organization.

METHODS   RAMP provides voluntary informational meetings, guest speaker engagements, workshops, and opportunities to write for a student led newsletter. Each session is developed to provide a connection between educational resources and actionable experience. We evaluated the demand and efficacy of sessions by recording meeting attendance and newsletter engagement from November 2022 to December 2023. Newsletter engagement was quantified by recording the number of unique opens and recipients who received the newsletter.

RESULTS   The first six meetings took place between November 2022 and November 2023. Meeting 1 attendance was 45 students, meeting 2 was 69 students, meeting 3 was 40 students, meeting 4 was 30 students, meeting 5 was 47 students, and meeting 6 was 41 students. The first seven newsletters were released between March 2023 and December 2023. Newsletter 1 had 82/103 (opens/delivered), newsletter 2 had 87/104, newsletter 3 had 72/106, newsletter 4 had 64/108, newsletter 5 had 101/120, newsletter 6 had 93/166, and newsletter 7 had 103/170.

CONCLUSION   RAMP's student-run nature allows for a flexible curriculum and the development of community, patient, and professional advocacy skills. We found that students continue to voluntarily attend meetings and engage with our resources as they see actionable results in education and newsletter engagement. RAMP hopes to serve as a template for integrating advocacy skill-building into medical education, with the goal of permanent integration into UME.

Mateusz Tkacz, MD

Mateusz Tkacz (Rush); Eleanor Belilos (Rush); Fredrick Hetzel (Rush)

THE CLINICAL AUTOPSY SERIES

INTRODUCTION   The mission of this project is to develop and implement a curriculum for resident education that promotes high value care through case based clinical reasoning with an additional goal to analyze evidence-based medicine through retrospective review of real clinical cases to apply foundational plans for future decision making. Residents will work together to retrospectively analyze a real clinical case and compare medical decisions made to current recommendations in management. This will provide an opportunity for residents to discuss how care could have been optimized in the presented case. This curriculum will highlight key treatment principles, gain exposure to current evidence-based medicine guidelines, and critically evaluate previous hospital cases to guide future patient care

METHODS   A curriculum consisting of a series of case analyses will be conducted monthly via small group discussion, highlighting key principles in management based on current evidence-based guidelines. Residents will work together to retrospectively analyze a real clinical case and compare medical decisions made to current recommendations in management. Evaluation will be conducted through pre- and post-curriculum surveys focused on resident confidence in the identification and management of common internal medicine admissions. The data will be analyzed to assess changes in resident knowledge and confidence after completing the curriculum. A narrative section will also be made available for residents to provide comments and feedback so that future iterations of the curriculum can be improved.

RESULTS   Pre-curriculum survey data will be available by the 2024 Trainee Research Day to provide a baseline of resident's confidence with the first session taking place in January 2024.

CONCLUSION   The aim of this project is to develop resident clinical reasoning and confidence supplemental to clinical training. Utilizing guidelines based in evidence-based medicine, this project envisions a curriculum that provides residents with the framework to develop a schema for management of common internal medicine issues that occur during an inpatient admission. The case series that is proposed works to compare clinical practice to what is recommended by current guidelines. This curriculum will promote critical thinking and clinical reasoning during small group discussions so that residents optimize their future treatment plans through high value evidence-based care.

John Toms, MD (2025), MS, BS

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TOWARDS GREATER ACCESS FOR ALL PLASTIC SURGERY TRAINEES: PROPOSING THE ACCESS MODEL FOR AFFORDABLE CONFERENCE PARTICIPATION

INTRODUCTION: This study evaluates the financial challenges when attending professional conferences faced by plastic surgery trainees in medical school and residency. These essential forums can be costly career development platforms. Herein we consider their average allowances and educational debts. To combat this, the study introduces the Affordable Conference Cost and Equity Support System (ACCESS) model, an equitable payment system designed to lessen economic burdens and increase trainee participation. The model aims to improve conference accessibility for professional development by addressing barriers comprehensively.

METHODS: This study conducted a cross-sectional analysis of 10 major plastic surgery conferences, assessing the financial barriers for medical trainees' attendance by analyzing costs including registration, both sponsored and unsponsored lodging within a five-mile radius, and meals against their budgets. A comprehensive PRISMA-based literature review on payment models was combined with this analysis to develop the ACCESS model.

RESULTS: Registration fees from 10 conferences, travel data from 11,048 flights and 20 Uber rides, and lodging from 10 sponsored hotels and 140 alternative hotels were compiled. Total estimated single-day attendance at a sponsored hotel was $1,320, which constitutes ~48% of the average monthly allowance for medical students ($2,730, n=25 medical schools) and 35% for resident physicians ($3,769, n=293 medical institutions). This single-day cost exceeds the average monthly "miscellaneous/personal" budget ($408, n=20 medical schools) consuming ~324% and ~234% of a medical student and residents budgets, respectively. These numbers increase to 91% and 66% of their average total monthly allowance for three-day conferences ($2,495 total) and ~612% and ~443% of their average "miscellaneous/personal" budgets.   The proposed ACCESS model includes tiered subscription plans, scholarships, institutional subsidies, and industry sponsorships, focused on registration costs. It features transparent financial reporting, URiM initiatives, and user-friendly access. Evaluation will be based on cost-effectiveness, engagement, diversity of participants, sponsor ROI, and satisfaction surveys, with plans for national expansion after successful local pilots.

CONCLUSION:This study highlights the urgent need for democratization of attendance to medical conferences for trainees. The ACCESS model offers an affordable and equitable solution by negotiating conference expenses amongst stakeholders and providing targeted financial assistance, aiming to remove professional development barriers in plastic surgery training.

Robert Vargas, MD

Robert Vargas MD (Rush), Leah Yuan MD (Rush), Michelle Sweet MD (Rush), Carol Burke MD (Rush)

STEP 2 STUDYING TRENDS IN THE STEP 1 PASS/FAIL ERA

QUESTION: How has USMLE Step 1 becoming pass/fail affected Step 2 preparations?

INTRODUCTION: In January 2022, the high-stakes USMLE Step 1 Examination became pass/fail in hopes of creating a more equitable residency application process. This shift has redirected the stress and preparation intensity to Step 2. Our study aims to understand the implications of this change on time and resources used for exam preparation for students who are already burdened with career planning, away rotations, and other pivotal tasks.

METHODS: A required mixed-method survey was distributed to a single institution's medical student classes of 2023 and 2024. 286 responses were collected (139 and 147, respectively) and evaluated for Step 2 study time, practice exams completed, and resources used. These cohorts' survey results were then compared and analyzed.

RESULTS: Findings indicate that 45.6% of students in 2023 reported studying over four weeks compared to 23.8% of students in 2022 and collectively are dedicating additional weeks to exam preparations. Between 2022 and 2023, data also showed an increase in the number of practice exams taken (<3: 21.5% vs 1.4%, 3-4: 56.2% vs 39.4%, ≥5: 22.3% vs 59.2%). The intensified focus on Step 2 has reduced time available for other essential M4 activities. The data is from a single-institution impacting its generalizability. The subjective nature of the study leads to response bias. Additional data may increase validity of the results.

CONCLUSIONS: The transition of USMLE Step 1 to pass/fail, while reducing pressures associated with that exam, has inadvertently intensified the pressures on M4 students preparing for USMLE Step 2. This shift in focus may have broader implications for the holistic development and well-being of medical students. Additional data is needed to determine whether residency programs are replacing Step 1 with Step 2 as a marker for interview selection, substantiating student's perception of need for additional preparation time.

Edena Khoshaba, BS

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LATE EATING AS A NOVEL RISK FACTOR FOR COLORECTAL ADENOMA

INTRODUCTION: Colorectal cancer (CRC) stands as a significant contributor to cancer-related fatalities in the United States. Lifestyle factors of modern societies including "Western" diet, and a lack of physical activity are known to contribute to its risk. Another common but less studied lifestyle factor is disruption in circadian rhythms. Peripheral circadian oscillators within the gastrointestinal tract are regulated by food. In this study, for the first time, we examined the association of time of eating and the development of colonic neoplasms.

METHODS: This prospective cross-sectional study enrolled participants undergoing screening colonoscopies (n=663). Questionnaires were used to gather information on food timing, dietary intake, sleep/wake patterns, and chronotype. Late eating was defined as consuming food within a 3-hour window of sleep onset for at least four days a week. Pathology reports confirmed the histology of colonic polyps, differentiating between precancerous lesions such as tubular adenomas (TA) and sessile serrated adenomas (SSA) versus benign hyperplastic polyps. Adenomas were further classified based on risk categories following recommended guidelines. Statistical analyses were performed to assess the relationship between late eating and adenoma risk.

RESULTS: A total of 644 patients met criteria for our study. Baseline participant characteristics stratified by food timing status are detailed in Table 1. There were 270 (42.2%) participants classified as late eaters, with late eating being more prevalent in those under the age of 60 (161, 59.6%, vs. 109, 40.4% in ≥60, p=0.0039). Of note, late eating was associated with the presence of adenoma (Figure 1). Compared to non-late eaters (124, 35.5%), late eaters had a higher prevalence of TA (116, 44.6%) (OR 1.46, 95% CI 1.05-2.03, p = 0.014). Late eating remained significantly associated with TA (OR 1.620, 95% CI 1.153-2.276, p=0.005) after adjusting our analysis for age and BMI. The adjusted results indicate that late eaters had a 62% higher likelihood of having TAs compared to non-late eaters. Similarly, the association of late eating on high-risk TA was also significant (OR 1.556, 95% CI 1.007-2.405, p = 0.046).

CONCLUSION: This study proposes late eating as an independent contributor to adenoma risk.

Caroline Wang, MD

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A REVIEW OF INCOMPLETE AND CANCELED OUTPATIENT COLONOSCOPY STUDIES: A SINGLE ACADEMIC TERTIARY CENTER RETROSPECTIVE ANALYSIS

INTRODUCTION: Incomplete colonoscopy rates vary from 4% to 25% and are associated with increased interval risk of proximal colorectal cancers. At Rush University Medical Center (RUMC), many colonoscopies are performed annually but there are no studies to date investigating areas for improvement in colorectal cancer screening, surveillance, and treatment at Rush. We sought to address these issues by identifying characteristics of and reasons for incomplete and canceled colonoscopies.

METHODS: We conducted a retrospective chart review of 196 incomplete and 477 canceled outpatient colonoscopies from January 2022 to December 2022 at RUMC and trends and reasons behind canceled or incomplete colonoscopies.

RESULTS: 67% of patients with incomplete colonoscopies were between the ages of 50-70. 46.3% were African American (AA) patients, 37% were Caucasian, 3.7% were Hispanic and 12.9% identified as "other". Female patients comprised 48% of all incomplete cases and 42.6% had a prior abdominal or pelvic surgery. 7.4% of patients received Moviprep, 31.5% received Suprep, and 57.4% received Golytely. Thursdays were associated with the greatest percentage (31.5%) of incomplete colonoscopies. 48.1% of all incomplete colonoscopies was due to poor bowel prep. For canceled colonoscopies, 52% of patients were between the ages of 50-70. 57.2% were AA, 21.2% were Caucasian, 15.7% were Hispanic and 5.9% identified as "other". Female patients comprised 56% of all canceled cases and 32.1% had prior abdominal or pelvic surgery. 62.7% of canceled cases were initially scheduled for screening purposes compared to 18% for surveillance and 18.9% for diagnosis. 13.4% of patients with canceled colonoscopies had received Moviprep, 27.8% received Suprep and 53.2% received Golytely. Thursdays had the highest percentage (26%) of canceled colonoscopies. The most common reasons for canceled colonoscopies were due to patient no-shows (37%), followed by patient cancellation (17.4%) and poor bowel prep documented in the pre-operative area (16.3%).

CONCLUSION: Poor bowel prep was the most common factor causing incomplete colonoscopies while patient no-shows led to the majority of canceled colonoscopies. Patient ages between 50-70, African American ethnicity, Golytely bowel prep and Thursday procedures were also associated with higher rates of both incomplete and canceled colonoscopies.

Kevin Truong-Balderas, BA/BS

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EVALUATING THE RISE OF K-BEAUTY IN THE UNITED STATES USING GOOGLE TRENDS

INTRODUCTION Cosmeceuticals are a rapidly growing industry. In a 2019 study, the global skincare market was dominated by the sale of Asian products.1 This study assesses the increasing popularity of these products in the United States over the 2008-2023 using Google Trends.

METHODS The Instagram hashtags "J-beauty," "C-beauty," and "K-beauty" were examined on August 27, 2023. "K-beauty" had 6.2 million posts, followed by "J-Beauty" (205,000), and "C-Beauty" (23,600). Due to the wide preference on Instagram for Korean products, the terms "Korean beauty", "Korean skincare", "Korean makeup", and "Korean sunscreen" were input to Google Trends (GT). This tool visually depicts the popularity of a designated search term using a Relative Search Value (RSV), a metric of total searches over time for the designated location.

RESULTS All four search terms demonstrate a rise in interest since 2008. "Korean beauty" had the highest overall average RSV of 34. Currently, "Korean skincare" is experiencing a peak at 100 in 8/2023, with the sharpest increase from 24 in 2021. These results highlight a steady increase in the Google searches for these products, and the current trajectory suggests further growth in subsequent years.

CONCLUSION Our study highlights a 15-year rise in US interest in Korean beauty products, likely driven by the surge in global social media and expedited by the COVID-19 pandemic.2 This trend provides dermatologists with insights to educate patients on active ingredients, potential side effects, and ensure purchase from authorized retailers.

Oluwamuyiwa Adebayo, BSN, PhD

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ROAD WORKERS' DILEMMA: EXPLORING HEALTH EQUITY IN THE MANAGEMENT OF MALIGNANT SMALL BOWEL OBSTRUCTION

INTRODUCTION African American/Black patients experience cancer care disparities, contributing to higher morbidity and mortality. This study evaluates interventions for malignant small bowel obstruction (mSBO), a common complication of metastatic cancer, to investigate the potential influence of race on its management.

METHODS We retrospectively reviewed charts at a US academic medical center, identifying 283 patients with malignant small bowel obstruction (mSBO). Data on demographics, nasogastric tube (NGT) insertion, surgical interventions, and dexamethasone administration were collected. The primary outcome was mSBO resolution without surgical intervention.

RESULTS Out of 283 patients, 54% were Black. Breast (7.8% vs. 3.1%) and genitourinary cancers (12% vs. 5.4%) were higher in Black patients. 30% of Black patients, compared to 19% of Non-Black patients, did not receive an NGT. Malignant SBO from gastrointestinal cancers had a higher likelihood of resolution (34%) compared to gynecologic cancers (18%).

CONCLUSION This study found no significant differences in dexamethasone administration or mSBO resolution between Black and Non-Black patients. However, Black patients were less likely to have NGT insertion compared to Non-Black counterparts (P < 0.05). Unexplored variations in non-surgical mSBO management may exist, requiring further research, particularly with racially matched cancer groups, to enhance insights into health equity in cancer care.

Hannah Allen, B.S.

Hannah Allen (Rush) Cristina Barkowski (Rush OB/GYN) Kate Palmer (Rush OB/GYN) Sadia Haider (Rush OB/GYN)

MEASURING THE EFFICACY OF THE BIRTH EQUITY EMERGENCY ROOM PILOT: A RETROSPECTIVE CHART REVIEW

INTRODUCTION   In Chicago, the severe maternal morbidity (SMM) for Black people was over 2.5 times higher than their White counterparts-and twice as high as Latinos and Asian/Pacific Islanders. To improve maternal health outcomes and disparities in Chicago, upstream social determinants of health (SDOH) must be addressed. The Birth Equity Emergency Room Pilot began with the initiative to screen pregnant and postpartum patients seeking care at the Rush University Medical Center Emergency Department for SDOH and connect those who screen positive with resources.

METHODS   Of the 2,340 patients who participated in the pilot from January 2022 to June 2023, 1,207 completed a SDOH screening. We identified a randomized cohort of 116 patients and conducted a retrospective chart review. Our primary outcomes identify the screen positive rate on SDOH questionnaire and birth outcomes measured by gestational age at delivery and birth weight. Our secondary outcomes include race/ethnicity distribution of patients who screened positive, and rates of food insecurity, housing instability, utility instability, and transportation barriers. Exclusion criteria encompassed "break the glass" restrictions or incomplete SDOH screening.

RESULTS   Ninety-nine patients of the 116 cohort met eligibility criteria. Of these eligible patients, 38.54% screened positive for SDOH, with 43.24% reporting housing instability. There was a marginal association between gestational age and housing instability. On average, patients who reported housing worry delivered at 38 weeks compared to 39 weeks (p = .075). Race/ethnicity had no impact on either variable. Three percent of patients met the criteria for SMM, which is over 4 times higher than previously established rates.

CONCLUSION   Considering that delivering at 37-38 weeks is associated with poorer fetal outcomes than 39-40 weeks, the marginal association between SDOH and gestational age warrants further investigation. Additionally, our cohort's elevated SMM rate must be contextualized: all study patients visited the ED during their pregnancy for a reason other than delivery, indicating higher risk and complexity than the general population. Small cohort size limits the internal and external validity of all findings. Future directions include increasing sample size and analyzing resource referral utilization rates.

Jerenda Bond, BS Physical Therapy; Doctorate in Physical Therapy; Doctor of Philosophy in Health Sciences

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THE LIVED EXPERIENCES OF RACIAL MICROAGGRESSIONS FOR BLACK PATIENTS WHILE RECEIVING ORTHOPEDIC-RELATED HEALTH CARE

INTRODUCTION: Race-based health disparities for racially and ethnically diverse people with orthopedic-related conditions are well documented and their experiences when seeking care deserve more attention. The purpose of this study was to understand the lived experiences of racial microaggressions occurring when racially and ethnically diverse people seek health care services for orthopedic-related conditions. We used transcendental phenomenology to understand their lived experiences.

METHODS: Participants were recruited through purposive sampling. Inclusion criteria included people who self-identify as being from a racially and ethnically diverse population, were 18 years and older, and who have experienced racial microaggressions while receiving orthopedic-related health care services. Recruitment was from a private university, large medical center, social media, and through word of mouth. Interviews lasted 30-45 minutes and were transcribed verbatim and de-identified. Data were analyzed through first and second cycle coding.

RESULTS: Eight participants met inclusion criteria and completed a one-on-one minimally structured interview; five participants attended a focus group. All participants self-identified as Black, none as Hispanic. Six participants self-identified as female, two as male, none as non-binary. Themes emerged to provide insight into their experiences. Nineteen final codes were organized into five patterns and then into five themes - two background and three figural themes. Background themes: discrimination can occur across a lifetime, and poor treatment of poor people fuels health inequity. Figural themes: racial discrimination can come at any time and in various forms; resistance is necessary in the face of racial discrimination; and despite discriminatory encounters, health care goals are achievable. Participants shared their lived experiences of racial microaggressions while seeking care for their orthopedic-related conditions (figural) through a lens shaped by their other past experiences with varied discrimination (background).

CONCLUSION: Black individuals have a longstanding relationship with racial discrimination that has a negative impact on many aspects of their lives, including their health. They want equitable health care and are willing to pursue health goal attainment. The results highlight ways to promote equity in varied health care spaces.

Caroline Canning, MD, MBI

Caroline Canning (RUMC), Sneha B. Suresh (RUMC), Balamurugan Shanmuganathan, Jim Boliboun (RUMC), Katherine Koo (RUMC), Michael Cui (RUMC), and Juan C. Rojas (RUMC)

DEVELOPMENT OF A RISK MODEL TO PREDICT SOCIAL DETERMINANTS OF HEALTH NEEDS USING PERSONAL AND COMMUNITY-LEVEL DATA WITH MACHINE LEARNING

INTRODUCTION: Social determinants of health (SDOH) encompass non-medical factors such as income, education, and housing, significantly impacting health outcomes. With growing awareness of the role of SDOH in health risks, many healthcare centers strive for universal SDOH screening but frequently encounter data collection challenges. We aimed to develop a machine learning (ML) model using electronic health records (EHR) and publicly available population-level data to determine which patients are at the highest risk of screening positive for SDOH needs.

METHODS: We conducted a retrospective study on adult patients at a single academic medical center, examining SDOH screenings from February 2022 to September 2023. Our cohort comprised patients who responded to at least one survey question and had a US address correlating with a census tract. Surveys that garnered two or more positive SDOH responses were classified as having SDOH needs. We connected patients' zip codes with the Chicago Hardship Index and associated their addresses with measures from the Social Vulnerability Index (SVI) from the Centers for Disease Control and Prevention (CDC). The dataset was divided randomly into a training set (70%) and a testing set (30%). We developed a Light GBM (Gradient Boosting Machine) model to assess a patient's risk of screening positive for SDOH needs.

RESULTS: Among 59,748 patients surveyed, 39,057 were in the training cohort and 20,691 were in the test cohort. There was a 14.1% positive SDOH rate for the test dataset. In the internal validation test dataset, our machine-learning model achieved an AUC of 0.79 (95% CI 0.78-0.83). At our health system's high-risk threshold (a score of 0.30), the model had a Positive Predictive Value (PPV) of 49%, a recall of 35%, Negative Predictive Value (NPV) of 90%, and a specificity of 94% in the test dataset. In the LightGBM model, the three most important predictors were patient age, racial and ethnic minority status, and housing type/transportation.

CONCLUSION: Utilizing readily accessible EHR and CDC data, we developed an ML algorithm that can accurately predict SDOH needs. We can serve patients better by performing a more targeted collection of SDOH needs and shift limited resources toward connecting patients to services.

William Cohen, Bachelor of Arts

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CARDIOMETABOLIC HEALTH INITIATIVE - 5 MONTH REVIEW

INTRODUCTION In the past decade, the prevalence of cardiovascular disease (CVD) has increased by 18.7%. Individuals with lower socioeconomic status (SES) are predisposed to having a higher risk for CVD as well as increased incidence of modifiable risk factors such as obesity, hyperlipidemia, diabetes, and hypertension. The World Health Organization estimates that 75% of all CVD mortality could be avoided with early mitigation of risk factors through lifestyle modification and medical therapy. Specific issues facing lower SES communities that contribute to higher rates of CVD include lack of access to preventative medicine and food insecurity. This study investigates the prevalence of various cardiometabolic risk factors in an underserved population on the West Side of Chicago and the need for community based accessible screening and prevention services.

METHODS In partnership with the Beyond Hunger food pantry in Oak Park, Illinois, the Cardiometabolic Health Initiative screened 70 patients from August 2023-January 2024. Clients of the food pantry received free point of care lipid profiles, A1c, and blood pressure measurements. Additionally, their medical histories were documented. 10-year atherosclerotic cardiovascular disease (ASCVD) risk profiles were calculated for each patient.

RESULTS Of the 70 total patients screened, 54 patients (77.1%) had a systolic blood pressure greater than 120 mmHg and 45 (64.3%) had a diastolic blood pressure greater than 80 mmHg. 37 patients (52.9%) had a LDL value greater than 100 mg/dL. 35 patients (50%) had an A1c of greater than 5.7. Only 58 patients had sufficient data to calculate a 10-year ASCVD score; of which 27 (46.6%) were low risk, 3 (5.2%) were borderline risk, 16 (27.6%) were intermediate risk, and 12 (20.7%) were high risk.

CONCLUSION Our data suggests a high prevalence of hypertension, dyslipidemia, and diabetes in an underserved, food insecure population in Chicago. Nearly half of the patients screened were found to have an intermediate or high risk (>7.5% ASCVD) of having a severe adverse cardiovascular event in the next 10 years. Our data supports the need for cardiovascular screening and prevention in underserved communities.

Shan Guleria, M.D.

Shan Guleria, MD (Rush); Janet Guptill, FACHE (Scottsdale Institute); Ishmeet Kumar, MHA (Scottsdale Institute); Mia McClintic (Rush); Juan C. Rojas, MD, MS (Rush)

ARTIFICIAL INTELLIGENCE IN HEALTHCARE: A NATIONAL SURVEY OF HEALTH SYSTEM LEADERS' INSIGHTS AND TRENDS

INTRODUCTION: The methods of artificial intelligence-derived predictive modeling (AIDPM) are now being applied to patient data for clinical decision support, maximizing operational efficiency, and more. However, relatively little work has explored how healthcare organizations manage the acquisition, deployment, and monitoring of their AIDPM. This study aimed to expand upon our work in 2021, which assessed how U.S. healthcare systems integrate AIDPM into clinical care. This new survey additionally addresses Large Language Models (LLMs) and whether governance prioritizes health equity.

METHODS: We collaborated with the Scottsdale Institute (SI), a non-profit organization sharing best practices in information technology among its 65 member healthcare systems. We requested the executive with the most knowledge of AIDPM at each member institution fill out the survey. Responses were collected between 6/21/2023 and 11/30/2023 using Research Electronic Data Capture (REDCap). The study was approved by the Rush University Medical Center Institutional Review Board.

RESULTS: The response rate was 49% (32/65). Although 84% of institutions utilize AIDPM clinically, only 53% of those institutions have a dedicated AIDPM team, and only 30% of those teams have a budget. These were not significantly different from our 2021 findings. Teams in 2023 had significantly more representation from experts in clinical informatics, clinical operations, and quality improvement compared to 2021 (p-values all < 0.02).   Support for LLMs in healthcare was unanimous, and 35% of respondents mentioned either management of physician inboxes or summarizing patient histories as proposed applications. The top barriers to successful AIDPM adoption included concerns regarding regulation, security, workflow integration, and clinician acceptance. Reasons for clinician hesitancy included concerns regarding alert fatigue, reduction in autonomy, and liability.   76% of organizations reported having a team member dedicated to health equity, although ethicists and leaders in diversity, equity, and inclusion were under-represented (18%). Reported efforts to promote equity included assessing data for socioeconomic or racial bias and evaluating deployed AIDPM for equity impacts.

CONCLUSION: Our study demonstrates that, despite advances since 2021, healthcare institutions have shown little change in their organizational structures concerning AIDPM. Health systems require more comprehensive recommendations on governance, with a focus on health equity.

Elizabeth Hsu, BS, MAMS

Elizabeth Hsu, Kristen Gebhardt, Hannah Becker, Monika Pitzele MD, PhD and Anna Condoleza RN, SANE-A

INTEGRATING SAFE(SEXUAL ASSAULT FORENSIC EXAMINER) TRAINING INTO THE MEDICAL EDUCATION CURRICULUM

INTRODUCTION The Sexual Assault Nurse Examiner (SANE) program emerged in the 1970s to enhance care for sexual violence survivors, training nurses in forensic examinations and trauma-informed care. Expanding on these guidelines, Illinois implemented the Sexual Assault Survivors Emergency Treatment Act (SASETA) in 2022, mandating a SANE or SAFE (Sexual Assault Forensic Examiner) respond within 90 minutes, intensifying strain on Illinois' already short-staffed nursing teams. To alleviate this, proposing the integration of SAFE training into Rush's medical school curriculum aims to fortify students' understanding of trauma-informed care, fostering collaboration between physicians and nurses while enhancing sexual violence care.

METHODS The Forensic Exam Training and Education (SAFTE) course encompasses a 40-hour online training segment focused on conducting forensic exams. It includes in-person sessions guided by Rush's Sexual Assault Program Director, SANE director, and women's behavioral health clinicians, emphasizing Rush and Illinois-specific policies and trauma-informed care communication. Subsequently, students can opt for on-call shifts to fulfill the three observational exams required for SAFE certification. This proposed curriculum represents the sole medical school offering this certification nationwide.

RESULTS In a parallel intervention at the University of Chicago, only 39% of providers felt confident in avoiding retraumatizing patients. After completing a condensed SAFTE training course, this percentage surged to 80% for all participants. Our comprehensive course promises deeper training to heighten knowledge and prevent retraumatization among patients.

CONCLUSION The genesis of our elective course stemmed from meticulous research identifying a critical need in sexual assault care. Its development involved collaborative efforts, navigating institutional barriers like approval committees and financial constraints. Nonetheless, the realization of this elective stands as a testament to the determination and resilience of the students and mentors involved. Given the pervasive prevalence of sexual assault, equipping future clinicians with the expertise to compassionately care for this patient population remains paramount.

Isabella Martinez, BS

Isabella Martinez (RMC), Michel Mendler (CLRI), Edward Mena (CLRI)

ETHNIC AND RACIAL DISPARITIES IN THE INITIAL PRESENTATION OF HEPATOCELLULAR CARCINOMA: REAL-WORLD DATA FROM A SINGLE NON-ACADEMIC HEPATOLOGY CLINIC WITH A DIVERSE POPULATION IN LOS ANGELES COUNTY

INTRODUCTION: The increasing incidence of Hepatocellular Carcinoma (HCC) in the U.S. is attributed to increasing rates of obesity, diabetes (T2DM), and metabolic dysfunction-associated steatotic liver disease (MASLD). We aim to discern social and clinical characteristics associated with HCC in a diverse population at a private Hepatology - focused practice in Los Angeles County, California.

METHODS: Retrospective study of patients at their initial evaluation for HCC from July 2018 - July 2023. HCC was diagnosed by standard MRI/CT criteria. Underlying causes of liver disease, presence of cirrhosis, pertinent clinical characteristics and socioeconomic factors were stratified by ethnicity and race and compared by univariate analyses.

RESULTS: 187 patients met inclusion criteria. 45.0% ethnically identified as Hispanic/Latino (HL) and 51.3% non-Hispanic/Latino (NHL). Of HLs, 82.1% racially identified as Non-White and 16.7% as White. Racial distribution was 3.2% Black, 28.3% Asian, 20.9% White, 43.3% Other. Median age was 71 (27-88), and 72% were male. HLs had higher prevalence of T2DM (55.3% vs 40.1%, p = 0.05) and BMIs (median 28.4 vs 25.0, p = 0.031) than NHLs. 88.8% had cirrhosis. HLs had higher prevalence of cirrhosis due to MASLD (53.6% vs 19.8%, p < 0.001) and alcohol abuse (17.9% vs 9.4%, p < 0.001) than NHLs. Most patients with HBV were Asian (93.6%), while most with HCV were White (32.1%, p < 0.001). Non-cirrhotic HCC was mostly due to HBV and MASLD (61.1%, 11.1%, P = 0.04). Asians (70.7%) and non-white HLs (17.7%) comprised most non-cirrhotic HCC cases (p = 0.04). Majority outside of UCSF transplant criteria were non-white HLs (42.3%, p = 0.043). White-HLs had higher systemic treatment rates than White-NHLs (46.2% vs. 16.0%, p=0.007); Asians had the lowest rates (5.7%, p=0.007). HLs had lower surgical resection rates than NHLs, (3.6% vs 13.5%, p = 0.044) while Asians exhibited the highest rates (68.8%, p = 0.008).

CONCLUSION: At the time of diagnosis, HLs exhibit higher incidence of cirrhosis attributed to MASLD and alcohol-associated liver disease, increased rates of non-cirrhotic HCC, and elevated BMIs. Additionally, HLs appear to present with more advanced disease leading to lower surgical resection rates and greater need for systemic therapy.

Conner Merriman, BS

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A DESCRIPTIVE ANALYSIS OF SOCIAL NEEDS, MEDICATION ACCESS, AND ADHERENCE ACROSS TWO INNER CITY HOSPITALS

INTRODUCTION Social determinants of health (SDoH) affect health outcomes and influence medication adherence. However, there is limited data on the relationship between SDoH and medication adherence in the Emergency Department (ED). This study examined SDoH and medication adherence among ED patients from two city hospitals.

METHODS This prospective cross-sectional study was conducted at two EDs to determine SDoH and medication adherence. We included adults (≥18 years) who spoke English and took ≥4 prescription medications or ≥1 "high risk" medication, including immunosuppressants, antiepileptics, sedatives, anti-Parkinson agents, antithrombotics, antihyperglycemics, or cardiovascular medications. Medications were deemed "high risk" by ED pharmacists based on long-term usage and side effects. Patients completed a survey regarding demographics, social needs, and medication adherence created through expert consensus and pilot-tested with cognitive interviewing. Data are as percentages with 95% confidence intervals.

RESULTS We enrolled 261 patients (53% female, mean age 62 years). Of this population, 36 (13.8%; 95%CI 9.9%-18.6%) reported unstable housing, 48 (18.4%; 95%CI 13.9%-23.4%) reported concern about having sufficient food, 55 (21.1%; 95%CI 16.3%-26.5%) reported having insufficient money to pay bills, and 65 (24.9%; 95%CI 19.8%-30.6%) neglected medical care due to distance or transportation. 65 (24.9%; 95%CI 19.8%-30.6%) reported running out of medicine and 25 (9.6%; 95%CI 6.3%-13.8%) deferred medication refills due to cost. 35 participants (13.4%; 95%CI 9.5%-18.2%) reported difficulty paying for medications, and 36 (13.8%; 95%CI 9.9%-18.6%) reported difficulty visiting the pharmacy.

CONCLUSION Among patients presenting to the ED on ≥4 prescription medications or ≥1 "high risk" medications, over one-third had social needs that impacted their medical care. The most commonly reported needs were insufficient money to pay bills and difficulty accessing medical care due to transportation. The most frequently reported medication adherence difficulties were running out of medications and deferring medication refills due to cost. This study demonstrates the prevalence of social needs and medication adherence issues among patients across two city EDs.

Trevor Poulson, BS, MS

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NUTRITIONAL STATUS AND AWARENESS AMONG HOMELESS SHELTER RESIDENTS: A SURVEY ANALYSIS

INTRODUCTION: Nutritional deficiencies and lack of awareness about nutrition are prevalent issues among the homeless population. This study aimed to investigate the dietary habits, access to nutritious food, and awareness of nutritional education resources among residents of a Chicago homeless shelter. Understanding these factors is critical for developing targeted interventions to improve the nutritional health of this vulnerable group.

METHODS: An anonymous survey was administered to 21 residents of a homeless shelter, collecting data on demographics (age, gender, race, employment status), duration of stay in the shelter, dietary habits (number of meals per day, meal sources), perceptions of meal quality, frequency of access to nutritious food, barriers to accessing nutritious food, and awareness and perceived usefulness of nutritional education resources. The survey also explored residents' interest in learning more about these resources.

RESULTS: The survey captured demographic profiles, with varying lengths of stay in the shelter and employment statuses, with 71% of the surveyed population identified as Black or African American, while the remaining participants identified as White or American Indian. Data on dietary habits revealed that the participants averaged 2.1 meals per day from shelters (86%), soup kitchens/food pantries (10%), public places (19%), and/or with personal funds (19%). The study also aimed to identify key barriers faced in accessing nutritious food and evaluated the level of awareness and interest in nutritional education resources among the participants. 43% of the participants reported rarely or never having access to nutritious food, 62% identified lack of money as the major contributor to barriers faced when accessing nutritious food, and 81% were interested in learning more about nutritional resources and healthy eating habits.

CONCLUSION: This survey provides valuable insights into the nutritional challenges and educational needs of homeless shelter residents. Findings indicate potential areas where intervention and support are needed, such as improving access to nutritious meals and enhancing awareness of nutritional education resources. The expressed interest in learning more about nutrition highlights an opportunity for targeted educational programs. Such initiatives could play a significant role in addressing nutritional deficiencies and promoting healthier lifestyles among the homeless population.

Richard Puls, BA

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GLOBAL HEALTH OTOLARYNGOLOGY SYMPOSIUMS: A PLATFORM FOR INCREASING GLOBAL HEALTH AWARENESS AND PARTICIPATION

INTRODUCTION: Studies suggest that exposure to a global health education increases the likelihood that the individual will examine career choices within the global health realm as well as broaden their knowledge of global health topics and increase their cultural sensitivity. One study indicated that medical students have limited knowledge regarding the global health careers available to physicians, and thus, they could greatly benefit from educational opportunities such as symposiums and learn more about potential global health career paths. The objective of this study is to evaluate whether a global health symposium is an effective platform for increasing student, resident, and attending participation in the global health otolaryngology field.

METHODS: Rush University Medical Center's Department of Otorhinolaryngology hosted a virtual Global Health Otolaryngology Symposium on May 5th, 2023. The event attracted physicians, experts, residents, and students interested in otolaryngology global health. A post-symposium anonymous survey evaluated participant motives, satisfaction, and levels of training. The survey, sent to 99 individuals, had a 14.14% response rate.

RESULTS: The survey data demonstrated that 57.1% (8/14 respondents) were otolaryngologist attendings, 35.7% (5/14 respondents) were medical students, and 7.1% (1/14 respondents) were residents. 57.1% of respondents indicated that their purpose for attending the symposium was to network with others in the field. 57.1% also indicated attending to gain exposure to updated research findings. 50% sought to gain basic exposure to otolaryngology in a global health setting, 35.7% attended to better inform their current medical practice, and 21.4% attended to gain access to new opportunities in the field. 92.8% of respondents strongly agreed that the symposium increased their knowledge related to global health otolaryngology initiatives. 85.7% of respondents strongly agreed that due to attending the symposium, they wished to incorporate global health work into their careers.

CONCLUSION: Rush University's Department of Otorhinolaryngology Global Health Symposium successfully increased awareness and engagement in global health otolaryngology among students, residents, and attendings. Continuously highlighting otolaryngology's contributions to global health is crucial in raising awareness about disparities in underserved regions and encouraging broader participation in addressing these challenges.

Tarisha Washington, M.S

Dr. Wrenetha Julion Professor & Associate Dean for Equity & Inclusion Michelle & Larry Goodman MD Endowed Professor of Health Equity Macy Faculty Scholar (2012-2014)   Dr. Todd Ruppar John L. and Helen Kellogg Professor of Nursing Assistant Dean for Nursing Science & Director, PhD Program Dept. of Adult Health & Gerontological Nursing, Rush University College of Nursing   Santosh Basapur, PhD Assistant Professor   Department of Family and Preventive Medicine Rush University

THE PERCEPTION OF PROVIDER MISTRUST BY AFRICAN AMERICANS

INTRODUCTION: There has been a long-standing history of mistrust between African Americans and representatives of the United States healthcare system. Provider mistrust has been associated with reduced satisfaction of care, treatment non-adherence, and lower health care utilization. The study examined the perception of AA mistrust in providers using a participatory design studio approach. The specific aims of the study are to (1) Examine the influence of patient age and provider characteristics on the perception of (2) Describe factors that influence AA mistrust of providers.

METHODS: This study used a design studio method, which is guided by the principles of human-centered design. The investigator interviewed 13 AA participants 18 years and older (male = x, female = x) to obtain their perspectives on factors that contribute to AA mistrust of healthcare providers. Two design studio groups were convened consisting of xx individuals in one group and xx in the other which allowed for a diversity of opinions and encouraged the free expression of ideas.

RESULTS: Participants identified three themes as barriers to building trust with providers: (1) discrimination, (2) negative interactions, and (3) unrealistic treatment plans. In addition, we found two themes that African American participants identified as facilitators to building trust: (1) positive interactions with providers during visits and (2) provider acknowledgment of mistrust. Three themes were identified regarding preferred provider characteristics: (1) gender concordance, (2) race concordance, and (3) recommendations. Due to the close age of the participants, we could not distinguish whether their perspectives differed by age.

CONCLUSION: This pilot study contributes to the literature by identifying barriers and facilitators that influence to African Americans to distrust service providers. It lays the groundwork for future research that examines how age differences may influence African Americans' perceptions of mistrust of service providers. These findings suggest the need to put patients' traditionally underrepresented and disadvantaged perspectives front and center when designing programs and strategies aimed at addressing health disparities.

Rachel Akers, BS, MS

Rachel Akers (M2, Rush Medical College)

MICROBIOLOGY PUBLICATION BIAS IN CYSTIC FIBROSIS CLINICAL TRIALS

INTRODUCTION Since the discovery of cystic fibrosis, a large volume of literature published has been published with studies at every level of evidence. Cystic fibrosis predisposes patients to opportunistic infections, with a textbook example being Pseudomonas aeruginosa. However, patients also suffer from other microbial diseases, such as Burkholderia cepacia and Staphylococcus aureus, which may be under-studied. This study aims to identify publication bias across pathogens proven to pose a higher risk to cystic fibrosis patients.

METHODS The PubMed database was queried for "cystic fibrosis" and each pathogen (Table 1). Results were filtered from 2003 - 2023, full-text articles only, and by fitting PubMed's criteria for a clinical trial. 285 articles matched the inclusion criteria. Data was analyzed via SPSS, with frequency, percentage, and Chi-Square of equal proportions tabulated.

RESULTS Clinical trials with a focus on P. Aeruginosa appeared most frequently and composed 71.2% of all papers. S. Aureus was the second most common microbe, at 10.2%, and most closely aligned with the expected value. Aspergillus and RSV were among the lowest represented, at 2.1% and 0.7%, respectively (Table 1). This trend points to bias towards bacteria in clinical trials and a potential gap in addressing fungal and viral infections in cystic fibrosis. Observed values of clinical trials by pathogen differed significantly ($p < 0.001$) from the expected value of 35.6 (Table 2).

CONCLUSION In the past 20 years, more clinical trials have been conducted with a focus on P. Aeruginosa than any other common pathogen. While more than 60% of adult cystic fibrosis patients are colonized by P. Aeruginosa, the lack of clinical trials on other pathogens is concerning, especially because cystic fibrosis patients have higher risks of long-term fungal colonization. Furthermore, infections in cystic fibrosis patients don't occur in isolation; reports of polymicrobial colonization are increasing and researchers should consider this when designing clinical trials.

Sneha Anand, BS Microbiology and Immunology

Sneha Anand (Rush); Mark Anderson (Abbott); Dylan Behun (Rush); Amy Gosha (Rush); Maria Garcia (Rush); Minnie Kang (Rush); Michael Stec (Abbott); Rebeca Tojo Suarez (Rush); Gavin Cloherty (Abbott); Alan Landay (Rush); James Moy (Rush)

EFFECT OF SARS-CoV-2 SPIKE PROTEIN ANTIBODIES ON BREAKTHROUGH INFECTIONS OVER A TWO-YEAR PERIOD FOLLOWING VACCINATION AND BOOSTER WITH mRNA VACCINES IN A COHORT OF HEALTH CARE WORKERS

INTRODUCTION The global re-sponse to COVID-19 included a massive push for vaccinations to re-duce the spread of the- virus. We se-ek to understand the dynamics of SARS-CoV-2 breakthrough infections and study the differences between hybrid immunity and vaccine only immunity. We hypothesize that individuals with higher antibody levels will have a lower incidence of breakthrough infections.

METHODS The study enrolled 1000 participants who received their first mRNA COVID-19 vaccine dose between December 2020 and February 2021. Excluding specific groups (n=76 who signed consent but did not return for the first and second blood draws, n=5 immunocompromised, n=9 were not fully vaccinated), data from 910 individuals were analyzed. Among them, 323 attended all eight blood draws conducted at intervals of 1, 5, 8, 11, 14, 17, 20, and 23 months after the second vaccine dose. Individuals who reported no infection but were positive for anti-nucleocapsid antibodies (≥0.8) were considered to have asymptomatic breakthrough infections (ABT).

RESULTS Results show 41.1% had symptomatic breakthrough infections (SBT), 7.7% had asymptomatic infections (ABT), and 51.2% remained uninfected (NBT). Participants with ABT had a twofold higher mean Spike (S) IgG prior to breakthrough infection compared to SBT individuals (p=.0001). The participants were further grouped into infection-naïve and previously-infected cohorts, defined as either no infection or infected prior to vaccination, respectively. Regarding breakthrough infections, the previously-infected cohort were more likely to have asymptomatic infections rather than symptomatic infections compared to the infection naive group. The previously infected cohort had 16.4 % ABT compared to the infection naive group which only had 6.0% ABT (p<.0001). Higher levels of S IgG were found in the NBT group compared to the SBT group at specific timepoints, 11, 14 and 17 months.

CONCLUSION This study illustrates the relationship between humoral immune responses and infection status. Although no absolute threshold of immunity was found in this study, our data indicates that higher antibody levels and hybrid immunity were found in asymptomatic vs symptomatic breakthrough infections. These findings may offer further insight for optimizing vaccine strategy and informing public health interventions.

Michelle Ash, IBS PhD

Michelle Ash (Rush, presenting), Anjelica Reyes (Rush), Lena Al-Harthi (Rush), Ron Veazey (Tulane National Primate Research Center), Jeffrey Schneider (Rush)

CHARACTERIZING SIV REBOUND IN THE CNS FOLLOWING CART CESSATION REVEALS DIFFERENTIAL MYELOID INFECTED CELL SUBSETS AS WELL AS A UNIQUE TRANSCRIPTOMIC AND INFLAMMATORY PROFILE COMPARED TO AIDS

INTRODUCTION The CNS HIV reservoir contributes to viral rebound following cART cessation. However, understanding how infected cells emerge from latency and contribute to rebound requires further investigation. We aimed to characterize the phenotype of infected cells and investigate changes in the neuroinflammatory signature of the brain associated with viral rebound upon cART cessation.

METHODS We utilized archived brain tissue from rhesus macaques intravenously infected with SIVmac251 that developed AIDS (n=3) or were virally suppressed and underwent cART cessation 14 days before necropsy (n=2). Using viral RNA/DNAscope and immunofluorescence microscopy, we quantified infected cells using markers for astrocytes (GFAP), microglia (Iba1) and pan myeloid cells (CD68/163/206). We used LC/MS to quantify cART levels and RNAseq to assess transcriptomic differences.

RESULTS In both groups, we found microglia and myeloid cells predominantly harboring SIV RNA and DNA. However, upon stratification of myeloid markers, we found that pan myeloid cells exhibited higher levels of infection in AIDS compared to cART cessation, while levels of infected microglia remained consistent between groups. In the temporal and occipital lobes, cART levels were inversely associated with infection. RNAseq analysis revealed an increase of response to viral infection pathways in cART cessation tissues, compared to uninfected as well as AIDS tissues. Additionally, we detected increased levels of TNF-a and IL-6 during cART cessation, as well as an alteration of myeloid markers CD163 (increased) and CD14 (decreased).

CONCLUSION These findings highlight a differential state of myeloid cells compared to CNS-resident microglia during viral rebound, as well as a skewing to an inflammatory macrophage state. Interestingly, the upregulation of viral infection response genes during cART cessation, compared to both uninfected and AIDS animals, suggests that viral rebound creates a unique and altered CNS landscape and may provide insight into novel ways of blocking viral rebound.

Hannah Becker, BS

Uddy Banerjee (Rush); Shahreen Chowdhury (Rush); Alexander Guess (Rush); Mennefer Blue (Rush); Brihat Sharma (Rush); Philip Held (Rush); Hale Thompson (Rush)

VALIDATION OF A MACHINE LEARNING CLASSIFIER TO IDENTIFY VULNERABILITY TO HIV ACQUISITION OR TRANSMISSION AMONG HOSPITALIZED PATIENTS AT AN ACADEMIC HEALTH CENTER

INTRODUCTION Despite the FDA's approval of HIV prevention medication, PrEP, over a decade ago and highly active anti-retroviral HIV treatment (HAART) over 25 years ago, HIV remains a pressing public health concern amongst specific marginalized populations.1 To combat transmission, this group developed a Convolutional Neural Network (CNN) based HIV risk classifier to be used in acute care settings that identifies individuals at risk of acquiring or transmitting HIV. Notably, this classifier was trained to identify specific risk factors often overlooked in CDC guidelines and by providers, such as substance misuse and black cis-gender females.2,3

METHODS Electronic health records (EHRs) of 1508 manually labeled patients hospitalized at Rush University Medical Center between 2017-2019 were utilized for this study. Clinician documents within the first 24 hours of patient presentation were processed through Apache clinical Text Analysis and Knowledge Extraction System (cTAKES), which standardizes medical terms from notes using Concept Unique Identifiers (CUIs). ~1.2M extracted CUIs were then used to train a binary CNN model for identification of patients at high-risk for acquiring or transmitting HIV. To validate the classifier, our team manually coded additional 400 patient charts to assess for HIV risk. Any disagreements amongst the three manual validators were discussed as a team to reach agreement and improve the validation process. The classifier accuracy was evaluated against this ground-truth dataset.

RESULTS For the validation process inter-rater reliability of over 90% was demonstrated. 18.0% of encounters were identified as high-risk during manual evaluations by our team of experts. The HIV classifier was able to predict 55% of these cases (sensitivity). Moreover, the model correctly predicted 82% of encounters identified as low to medium risk (specificity).

CONCLUSION Pending further validation, an effective HIV classifier using EHR was developed to target HIV risk in Rush's ER. This model could extend to neighboring hospitals like UI and Cook county, curbing HIV transmission in Chicago. Integrating this tool into patient care can heighten provider awareness, patient access, and HIV risk awareness. The ultimate aim is reaching all at-risk patients, even those not considered "typical," for improved HIV care and prevention.

Deeya Bhattacharya, BS

Deeya Bhattacharya, BS (RU), Hemil Gonzalez, MD (RU)

UNRECOGNIZED CRIBRIFORM PLATE DEFECT LEADING TO RECURRENT STREPTOCOCCUS PNEUMONIAE MENINGITIS

INTRODUCTION: We present a case of a man in his forties with an unexplained history of recurrent Streptococcus pneumoniae meningitis. Though Streptococcus pneumoniae is the most common cause of bacterial meningitis in adults, recurrence with this pathogen is usually due to an underlying disease process(1). The risk of meningitis with Streptococcus pneumoniae increases with the presence of bacteremia(2), disruption in the blood-brain barrier(3), or immune compromise(1).

METHODS: The Rush University Institutional Review Board (IRB) has determined that this case report does not require submission to the Rush Research Portal (RRP) per Policy RA-IRB-118.

RESULTS: A forty-three-year-old man with type 2 diabetes mellitus and alcohol use disorder presented to the emergency room with altered mental status. Upon evaluation, he had Streptococcus pneumoniae bacteremia, meningitis, and ventriculitis. He was treated with ceftriaxone for 14 days and made a full recovery. Approximately two and half years later, he again presented to the emergency room with altered mental status and fever and a second episode of Streptococcus pneumoniae meningitis was diagnosed. He was initially treated empirically and once cerebrospinal fluid (CSF) cultures grew penicillin-susceptible Streptococcus pneumoniae he was managed with intravenous ceftriaxone. His course was complicated by ventriculitis and vasculitis with resultant vasospasm leading to multiple ischemic strokes. A skull base MRI showed herniation of the left inferior frontal lobe through a cribriform plate defect.

CONCLUSION: Streptococcus pneumoniae is a member of the natural flora of the nasopharynx(3). Basilar skull fractures or traumatic brain injury(2) can cause leaks in cerebrospinal fluid(4) and disrupt the blood-brain barrier, creating an opportunity for Streptococcus pneumoniae to infect the central nervous system from the nasopharynx(4,5). There was no preceding history of head trauma in this patient, which could suggest a structural abnormality causing recurrent meningitis, such as a pre-existing basilar skull defect. This patient underwent a repair of the defect and was immunized against Streptococcus pneumoniae. He recovered from his infection but now requires assistance with activities of daily living due to sequelae from his strokes.

Madeline Carlson, MD

Madeline Carlson MD (Rush); Claudia Sanchez (UTMB); Katelyn Dato-on DO (Rush)

RARE MANIFESTATION OF PEDIATRIC VZV: EYE DON'T KNOW HOW THIS HAPPENED

INTRODUCTION: We describe a rare case of a pediatric patient with history of perinatal varicella zoster virus (VZV) exposure and fully immunized to VZV who presented with herpes zoster ophthalmicus (HZO) in childhood.

METHODS: An 11-year-old male presented with four days of left periorbital swelling and pain, headache, and one-day history of a vesicular erythematous rash over his left eye following empiric treatment for possible preseptal cellulitis with no response. His physical exam was remarkable for left eye edema and erythema, clear eye drainage, and a bullous vesicular rash along the left V1 distribution. A fluorescein stain exam demonstrated punctate corneal uptake and no retinal lesions. The patient had received scheduled VZV vaccines at 23 months and 4 years. He had no prior VZV infections. However, his mother had a primary VZV infection with a diffuse rash during the third trimester of pregnancy resolving about 7 days prior to delivery of the patient. The patient had no signs of illness as an infant.

RESULTS: Initial metabolic profile, complete blood cell count, and CT of the orbits were unremarkable. Our differential included herpes simplex virus (HSV) infection versus herpes zoster (HZ). A sample of vesicular fluid was negative for HSV-1/2 and positive for VZV by RT-PCR. It was subsequently confirmed to be wild-type VZV. His white blood cell count reached a nadir of 2.37 ´ 103cells/µL at day 7 of illness before improving on acyclovir. The patient was treated with intravenous acyclovir, prednisolone and gentamicin eye drops, and gabapentin in addition to routine pain control. Once the patient's vesicles had crusted over and periorbital swelling improved, he was discharged with valacyclovir to complete a total 14-day course. He was also referred for outpatient immunodeficiency evaluation.

CONCLUSION: Our case highlights the importance of recognizing VZV presenting as HZ in children. Given our patient's VZV was wild-type and he had no history of previous symptomatic infection, we suspect transmission was in utero. Exposure to VZV in utero, particularly between 28 weeks of gestation and 5 days prior to delivery, increases risk of developing HZ in childhood regardless of vaccination status.

Bryan Dulion, GSAL

Bryan Dulion, Niyati Patel, Arnold Olali, Ankur Naqib, Ryan D. Ross   Department of Anatomy & Cell Biology, Department of Microbial Pathogens and Immunity

TAF VS TDF: TENOFOVIR ALAFENAMIDE PROMOTES WEIGHT GAIN AND IMPAIRS FATTY ACID METABOLISM-RELATED SIGNALING PATHWAYS IN VISCERAL FAT TISSUE COMPARED TO TENOFOVIR DISOPROXIL FUMARATE

INTRODUCTION: Currently, there are 39 million people globally living with HIV, with roughly 30 million taking antiretrovirals. People living with HIV are at risk for lower bone mineral density, osteoporosis, and skeletal fractures. Tenofovir disoproxil fumarate (TDF), a commonly prescribed antiretroviral, is associated with bone loss and increased bone turnover. Tenofovir alafenamide (TAF) is better for bone health but has been associated with increased weight gain, particularly in women. TDF and TAF are both prodrugs of the nucleoside/nucleotide reverse transcriptase inhibitor, tenofovir, and it is unclear what mechanisms drive the variable fat response. Therefore, the current study investigated the adipose tissue response in HIV-infected female mice treated with TDF or TAF, both in combination with dolutegravir (DRG) and emtricitabine (FTC).

METHODS: Thirty female NBSGW mice underwent reconstitution with HIV-infected human peripheral blood mononuclear cells at 12 weeks of age. Mice were randomly assigned into three groups - controls, TDF/DTG/FTC, or TAF/DTG/FTC. All treatments were administered into the food to model oral administration for a total of 6 weeks. Lean and fat mass were assessed using dual x-ray absorptiometry. Visceral fat tissue was collected to assess gene expression using targeted qPCR and unbiased RNAseq. Blood was collected to measure circulating adipokines, leptin and adiponectin. Treatment effects were assessed using a one-way ANOVA, followed by post-hoc t-tests.

RESULTS: TAF/DTG/FTC treatment significantly increased lean and fat mass (p= 0.008 and p= 0.046) when compared to TDF/DTG/FTC. Adipocyte signaling was also altered by TAF/DTG/FTC with elevated leptin (p= 0.009) and PPARγ expression (p=0.026) compared to TDF/DTG/FTC or controls. Pathway analysis confirmed altered fat metabolism in TAF/DTG/FTC treated animals, with downregulated fat digestion and absorption as well as downregulated cholesterol metabolism compared to controls, which are not seen in TDF treated mice. Circulating levels of the adipokine, adiponectin, were significantly elevated in the TAF/DTG/FTC group compared to control mice (p=0.03). A similar effect was not noted in the TDF/DTG/FTC treated mice.

DISCUSSION: The current study recapitulates clinical weight gain noted in women receiving TAF in a novel mouse model of HIV-infection. We also note differential tissue-level signaling events in visceral fat from TAF treated mice.

Wadi Eghterafi, BS and MD-Candidate

Wadi Eghterafi (RMC)

DIVERSITY IN BACTERIAL SPECIES STUDIED IN THE CONTEXT OF PHAGE-ANTIBIOTIC-RESISTANCE INTERACTIONS

INTRODUCTION: Bacteriophages, or phages, play a pivotal role in the evolutionary dynamics of bacterial resistance, influencing not only resistance to phage attacks but also to antibiotics. This intricate phage-bacteria co-evolution demands a comprehensive understanding, especially in the context of therapeutic applications (Levin & Bull, 2004). The clinical relevance of this interaction is underscored by findings that certain phages, such as OMKO1, can render multi-drug resistant bacteria like P. aeruginosa more susceptible to antibiotics (Chan et al., 2016). In an era where antibiotic resistance is a mounting concern, delineating which bacterial strains are central to this research and which are not becomes crucial for directing ongoing efforts to develop effective treatments against antibiotic-resistant bacteria.

METHODS: Using a focused PubMed search [(bacteriophage) AND (Antibiotic) AND (Interaction)], I isolated 565 studies from 2014 to 2024. I then created a Python script that leveraged machine learning to process each abstract, analyzed, and categorized the number of times certain bacterial species were mentioned. Lastly, the bacterial counts were categorized into two groups: Highly Studied Bacteria and Less Studied Bacteria, using the median as a cut-off point (56.0) and verifying statistical significance through a Mann-Whitney U test ($p < 0.005$).

RESULTS: Firstly, a majority of the bacteria in both groups were gram-positive. Secondly, bacteria in the highly researched group largely have established vaccines, while those in the less researched group were less likely to have an established vaccine. Lastly, the gap between the highly studied and less studied groups was significant: the highly studied group accounted for 92.4 percent of the literature.

CONCLUSION: This may suggest that there is a need to study gram-negative species phages in their ability to interact with antibiotic resistance, especially in cases where there are no vaccines available for these species.

Audrey Goldstein, BS

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DIAGNOSTIC STEWARDSHIP TO REDUCE CATHETER ASSOCIATED URINARY TRACT INFECTIONS AMONG PATIENTS WITH INDWELLING URINARY CATHETERS

BACKGROUND: Catheter-associated urinary tract infections (CAUTIs) are commonly diagnosed healthcare-associated infections. Erroneous CAUTI diagnoses are common because the key diagnostic test - urine culture - cannot distinguish asymptomatic bacterial colonization of the catheterized bladder versus true infection. Overdiagnosis may impede appropriate treatment and inflate public reporting of CAUTI rates. This study's objective was to evaluate the impact of a computerized diagnostic stewardship intervention on urine culture utilization among patients with indwelling urinary catheters.

METHODS: We performed a single-center retrospective observational study at Rush University Medical Center from April 2018 - July 2023. In February 2021, we implemented guideline-driven clinical decision support for the ordering of urine cultures from adult patients with an indwelling urinary catheter. An alert required providers to select one internal guideline criteria from the following: 1) neutropenia, 2) kidney transplant, 3) recent urologic procedure, 4) evidence of urinary tract obstruction; or if none of the criteria were met, an infectious diseases consultation was required for approval. Facility-wide CAUTI rates per 10,000 catheter days were compared before and after the intervention using linear regression models, controlling for time and monthly facility COVID-19 hospitalizations.

RESULTS: Among 598 patient admissions with ≥1 diagnostic stewardship alert, 284 (47.5%) met our guideline criteria and 314 (52.5%) urine cultures were averted (Table). In unadjusted models, CAUTI rates decreased from 12.5 to 7.6 per 10,000 catheter days (p=0.04). In multivariable models controlling for time and COVID-19 hospitalizations, CAUTI rate decreased from 6.9 to 5.5 per 10,000 catheter days (p=0.60) (Figure).

CONCLUSION: The intervention was successful in averting unnecessary urine cultures. CAUTI rates declined in the baseline vs intervention period. However, the impact of the intervention was difficult to measure given the influence of COVID-19. Our results suggest that a computerized clinical decision support tool may be useful to reduce unnecessary urine cultures in adult patients with indwelling urinary catheters. Further work is needed to assess for potential patient harms of this intervention.

Marion Graham, MS

Marion Graham (Rush), Ai-Yu Gong (Rush), Xian-Ming Chen (Rush)

CRYPTOSPORIDIUM PARVUM HIGHJACKS A HOST LNCRNA, U90926, TO SUPPRESS INTESTINAL EPITHELIAL CELL-AUTONOMOUS ANTIPARASITIC DEFENSE

INTRODUCTION: Cryptosporidium is a protozoan parasite that infects a wide variety of vertebrates, causing intestinal cryptosporidiosis. The intestinal epithelial cells provide the first line of defense against Cryptosporidium intestinal infection and play a central role in activating and regulating the host immune response. Interferon gamma (IFN-γ) from immune cells infiltrated at the site of infection plays a key role in the epithelial cell-autonomous defense. Nevertheless, the success of the parasite is the result of its ability to evade the host immune responses. Increasing evidence suggests long noncoding RNAs (lncRNA) participate in host-pathogen interactions but the underlying mechanisms are not fully understood. The lab identified a panel of host lncRNAs that are upregulated following Cryptosporidium infection, including U90926.

METHODS: qPCR, CRISPR/Cas9, siRNA transfection, RNA-sequencing

RESULTS: We demonstrate that U90926 is upregulated in response to infection but is not upregulated in response to the immune signaling pathways tested. Additionally, inhibition of U90926 resulted in a decreased infection burden. Complementary, overexpression of U90926 resulted in rescued levels of infection burden, suggesting U90926 is acting in a pro-parasitic manner. Furthermore, inhibition of U90926 displayed increased levels of known IFN-γ stimulated genes, suggesting U90926 may be targeting defense gene expression.

CONCLUSION: Our study highlights a new strategy by Cryptosporidium to hijack a host lncRNA to suppress epithelial cell-autonomous defense and allow for a robust infection.

Ogechukwu Ibik, MS

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TRANSIENT UNILATERAL LIMB DISCOLORATION IN A POSTOPERATIVE 16-YEAR-OLD BOY

INTRODUCTION: Anaphylaxis is an acute multisystem syndrome caused by release of mast cell and basophil-derived mediators into circulation in response to foreign substances. Common presentations include cutaneous and respiratory manifestations; however, cardiovascular effects of anaphylaxis are possible and can be less obvious to clinicians.

CASE DESCRIPTION: 16-year-old boy with recent history of left ACL rupture and repair was admitted to the floor for management of postoperative septic arthritis due to methicillin-sensitive Staph Aureus (MSSA) infection. After debridement, he was started on ceftriaxone and Bactrim and developed a diffuse urticarial rash. Ongoing full-body rashes with symptom fluctuations after transition to cefazolin, oxacillin, and clindamycin caused difficulty in establishing which antibiotic he was allergic to. Given this uncertainty and cefazolin being the most effective treatment for MSSA septic arthritis, PICU transfer and four-step cefazolin challenge were initiated per Allergy/Immunology recommendations before continuing his treatment course. During the last step, family noticed his right lower extremity turned dark blue up to the mid-thigh region after ambulation. Upon investigation while standing, he was noted to have a marked increase in heart rate - orthostatics showed HR rising from 98 to 138 and BP dropping from 136/55 to 102/64 on standing without symptoms. Given the onset of urticarial rashes and venous pooling in the setting of continuous beta-lactam usage, a beta-lactam allergy was diagnosed. He was then restarted on clindamycin after IV fluids and methylprednisolone to suppress the ongoing reaction and transferred to the floor without further complications.

DISCUSSION: This was a unique case of an anaphylactic reaction to beta-lactam medications. In anaphylaxis, the effects of histamine and nitric oxide can cause widespread vasodilation and increased vascular permeability, precipitating hypotension and anaphylactic shock. In this patient undergoing a drug challenge with a beta-lactam agent, these effects manifested in lower extremity venous pooling upon standing due to lack of venoconstriction required to pump deoxygenated blood to the heart - the resulting decrease in preload led to orthostatic hypotension. Recognition of the different manifestations of anaphylaxis, including orthostatic hypotension and venous pooling, is critical for clinicians to assess possible systemic allergic reactions in patients, especially during drug challenges.

Kehua Jin, PhD

Kehua Jina,b, Ai-Yu Gonga, Shuhong Wanga, and Xian-Ming Chena

ANTISENSE OLIGONUCLEOTIDES TARGETING LncRNA XR_001779380-Prdm1 INTERACTION PROMOTE IFNγ-MEDIATED ANTI-CRYPTOSPORIDIUM DEFENSE IN NEONATAL INTESTINAL EPITHELIAL CELLS

INTRODUCTION: Long non-coding RNAs (lncRNAs) are RNA transcripts (>200 nt) not translated into protein. Increasing evidence suggests that lncRNAs are a critical regulatory component of intestinal epithelial cell (IEC) anti-Cryptosporidium defense and may be new therapeutic intervention targets. In our previous study we demonstrated that lncRNA XR_001779380 can interact with Prdm1, an RNA-binding protein expressed in neonatal IECs, resulting in suppression of IFNγ-mediated epithelial defense in murine neonatal intestine following C. parvum infection.

METHODS: Here, we designed multiple phosphorodiamidate-morpholino oligomers (PMO-ASOs) targeting the putative binding regions of XR_001779380 with Prdm1. These ASOs can efficiently be delivered into cultured mouse IECs. By using the RNA immunoprecipitation assay, interactions between XR_001779380 and Prdm1 induced by IFNγ was significantly inhibited in neonatal IECs transfected with two of the designed ASOs (i.e., PMO-ASO-#4 and PMO- ASO-#7) which target the 176-227 and 435-486 regions of XR_001779380, respectively. Treatment of PMO-ASO-#4 and PMO-ASO-#7, but not other PMO-ASOs or control-ASOs,

RESULTS: ASO enhanced expression of IFNγ-stimulated genes (e.g., Igtp, Irgm2, and Ido1) and consequently, decreased parasite burden of C. parvum infection in neonatal IECs.

CONCLUSION: PMO-ASOs targeting XR_001779380-Prdm1 interaction would be able to promote IFNγ-stimulated cell-autonomous anti-Cryptosporidium defense in neonatal IECs.

Joshua Jones, BA

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MULTIPRONGED APPROACH TO RECRUITMENT OF PEDIATRIC PATIENTS WITH BETA-LACTAM ALLERGIES FOR EVALUATION AND DE-LABELING

INTRODUCTION: Penicillin allergy is the most commonly reported drug allergy in the pediatric population. However, most reports do not represent true IgE-mediated or late-onset severe hypersensitivity reactions. False allergy labels can lead to unnecessarily broad and/or non-first line antibiotic utilization, the development of antibiotic resistance, adverse drug side effects, and have implications for the use of antimicrobials in adulthood. In an effort to decrease inappropriate allergy labeling, we have implemented a multipronged approach for the evaluation of documented beta-lactam allergies in pediatric patients and potential "de-labeling" of inaccurate or outdated allergies.

METHODS: We performed retrospective chart review of pediatric patients (0-18 years) with a documented beta-lactam allergy who were seen in clinic at a single tertiary medical center between 2014-2019. Prospective telephone screening then began to further characterize reaction symptoms and timing to determine patient candidacy for allergy testing (Fig. 1). Inpatient screening began in April 2022. If amenable to referral, eligible patients are then referred for outpatient Allergy and Immunology (A/I) assessment.

RESULTS: A total of 1160 eligible pediatric patients were identified, and initial results are summarized (Fig. 2). Of those screened, 48 (57%) patients were referred. 5 (6%) patients were de-labeled via screening, of which 3 had received and tolerated repeat dosing. 11 (33%) patients have attended allergy appointments; 4 (36%) were tested and all were de-labeled (ages 6-11 years) from mostly non-IgE-mediated reactions. Additionally, 16 patients have upcoming appointments, and recruitment efforts are ongoing to include increased inpatient recruitment.

CONCLUSION: Use of an inpatient and outpatient algorithm can help identify pediatric patients less likely to have a true or persistent beta-lactam allergy (delayed-onset mild symptoms, or IgE-mediated reaction >5 years ago) and who could benefit from formal allergy testing to potentially remove their allergy label. In the future, algorithm implementation within the electronic medical record may assist clinicians in thorough documentation of beta-lactam allergies and expeditious referral for allergy testing when appropriate.

Itzel Lazcano, BS, MS

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EXAMINING THE EXPRESSION OF LEPTIN AND PPAR-γ IN ADIPOCYTES IN RESPONSE TO ANTIRETROVIRALS

INTRODUCTION The management of HIV has improved with combined antiretroviral therapy (cART). An increasing amount of research indicates that cART impacts adipocyte metabolism, and in some cases, can promote fat accumulation and increase the risk for metabolic conditions. Tenofovir alafenamide (TAF), is reported to promote weight gain, and yet tenofovir disoproxil fumarate (TDF) is thought to be weight suppressive. The mechanism driving the differing response to TAF and TDF is unclear, therefore in this study we investigated the effects of TAF and TDF on adipocyte gene expression in vitro.

METHODS To model adipocyte response to cART, we used SGBS cells, a human-derived adipocyte cell line. SGBS cells were differentiated for 14-days and then treated with TAF and TDF at 30 ng/ml, 300 ng/ml, and 3 µg/ml for 24 hours. All drugs were solubilized in 80% DMSO, which was used as a vehicle control. RNA was extracted using Trizol and quantitative polymerase chain reaction (qPCR) was carried out with the housekeeping gene, GAPDH, and the targets leptin and PPAR-γ.

RESULTS   TAF and TDF had a dose-dependent effect on the expression of leptin and PPAR-γ in adipocytes. At the lowest dose (30 ng/ml), TDF treated cells had higher leptin expression compared to TAF, while at the highest dose (3 µg/ml) TAF treated cells had higher leptin expression. Similarly, TDF upregulated PPAR-γ expression compared to TAF at the lower dose (30 ng/ml), and TAF showed higher levels of PPAR-γ expression at the highest dose (3 ng/ml). These results indicate a possible interaction between TAF and TDF in a dose-dependent manner.

CONCLUSION Despite the similar structures and mechanism by which TAF and TDF suppress HIV replications, the two drugs have considerably different effects on the metabolic health of people with HIV . Our study investigated the direct action of TAF and TDF on adipocyte metabolism and found that TAF and TDF have differing effects. These preliminary results may help to explain the metabolic changes seen in HIV patients. Additional research is needed to validate these patterns and provide clarity on the underlying mechanisms to provide insights into the complex interactions between cART and adipocyte activity.

Charia McKee, B.S. in Biology

Charia McKee (Rush); Sunnie Yoh (Scripps Research Institute); João Mamede (Rush)

PQBP1/CGAS INNATE SENSING COMPLEXES FORM DURING THE EARLY STEPS OF REVERSE TRANSCRIPTION

INTRODUCTION Cytosolic cyclic GMP-AMP Synthase (cGAS) recognition of HIV-encoded nucleic acid species leads to the initiation of an IRF3-dependent innate immune response and the production of type I interferon. Reverse transcription is a multi-step process that generates intermediate virus-derived nucleic acids species that may activate cGAS. The interplay of HIV reverse transcription complexes (RTC) formed within the intact or disassembling viral core, its advancement from the membrane to the nucleus, and the resultant triggering of innate sensing has not been fully defined. We recently identified Polyglutamine Binding Protein 1 (PQBP1) as an important capsid-binding cofactor required for cGAS activation in dendritic cells. However, the extent of PQBP1's influence on and the kinetics of cGAS sensing is undefined.

METHODS To explore the interaction of PQBP1 with the HIV-1 capsid, we assessed the ratio of cGAS-associated viral particles in the presence of chemical compounds (Nevirapine and RNaseH inhibitor 7390) that arrest reverse transcription in its very early stages. We also used live cell imaging with a fluid phase marker of fusion and capsid integrity loss followed by fixed immunofluorescence. To assess the temporal relationship between cytoplasmic capsid permanence and cGAS activation, we measure ISG54 expression in the presence of a compound that inhibits nuclear import (Importazole).

RESULTS We observe that innate sensing complex formation is increased when reverse transcription is blocked during its early steps by an RnaseH inhibitor and PQBP1 is associated with the HIV-1 capsid, recruiting cGAS to sense the RTC after the initiation of the first steps of reverse transcription. Further, when the viral capsid is restricted to the cytoplasm at the time of or very soon after infection initiation, cGAS-mediated ISG54 expression is increased.

CONCLUSION These results give insight into the kinetics of cGAS activation, what viral products may be sufficient for triggering cGAS, and highlight a relationship between cytoplasmic trafficking and innate sensing. As capsid stability is suspected to play a large role in PQBP1's recognition of capsid, we will further define these interactions with capsid-inhibiting drugs (PF74 and Lenacapavir) and cGAS inhibitor (G140) to determine the impact of these mutants on RTC formation.

Jamie Naso, BS, MPH

Jamie Naso (RMC)

ASYMPTOMATIC MIGRANT TEENAGER WITH UNILATERAL HILAR ADENOPATHY

CASE: A 17-year-old Venezuelan migrant is referred to the ED after a chest Xray performed at his temporary housing shelter revealed unilateral hilar adenopathy.   The patient arrived to the ED hemodynamically stable, afebrile, and in no acute distress. On review of systems, he denied shortness of breath, fever, cough, chest pain, weakness, night sweats, weight loss, nausea, vomiting or changes in bowel movements. His mom believed the patient had lost weight recently, but she thinks this might be related to their long migration journey. The patient received his recommended routine pediatric immunizations in Venezuela, including a BCG vaccine.   Physical exam was unremarkable. A repeat chest x-ray was significant for 2 small, subtle patchy opacities in the right lung and a prominent left hilum; the left lung appeared clear; no pleural effusion was appreciated. A CBC and CMP were ordered and returned within normal limits. QuantiFERON gold assay was ordered and returned positive. A chest CT revealed a large consolidative opacity in the posterior, parahilar left upper lobe with cavitation partially opacified with fluid. AFB sputum cultures returned positive.

DIAGNOSIS: Tuberculosis

DISCUSSION: The patient was started on isoniazid, rifampin, pyrazinamide, ethambutol, and a pyridoxine supplement. Per local public health guidelines, the patient was required to produce 3x negative sputum cultures before he could return to his shelter. This required over 6 weeks of treatment. The patient was discharged back to his shelter and continued treatment for tuberculosis as an outpatient. He remained asymptomatic throughout his hospital stay.   Roughly 30% of active tuberculosis patients are asymptomatic. This patient's asymptomatic presentation is unique as cavitary tuberculosis usually presents with severe symptoms. Therefore, it is imperative to continue screening high risk populations and their close contacts, such as this patient, to prevent transmission and reduce morbidity and mortality.   The patient's prolonged inpatient treatment also poses a challenge from a learning perspective. Collaboration with Chicago Public Schools and social work ensured the patient was provided with school activities while he remained in isolation. For pediatric patients undergoing long hospital stays, the clinician should work with local partners to ensure learning is uninterrupted.

Shuhong Wang, MS

Shuhong Wang (Rush University Medical Center); Ai-Yu Gong (Rush University Medical Center); Xian-Ming Chen (Rush University Medical Center)

BILE ACID MALABSORPTION CONTRIBUTES TO THE DYSREGULATED INTESTINAL HOMEOSTASIS FOLLOWING CRYPTOSPORIDIUM INFECTION

Cryptosporidium spp., an apicomplexan protozoan, is one of the most common pathogens responsible for moderate-to-severe diarrhea in children under 2-year-old. Infection in children is associated with malnutrition, growth defect and even impaired cognitive development. The loss of small intestine microvillus border caused by infection can lead to childhood malnutrition with diarrhea. However, the molecular mechanisms of malnutrition following infection remain unclear. We report here that Cryptosporidium infection impairs bile reabsorption in the ileum by decreasing the apical sodium-bile acid transporter expression at post-transcription level, thereby reducing bile acid pool in the enterohepatic circulation. Using RNA-seq, comprehensive lipidomic analysis and bile acid-targeted assay, we found that Cryptosporidium infection altered lipid and bile acid metabolism in the liver. Reduction of the bile acid pool after infection impaired lipid absorption in the small intestine. Replenishing bile acids prevented decreased lipid absorption in the infected neonatal mice, suggesting that Cryptosporidium infection reduces lipid absorption via decreasing bile acids. Bile gavage significantly reduced the infection burden and attenuated the dysregulated homeostasis of stem cells in the small intestine and colon following infection. Together, our data indicate that bile acid malabsorption contributes to the pathogenesis of intestinal homeostasis following Cryptosporidium infection.

Khaled Aboushaala, MD, MS, PhD Candidate

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DISCOVERY OF CIRCULATING BLOOD BIOMARKERS IN PATIENTS WITH AND WITHOUT MODIC CHANGES OF THE LUMBAR SPINE: A PRELIMINARY ANALYSIS

INTRODUCTION: Low back pain (LBP) is the world's most disabling condition.1 Modic changes (MC) are pathological vertebral endplate and bone marrow changes visible on magnetic resonance imaging (MRI) that are highly associated with cLBP and increase with age.2 In one of the first studies, our team had identified circulating blood proinflammatory cytokines that were related to DD and severity of DD3 as well as specific blood biomarkers that were significantly elevated between MC and asymptomatic patients.4 Purpose: The following study aimed to determine the existence of blood biomarkers in symptomatic patients with or without lumbar Modic changes (MC).

METHODS: A cross-sectional sub-analyses of a prospective cohort was performed. Fasting blood samples were collected from patients with and without lumbar MC who had undergone spinal fusion or microdiscectomy. An 80-plex panel and CCL5/RANTES were used to assess preoperative plasma cytokine concentrations. Patient demographics and imaging phenotypes were also assessed.

RESULTS: Thirty-one subjects were analyzed (n=18 no MC; n=13 MC). No significant differences were found in age, sex, body mass index, smoking and alcohol history, and surgical procedure (i.e. fusion, decompression) between the two groups (p>0.05). Several statistically significant blood biomarkers in MC patients were identified, including elevated levels of C-C Motif Chemokine Ligand 5 (CCL5, p=0.0006), C-X-C Motif Chemokine Ligand 5 (CXCL5, p=0.05), while Macrophage Migration Inhibitory Factor (MIF) was significantly lower (p=0.009). Additionally, Pentraxin 3 (PTX3, p=0.06) and Galectin-3 (Gal-3, p=0.07) showed trends toward significance. Moreover, MC patients exhibited significantly higher levels of disc degeneration (p=0.0001) and displacement severity (p=0.020). Based on multivariate analyses and controlling for disc degeneration/displacement, CCL5 (OR: 1.02; 95% CI:1.002-1.033; p=0.028) and MIF (OR:0.60; 95% CI:0.382-0.951; p=0.030) were independently associated with MC patients.

CONCLUSION: This "proof-of-concept" study is the first to identify specific and significantly circulating blood biomarkers associated with symptomatic patients with lumbar MC, independent of disc alterations of degeneration and/or bulges/herniations. Specifically, differences in CCL5 and MIF protein levels were significantly noted in MC patients compared to those without MC.   REFERENCES: [1] GBD, Lancet Rheum, 2023; [2] Maatta et al, Medicine, 2016; [3] Grad et al, Eur Cell Mater, 2016; [4] Karppinen et al, Euro Spine

Natalie Adamczyk, BS

Natalie S. Adamczyk(RUSH), Shingo Ishihara(RUSH), Richard J. Miller(NU), Anne-Marie Malfait(RUSH), Rachel E. Miller(RUSH)

ROLE OF PIEZO2 IN OSTEOARTHRITIS OF BOTH SEXES

INTRODUCTION: Osteoarthritis (OA) and its associated pain is one of the leading causes of disability. We have previously shown that conditionally knocking out Piezo2, a mechanosensitive ion channel, from nociceptors in male mice protected from mechanically mediated pain in experimental OA. Recent work has shown that FM dyes, which can block mechanically activated currents, are dependent on Piezo2 for uptake by sensory nerve endings, whereas a toxin, GsMTx-4 is a nonselective mechanosensitive channel blocker. The goals of the current study were two-fold. First, to assess sex effects of Piezo2cko in OA models; secondly, to assess the effectiveness of mechanosensitive ion channel blocking.

METHODS: All animal procedures were approved by Rush's IACUC. Male and female Piezo2cko and WT mice underwent sham or partial meniscectomy (PMX) surgery of the right knee. Weight bearing was assessed pre, 4, 8, and 12 weeks post-surgery. Knee hyperalgesia was assessed at baseline, 4, 7 and 12 weeks post-surgery. At 7 weeks post op, mice were intraarticularly (i.a.) injected with FM dye (5nmol in 2.5μl) or saline (2.5μl) then tested for changes in knee hyperalgesia over 90 minutes. The following week mice were injected with GsMTX-4 i.a. (75μM in 5ul) and tested for changes in knee hyperalgesia. Aged 2-year-old male Piezo2cko and WT control mice were tested for knee hyperalgesia at baseline, post saline(5μl), and post FM dye i.a. injections.

RESULTS: Male and female WT PMX mice developed weight bearing asymmetry by 12 weeks post op, but Piezo2cko mice were protected. Female and male Piezo2cko PMX mice had significantly less knee hyperalgesia compared to WT PMX mice at 4, 7, and 12 weeks post-op. Injection of FM dye temporarily reversed knee hyperalgesia in WT female and male PMX mice with no significant effect on Piezo2cko mice, corroborating a Piezo2 dependence of this dye. In contrast, GsMTx-4 had an effect in both strains of female PMX mice. Aged male WT mice had significantly lower pressure thresholds compared to Piezo2cko mice; injection of FM dye reversed knee hyperalgesia in WT only.

CONCLUSION: The current study provides evidence that targeting mechanosensation is effective in reducing mechanical pain in both sexes.

Devin Asher, BS

Devin Asher, Jennifer E. Wright, Deborah J. Hall, Brett R. Levine, MD, Robin Pourzal, PhD Rush University, Department of Orthopedic Surgery, Chicago, IL

EVALUATING THE FAILURE RATE AND MECHANISM OF POLYETHYLENE TIBIAL LINERS FROM SURGICALLY RETRIEVED TOTAL KNEE ARTHROPLASTY

INTRODUCTION The number of total knee arthroplasties and revisions is increasing annually in the US. The normal wear of implanted materials, including polyethylene (PE) and highly cross-linked polyethylene (XLPE), is known to be a cause of osteolysis and decreased bone density. With the introduction of modern XLPE, the traditional patterns of osteolysis and inflammatory response have been significantly reduced and the lifespan of the implants prolonged. 25% of failures are currently reported due to "Infection or other inflammatory responses" and 24% of failures are attributed to "Mechanical Loosening". Meanwhile, recent data at Rush suggests that while the traditional histopathological methods, XLPE particles are not observed, a new method, Fourier Transform Infrared Spectroscopic imaging has shown inflammatory responses around TKA are often characterized by macrophages laden with fine PE accumulations.

METHODS A cohort of 101 (68 conventional/31 XLPE) retrieved TKA PE liners was established based on total time in situ ⬚7 years. Each liner was evaluated for gross breakdown and delamination and scored by severity. The minimum thickness of each condylar surface is measured and compared to the manufacturer-reported minimum thickness. Additionally, all cases were radiographically evaluated with pre and post-op studies for evidence of implant loosening and osteolysis. Histopathological and FTIR-I evaluation of periprosthetic tissue samples is forthcoming. All data was evaluated by multiple linear regression to determine the impact of different patient demographic factors and implant factors (size, polyethylene type) on polyethylene wear and the extent of loosening based on radiographic metrics.

RESULTS XLPE liners showed a lower incidence of loosening and instability/laxity but more unspecified failures and infections. The most common reasons for failure of highly worn liners (1-2) were instability and laxity. Conventional PE liner wear correlated with time in situ with XLPE liner data still forthcoming. Further analysis is ongoing.

CONCLUSION The impact of PE wear appears to be underestimated because the primary diagnosis is often instability/laxity while delamination is often present in those cases. A linear relationship between wear and time in situ for PE liners was noted but XLPE is still under investigation. After tissue analysis, relationships between tissue characterization and wear rate will be evaluated.

Luisa Cedin, PT, MS

Luisa Cedin (RUSH); Christopher Knowlton (RUSH); Camila Antognini (RUSH), Takayuki Koya (RUSH), Christopher Ferrigno (RUSH), Markus A. Wimmer (RUSH)

REAL-TIME MUSICAL FEEDBACK AS A TRAINING TOOL FOR KNEE ADDUCTION MOMENT REDUCTION

INTRODUCTION Osteoarthritis (OA) is the most common joint disease in adults. Modifications to gait have been shown to reduce joint loading and improve pain and physical function in people with knee OA. Specifically, the knee adduction moment (KAM) has been identified as a biomechanical biomarker for radiographic knee OA progression. Therefore, gait training interventions to reduce the KAM may be effective in managing knee OA. We aim to reduce KAM by using musical feedback based on pressure-sensing insoles in healthy subjects.

METHODS Real-time plantar pressure was obtained at 100Hz with Insole3 (Moticon ReGo AG), a 16-sensor pressure insole with an embedded six-axis inertial measurement unit (IMU) controlled by a smartphone app via Bluetooth connection. CoP was real-time transmitted across Wi-Fi and received via User Datagram Protocol (UDP) in Max 8 (Cycling '74), a desktop visual programming environment for music and multimedia. A 25% decrease in average peak lateral CoP was used as the threshold to provide auditory feedback. Instructions on the musical feedback were given to 20 healthy participants with a lowpass filter applied to a playlist of popular songs when the CoP exceeded the set threshold, having the effect of muffling the sound. The participants were instructed to avoid muffling the sound while maintaining a comfortable, natural-feeling gait. After practicing with musical feedback for 10 minutes, the feedback was removed. Participants were asked to recreate their walking patterns without sound assistance. Participant comments were obtained via a questionnaire.

RESULTS Preliminary results of 10 subjects show that the mean first KAM peak was reduced by 10.2% after instructions and by 7.5% after training with our system. Mean peak KAM2 was lowered by 5.7% after instructions and by 6.5% after training. So far, all participants agreed or strongly agreed that they understood the instructions and changes in the sound.

CONCLUSION Musical feedback based on CoP seems to reduce both KAM peaks in healthy participants after verbal instructions and after a short practice. Feedback was positive regarding the usage and comprehensibility of the system. Further analysis of the remaining subjects is required to solidify our initial observations

Talissa Generoso, MD

Talissa Oliveira Generoso (RUSH, IBTS), Vitor La Banca (IBTS), Felipe F. Gonzalez (RUSH,IBTS), Joao Artur Bonadiman (IBTS), Lucas Valerio Pallone (RUSH, IBTS), Eliane C. Guadagnin (IBTS), Grant Garrigues (RUSH), Gustavo Leporace (IBTS), Jonathan Gustafson (RUSH), Leonardo Metsavaht (IBTS)

THREE-DIMENSIONAL KINEMATICS IN PATIENTS WITH ANTERIOR SHOULDER INSTABILITY - A SYSTEMATIC REVIEW WITH META-ANALYSIS

INTRODUCTION. Anterior Shoulder Instability (ASI) is a common orthopedic condition, often resulting in altered shoulder kinematics that can persist after treatment. Understanding the etiology and the biomechanics of the unstable shoulder is crucial to determine the most appropriate treatment option. This study aims to conduct a systematic review and meta-analysis of 3D shoulder kinematics in ASI patients (CRD42022314583).

METHODS. A broad search was conducted within PubMed, Scopus, and Cochrane Library following the PRISMA guidelines. We included all cross-sectional or longitudinal studies with 3D motion analysis describing shoulder kinematics in patients with ASI. The quality of each study was assessed using the MINORS criteria. Qualitative and quantitative synthesis was performed.

RESULTS. Nine studies were included in the qualitative analysis and two in the quantitative meta-analysis. The qualitative review detected conflicting evidence for some parameters. Glenohumeral head had a greater anterior translation in unstable shoulders in three of the papers analyzed, while the difference was not significant in one and another found higher variability for glenohumeral overall translation for instability patients. Two studies showed lower external rotation ROM for unstable shoulders while one didn't find significant differences. Conflicting results were also found regarding changes in scapulohumeral rhythm and scapular orientation. The meta-analysis showed that the control group has a significantly greater glenohumeral (GH) peak angle on the frontal plane compared to the instability group. Meta-analysis also indicated a greater scapulohumeral rhythm on the frontal plane for the instability group.

CONCLUSIONS. The meta-analysis results indicate increased scapulohumeral rhythm and reduced glenohumeral peak angles for unstable shoulders. The qualitative analysis found controverse results for scapulohumeral rhythm, scapular orientation, glenohumeral head translation and shoulder range of movement. Kinematic changes due to ASI may be related to pain, apprehension, or impaired neuromuscular control during shoulder tasks, suggesting that these factors should be addressed during treatment. The lack of methodological consistency in studies examining motion analysis and shoulder instability was a limiting factor.

Felipe Gonzalez, MD, MSc

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FROM PACE TO IMPACT: DECODING BIOMECHANICAL PROFILES IN RUNNERS WITH ARTIFICIAL INTELLIGENCE

INTRODUCTION: Running styles adopted by runners can have an impact on exposition to risk of injury. This study aimed to identify whether different biomechanical running profiles among healthy asymptomatic runners, and to examine their lower limb mechanical loading characteristics, while evaluating potential implications for injury risk.

METHODS: The study was approved by an Institutional Review Board (Study ID: 87148418.7.0000.5257). All subjects signed an informed consent. Seventy-nine healthy runners ran on a treadmill at 2.92 m/s. Step cadence, stance time, vertical oscillation (range of vertical displacement of the center of mass during a cycle), duty factor (ratio of stance time over stride time), vertical stiffness (ratio of the change in vertical ground reaction force to the change in vertical oscillation), ground reaction force, and anteroposterior, lateral, and vertical smoothness (calculated using the spectral arc length function) were determined from three-dimensional kinematic data collected using an eight-high-speed camera motion analysis system. A combination of Principal Component Analysis, Self-Organizing Maps, and K-means clustering techniques was used to delineate distinct biomechanical running profiles. Kruskal-Wallis tests were conducted to compare the numeric variables among groups. Pearson's Chi-squared tests were employed to compare observed frequencies of categorical variables among groups. The level of significance was set at 0.05.

RESULTS: Five distinct biomechanical profiles were identified ($p<0.001$). Profile 3 showed characteristics associated with the lowest joint overload due to reduced peak ground reaction forces and greater movement smoothness. Profile 5 exhibited the highest joint overload, driven by high ground reaction forces, low duty factor, and high vertical oscillation. Profile 1, despite having a low step cadence, exhibited low joint load due to a high duty factor and low peak ground reaction forces. Profiles 2 and 4 showed contrasting running patterns but maintained moderate smoothness and peak ground reaction forces.

CONCLUSION: The findings underscore the complexity of running biomechanics and shed light on the limitations of models focusing on isolated biomechanical factors. The identification of these distinct running profiles can inform future research examining injury risk within each profile and guide the development of tailored training regimens to balance capacity and demand, potentially contributing to injury prevention in runners.

Ian Hermanns, Bachelor Science Mechanical Engineering

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DEVELOPMENT OF A FINITE ELEMENT MODEL OF A MODULAR REVISION TOTAL HIP ARTHROPLASTY STEM WITH CONNECTING PIN

INTRODUCTION: Total Hip Arthroplasty (THA) is a very successful and cost-effective treatment for various terminal diseases of the hip. However, complications can prompt the need for revision total hip arthroplasty (rTHA). Uncemented, tapered, fluted stems allow bridging proximal bone defects of the femur. However, recent reports have demonstrated a unique failure mode of such modular stems, with loosening of the connection pin from the distal component, a shrink fit connection. A finite element analysis (FEA) model was developed to better understand this new failure mode and investigate implant behavior under in vivo loads. The FEA models were verified against bench failure data.

METHODS: Publications, manufacturer brochures and caliper measurements were used to develop ten (10) models of the femoral stem of a modular, tapered, fluted, uncemented stem (Revitan, Zimmer Biomet) in Inventor/2022 (Autodesk, San Francisco, CA). The system consisted of a connecting pin (CoCr28Mo6, E = 210 GPa, v = 0.3, Y = 824 MPa) and femoral stem (Ti6Al7Nb, E = 105 GPa, v = 0.35, Y = 900 MPa). Elastic-perfectly plastic behavior was modeled. Five femoral stem nominal diameters (14 to 24 mm) were evaluated at high (42 micron) and low (23 micron) interference fits, corresponding to estimated manufacturing tolerances. Models were meshed and evaluated in Abaqus/2019 Standard (Dassault Systèmes, Waltham, MA) using quadratic tetrahedral elements.

RESULTS: The average nodal tangential slip at the shrink fit interface in the low interference model increased as the implant diameter decreased, with notable slip above 1 micron with in vivo forces corresponding to walking up stairs, walking down stairs, and jogging. The average nodal tangential slip in the high interference model was decreased in all modes assessed, with notable slip above 1 micron with in vivo forces corresponding to jogging only.

CONCLUSIONS: FEA model verification suggest that interference tolerance has a significant effect on the holding torque capacity between the connecting pin and femoral stem. The chosen coefficient of friction and high and low interference tolerance results in model-predicted reaction moments that represent the variability in the experimental data well. The increased tangential slip that occurred may indicate that jogging should be restricted outright with rTHA.

Lesly Honore, BS, Medical Degree (Undergoing)

Austin Yu, BS1 Lesly Honore, BS2 Anne Timmermann, MS2 Matthew Demetrious, MD3 Steven Gitelis, MD1 Ira Miller MD, PhD3 Alan Blank MD, MS1

CHARACTERIZING THE TRANSFORMATION AND DIAGNOSIS OF ATYPICAL LIPOMATOUS TUMORS TO DEDIFFERENTIATED LIPOSARCOMA: SINGLE INSTITUTIONAL OUTCOMES

INTRODUCTION Atypical lipomatous tumor (ALT) is a locally aggressive, benign adipocytic tissue mass with risk of transformation into dedifferentiated liposarcoma (DDLS), a mixed-grade, non-lipogenic tumor with increased risk for metastasis and mortality. Studies have evaluated the dedifferentiation rate of DDLS but seldom report the methodology of how their diagnosis of DDLS was obtained during their work-up and treatment. Diagnostic methodology remains crucial in DDLS due to their heterogeneous architecture and lower core needle biopsy (CNB) accuracy compared to other soft tissue tumors. Our study included a longitudinal cohort of ALT/DDLS patients characterizing how and when patients received their diagnoses.

METHODS 168 patients diagnosed with ALT-only(n=129), DDLS-only(n=22), or both(n=17) were included. Among DDLS patients, the presence of a prior ALT diagnosis along with time between their ALT and DDLS diagnosis was measured. Histology, location, results, and methods of each diagnosis were recorded including, CNB, surgical resection, or both. Disease-specific survival (DSS) and recurrence free-survival (RFS) were calculated with univariate/multivariate analysis for risk factors.

RESULTS Among patients who received a diagnosis with CNB consistent with ALT, 7 were subsequently diagnosed with DDLS after surgical resection, representing 4.8% of ALT patients. Mean time between diagnoses was 2.3 months(STD 2.0). Five(3.4%) patients were diagnosed with a DDLS recurrence after initial ALT diagnosis confirmed with CNB and surgical resection. Median time between diagnoses was 37.0 months(IQR 16.0, 63.0). Five (3.4%) had tumors with a heterogeneous composition on initial surgical resection, described as an ALT with dedifferentiated components. 22 DDLS patients had no prior ALT diagnosis. 9 were diagnosed from both CNB and surgical resection, and 13 were diagnosed from surgical resection directly after clinical suspicion and imaging concerning for sarcoma. DSS in the DDLS was significantly lower than ALT-only DSS(p<0.0001). There was no significant difference in RFS.

CONCLUSION DDLS may arise after an extended period of time after ALT resection or simultaneously with an ALT diagnosis. Due to its varied diagnostic timeline and appearance, caution is advised when evaluating and treating ALT. This is the first study to provide clinical experience of the DDLS timeline and distinguish how and when DDLS arises in relation to ALT.

Zeeshan Khan, BA

Zeeshan A. Khan BA (Rush, presenting), Eric N. Azua MD (Baylor), Safa Gursoy MD PhD (Acibadem), Mario Hevesi MD PhD (Mayo Clinic), Jorge Chahla MD PhD (Rush)

A NOVEL DESCRIPTION OF MEDIAL MENISCUS EXTRA-ARTICULAR VASCULARIZATION: A MULTICENTER ANATOMICAL AND IMAGING STUDY INTRODUCING THE "MEDIAL MENISCAL ARTERY"

INTRODUCTION   The microvasculature of the human meniscus has been famously described by Arnoczky and Warren. However, to date the qualitative and quantitative extra-articular vascular anatomy of the medial meniscus has not yet been characterized. Therefore, the purpose of our study was to perform a qualitative and quantitative anatomic study of the extra-articular medial meniscal vasculature and to introduce the novel "medial meniscal artery" (MMA), potentially providing future guidelines for the treatment of meniscal pathology.

METHODS   Thirty-three unpaired frozen human cadaveric knees were dissected. The popliteal artery was identified and cannulated with an angiocatheter. The arteries were perfused with a red acrylic paint solution allowing for improved visualization. Artery dimensions and distances were measured using a digital caliper. Perfused specimens were imaged with Computed Tomography scanning and 3D reconstruction was performed using segmenting software to identify vessels and perform artery dimension measurements.

RESULTS   The MMA was consistently identified in all specimens. In 26 of 33 (82%) specimens, the MMA branched directly from the popliteal artery, while in 6, the MMA shared a common trunk with the inferior medial genicular artery (IMGA). The MMA was easily distinguishable from the superior MGA, inferior MGA, and MGA, given its direct course to the medial joint line with terminal branches to the posterior horn of the medial meniscus and deep to the semimembranosus tendon. On CT scan 3D reconstruction, the MMA exhibited a consistently smaller vessel diameter relative to the genicular arteries.

CONCLUSION   This is the first study identifying and quantitively describing the MMA in the human knee. The MMA can be identified consistently on gross anatomic dissection in patients of varying demographics. The findings of this study help to further refine diagnostic and treatment options for meniscus preservation. Additionally, this study helps to define safe zones in the knee during posterior surgical approaches and furthers the base of knowledge for emerging vascular procedures such as genicular artery embolization.

Takayuki Koya, MD, PhD

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KNEE KINEMATICS AND KINETICS DURING LEVEL AND DOWNHILL WALKING AFTER TOTAL KNEE ARTHROPLASTY USING A ROBOTIC LIGAMENT TENSIONER

INTRODUCTION: Robotic Total Knee Arthroplasty (TKA) holds promise in reliable ligamentous balancing that may improve patients' functional outcomes. This observational study aimed to compare functional parameters after robotic cruciate retaining (CR)TKA with manually implanted CR TKA and data from a healthy elderly group to see whether the gait of the robotic TKA has become indistinguishable from healthy.

METHODS: Three groups (n=13 each) were included: All subjects of the "rTKA" (robotic TKA) group were recruited from a single surgeon's clinic for this IRB-approved study. Both "mTKA" (manually implanted TKA) and the elderly "Healthy" comparator groups were added from a data repository. Optoelectronic gait analysis was used to obtain joint kinematics and kinetics. Subjects were instructed to walk on level and downhill walkways outfitted with force plates. Knee kinematics and external moments were calculated and normalized to %bodyweight x height using inverse dynamics. One-way ANOVA with post-hoc Games-Howell analyses and Statistical nonParametric Mapping (SnPM) of the waveforms were performed.

RESULTS: During the midstance phase, rTKA showed a larger knee flexion angle (10.9°, SE=1.5) compared to the Healthy (0.34°, SE=1.5) and mTKA (5.3°, SE=1.5) in level walking ($p<.001$, $p=.044$, respectively). The peak flexion moment was higher in rTKA and the Healthy ($p<.001$, $p=.017$ in level walking, $p<.001$, $p=.003$ in downhill, respectively) than in mTKA, which may suggest the normal quadriceps use. On the contrary, the peak extension moment was significantly lower in rTKA than in the Healthy and mTKA. ($p<.001$, $p=.002$ in level walking, $p=.002$, $p=.003$ in downhill, respectively)

CONCLUSION: This study is one of the first to objectively compare robotic and manual TKA reporting differences in level walking as well as during a mid-flexion activity such as downhill walking. The higher flexion moment in rTKA vs. mTKA may suggest that proper ligament tensioning is helping the extensor mechanism, which is often compromised after TKA. The lower extension moment occurred during the swing phase and, therefore, is less concerning. One of the limitations of this study was that TKA implant design was not identical between groups. Future work will take this into account and identify the exact reasons for the differences in kinetics.

Hoomin Lee, PhD

Hoomin Lee (Rush); and Frank C. Ko (Rush)

ROLE OF HYPOXIA-INDUCIBLE FACTOR-1α (HIF-1α) IN INTRAMEMBRANOUS BONE REGENERATION

INTRODUCTION Intramembranous bone regeneration plays an important role in orthopaedic and dental procedures. Despite the increasing importance of intramembranous bone regeneration, the underlying mechanisms of intramembranous bone regeneration remain unclear. HIF-1α plays a pivotal role in many pathways such as angiogenesis, cell migration and cell differentiation, and is well known to promote bone formation and endochondral bone regeneration through these roles. However, studies to date have yet examine the role of HIF-1α activation or inhibition on intramembranous bone regeneration.

METHODS We therefore sought to determined the effects of the HIF-1α activation or inhibition on mice that underwent surgical ablation of bone marrow, a well-established intramembranous bone regeneration model. At 4 weeks of age, mice underwent surgery and were administered every 2 days with 30 μg/g of 2-methoxyestradiol (2ME2) or 10 μg/g of dimethyloxaloylglycine (DMOG) to inhibit or activate HIF-1α, respectively.

RESULTS & CONCLUSION We performed a microcomputed tomography analysis of post-surgery day 7 regenerating bone marrow BV/TV and found that the activation of HIF-1α was not different compared to the control, whereas HIF-1α inhibition by DMOG impaired intramembranous bone regeneration by 25%. These data suggest that HIF-1α is necessary for intramembranous bone regeneration and may improve efficiency of fracture healing or enhance implant fixation.

Stephanie McCarthy, IBS PhD

Stephanie M. McCarthy (RUMC), Douglas W. Van Citters (Dartmouth), Audrey J. Martin (Dartmouth), Joshua J. Jacobs (RUMC), Brian J. McGrory (Dartmouth), Robin Pourzal (RUMC)

INTER-RATER AND INTER-INSTITUTIONAL RELIABILITY OF IMPLANT WEAR ANALYSIS TECHNIQUES

INTRODUCTION: Proper material loss assessment is essential to understanding the inflammatory effects attributed to debris release from total hip arthroplasty components. Coordinate measuring machines (CMM) are used to measure material loss, utilizing ASTM standards for tactile and optical techniques. Material loss assessment between raters using the same or different techniques are not commonly compared. This study's purpose was to evaluate 1) how material loss analysis compares between two observers from the same institution, 2) how material loss analysis compares between two observers from different institutions, and 3) how resulting material loss measurements trend with patient outcome data.

METHODS: Nineteen CoCrMo femoral heads were retrieved. Median(range) time in situ was 75.3 months (22.3-109.3). Serum cobalt (Co) ion levels were available for 6 patients. Lab A measured head taper molds using an optical CMM. A senior investigator (SI) and trainee (TI) used the same CMM data to compute material loss. Lab B measured the same femoral heads with a tactile CMM, using a fitting algorithm to compute material loss. Inter-rater and inter-laboratory reliability of material loss was tested using intraclass correlation coefficient (ICC), and correlations with time in situ and Co ion findings were examined.

RESULTS: At Lab A, median(range) material loss was 4.78mm3(0.0-11.73) and 4.38mm3(0.0-15.45) for the SI and TI, respectively. At Lab B, median material loss was 2.25mm3(-.44-17.3). ICC results (95% CI) were ICC=0.93(0.84-0.97), demonstrating good-excellent agreement between reviewers and institutions. Good agreement was seen between Lab A SI and TI ($R2=0.87$, $p<0.001$), and between Lab A SI and Lab B ($R2=0.73$, $p<0.001$). Lab A SI, TI, and Lab B demonstrated a significant correlation between material loss and time in situ($R2=0.61$/$p=0.001$, $R2=0.54$/$p=0.002$, $R2=0.29$/$p=0.027$, respectively). A trending correlation with Co ion data was observed: Lab A SI: $R2=0.61$/$p=0.066$, Lab A TI: $R2=0.75$/$p=0.026$, Lab B: $R2=0.31$/$p=0.25$.

CONCLUSION: We have demonstrated excellent agreement in CMM data wear analysis method reliability between raters at different institutions using two CMM techniques, indicating the validity of both techniques. This study marks a step in the direction of ensuring comparable methods across the field. Additionally, this study suggests a potential correlation between material loss and blood Co ions levels, needing further exploration.

Colton Mowers, B.S.

Colton C .Mowers (Rush), Deborah J. Hall (Rush), Jennifer L. Wright (Rush), Gregory P. Nicholson (Rush), Grant E. Garrigues (Rush), Robin Pourzal (Rush)

IMPLANT FAILURE DUE TO ASEPTIC LOOSENING IN ANATOMIC AND REVERSE TOTAL SHOULDER ARTHROPLASTY

INTRODUCTION: It's important to emphasize the progress in shoulder implant design, but the ever-enduring need for improved durability, leading to better patient outcomes. My project investigated correlations between wear, implantation time, macrophage response within periprosthetic tissue, and radiographic evidence of loosening from Total Shoulder Arthroplasty (TSA) and Reverse Total Shoulder Arthroplasty (rTSA) implants. We aimed to ascertain reasons for aseptic loosening and osteolysis-inducing particles, correlating implant damage, histopathological patterns, and radiographic evidence of loosening, ultimately leading to implant failure. We highlight a lack of a quantitative protocol for TSA loosening and aim to contribute insights into implant performance and mechanisms contributing to failure.

METHODS: We utilized a retrieval cohort of 82 shoulder implants (59 TSA and 23 rTSA). The cohort was categorized by stem length, number of modularities, and manufacturer. Time in situ, patient age, and gender were noted. Radiographic assessment for radiolucencies and implant alignment was done by an experienced orthopedic surgeon using a scoring system (Gruen zones). We also identified scapular notching in RSA patients, described by Sirveaux. A qualitative damage assessment of bearing surfaces and polyethylene liners was performed. Damage of modular taper surfaces was also scored. A histopathological evaluation of periprosthetic tissue samples was also performed. Finally, a multiple linear regression and Mann-Whitney tests were conducted to determine the relationship between patient and implant factors with wear scores, tissue scores, and radiographic loosening in both TSA and RSA.

RESULTS: The total Gruen zone score correlated with the diagnosis of aseptic loosening in TSA ($p<0.05$), but not RTSA. Patients with short-stem TSA had lower total Modified Gruen scores than patients with rTSA ($p=0.007$). Patients with TSA had longer time implanted time than rTSA patients ($p=0.0074$). Patients with TSA had higher polyethylene bearing wear than patients with rTSA ($p <0.0001$). Patients with TSA had lower metal bearing surface wear than patients with rTSA ($p=0.0082$).

CONCLUSION: In conclusion, our study revealed significant differences in aseptic loosening, time in situ, and wear rates between TSA and rTSA. Future work will attempt to correlate stem length, implant manufacturer, and implant surface topography to gain insight on mechanisms of aseptic loosening.

Alia Obeidat, PhD

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THE DISTRIBUTION OF NERVES IN THE SYNOVIUM AND OSTEOCHONDRAL CHANNELS OF PATIENTS WITH MILD AND ADVANCED OSTEOARTHRITIS.

BACKGROUND: Sprouting of nociceptors has been reported in late-stage OA, both in human knees and in rodent models. However, in depth description of neuronal remodeling of the human OA knee is still lacking. Here, we sought to develop methods for the systematic and reproducible description of the sensory innervation of different structures of the knee joint in patients with mild and advanced OA, leveraging the availability of postmortem knee samples with all articular tissues matched within knees.

METHODS: From each of 30 donors, a total of >40 knee tissue blocks (plus 12 DRGs) were collected, fixed, decalcified where necessary, and paraffin embedded. These blocks were shipped from Scripps. Here, we performed an initial analysis using osteochondral plugs (OCP) from mild OA (grade 1.5, Modified Outerbridge classification) and advanced OA donors (grade 3) at 4 tibial sites (Fig. 1A), as well as synovial samples from mild OA (grade 1) at 6 different sites (Fig.1B). Five-🔲m thick sections were either stained with Hematoxylin and Eosin or Safranin O/Fast Green. Adjacent sections were used for immunohistochemical staining as follows: Pan neuronal marker (PGP9.5, Abcam ab27053, 1:200), endothelial cell markers (CD31, Abcam Ab28364, 1:50 and CD34, Agilent GA63261-2), Calcitonin gene related peptide (CGRP, immunostar 24112,1:500) or Isotype control (Rabbit IgG, Abcam Ab172730, 1ug/ml). Proteinase K was used for antigen retrieval. Sections were incubated with primary antibody at 4°C overnight. Sections were stained with biotin-streptavidin/HRP and DAB chromogen, and then counterstained with methyl green.

RESULTS: At all 4 tibial sites, we observed the presence of PGP9.5+ and CGRP+ neuronal signal in osteochondral channels that either approach (Fig. 2a) or breach the tidemark (Fig. 2b-d) in mild and advanced OA respectively. We also looked at endothelial markers to recognize neuronal versus vascular signal within osteochondral channels, and observed both CD31, CD34 signal inside these channels (not shown). PGP9.5+ signal was also observed in the medial and lateral peri-meniscal synovium, in addition to other medial and lateral synovial sites of 23- and 42- year old donors (grade 1, n=1) (not shown).

CONCLUSIONS: PGP9.5+ and CGRP+ nerve fibers were detected in the osteochondral channels and synovium in patients with mild and advanced OA.

Narcisa Olendorf, M.S. Biotechnology

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TO EVALUATE THE EFFICACY OF NON-STEROIDAL ANTI-INFLAMMATORY DRUGS (NSAID) (MELOXICAM) IN MURINE MODEL OF LOW BACK PAIN IN MICE

OBJECTIVE: Clinical study demonstrated that nonsteroidal anti-inflammatory drug (NSAID), meloxicam in a dose of 15 mg/day is an effective and safe therapy for the treatment of acute nonspecific back pain (NSBP) in 2078 patients. The objective of the present study is to investigate if the anti-hyperalgesic efficacy of meloxicam in a murine model of low back pain.

METHOD: Following IACUC approval, thirty-two young adult male C57BL/6 mice (20g; 9 weeks) were evaluated for mechanical hyperalgesia in a mouse model of disc puncture producing low back pain (LBP). Mice were positioned supine and anesthesia was maintained with 1.5 % isoflurane in oxygen via a facemask at a rate of 1 L/minute. The L4/5 and L5/6 discs were punctured with a 25G needle the nucleus pulposus (NP) expressed. Mechanical allodynia was assessed starting at 7 days using von Frey filaments. On day 14 & 21 post disc puncture, animals were allocated to two treatment groups: saline and 10mg/kg meloxicam. The drug was injected for 3 consecutive days with von Frey testing 23 h after each injection. AUCs were calculated using trapezoidal integration. The primary outcome of the study was the area under the curve (AUC) of the von Frey force thresholds over time (g*d) for the 3 days following the injections. The AUC data following treatment were compared among the treatment groups using the nonparametric test Wilcoxon two-sample test, Kruskal Wallis test, with post hoc comparison made using Dunn's test with Bonferroni correction. Differences in mean and confidence intervals of the difference were calculated using a 1500 sample bootstrap.

RESULTS: Prior to surgery paw withdrawal pressure to von Frey stimulation was 3.40 (1.80 to 3.68) grams. Fourteen and twenty one days after surgery median PWT values were 0.67 (0.26 to 1.23) g and was not different between saline (mean 0.60, 95% CI 0.34 to 0.87) and meloxicam (mean 0.67, 95% CI 0.52 to 0.81) treated mice. AUC's mean difference 0.98, 95% CI 0.44 to 1.52 and nonparametric Wilcoxon Two-Sample test P=0.0003.

CONCLUSION: The meloxicam following low back pain in mice is shows analgesic effects in compare to saline treatment.

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NAVIGATING MEDIAL MENISCUS TEARS: A THREE-DIMENSIONAL ANALYSIS OF GAIT ALTERATIONS AND SURGICAL OUTCOMES

INTRODUCTION Medial meniscus posterior root tears (MMT) can severely impair the meniscus's ability to absorb load, similar to the effects of a meniscectomy. Nonetheless, it is uncertain whether individuals with MMT exhibit gait changes, potentially exacerbating knee loads and increasing the risk of knee osteoarthritis. Furthermore, it is unclear if medial meniscus root repair (MMR) can restore normal knee kinetics. We aimed to investigate changes in external moments in MMT and MMR patients, hypothesizing that MMT patients would display protective gait patterns.

METHODS In an ongoing cross-sectional study, we analyzed six subjects with MMT, four with MMR, and three healthy, age-matched controls (CON). Participants walked on level ground at a self-selected speed. Data were collected using 24 high-speed cameras and force plates. Knee kinematics and peak moments during gait were calculated, with group comparisons made through Kruskal-Wallis and Dunn tests.

RESULTS MMT and MMR groups showed significantly lower knee flexion moments than the CON group (p<0.05), indicating reduced quadriceps activation. The MMT group had lower knee extension moments than MMR and CON (p<0.05), reflecting a strategy to minimize external knee forces post-injury. MMR patients' knee extension moments were closer to CON (p<0.05), suggesting surgical restoration of this gait variable. MMT patients had lower abduction and adduction moments, indicative of offloading the medial knee compartment (p<0.05). No significant differences were found in internal rotation moments across groups.

CONCLUSIONS This study reveals that MMT lead to alterations in knee moments during gait, which are partially restored following root repair. MMT patients presented altered knee moments that are compatible with a protective strategy to unload the knee and compensate for increased medial compartment contact pressures that are reported in MMT injuries. Moreover, MMR patients presented knee moments that were more similar to healthy controls than MMT patients, suggesting that arthroscopic repair can restore gait characteristics. Further research with a larger sample, actively being enrolled by the authors, is expected by the time of the meeting and is necessary to confirm these preliminary results.

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ASSESSING CHANGES IN DELTOID AND TRAPEZIUS MUSCLE COORDINATION OF PATIENTS AFTER REVERSE TOTALI SHOULDER ARTHROPLASY

INTRODUCTION/BACKGROUND Reverse total shoulder arthroplasty (RTSA) is the preferred surgical option for patients with inoperable rotator cuff tears or shoulder arthritis. Despite general success and satisfaction, up to 25% of patients exhibit persistent functional deficits with overhead reaching tasks. These ongoing deficits may indicate functional differences that could be related to poor muscular coordination of the deltoid and trapezius following surgery. It is critical to understand not just the range of motion changes and improvements in these patients, but also the relative improvements in their muscular coordination and excitation.

METHODS Patients undergoing planned RTSA (n = 14) consented to participate in this IRB-approved study. All participants presented with rotator cuff insufficiency, glenohumeral arthritis, and/or poor active elevation that had failed conservative management. At post-op timepoints, participants underwent biomechanical analysis during an arm abduction task. Motion capture markers were used to track motions of the thorax, humerus, and scapula. Muscle excitations were measured using electromyography for the deltoid and trapezius muscles. Outcomes included range of motion and mean EMG activation for the concentric phase of the task. Statistical analysis included normality tests and independent t-tests to compare high-functioning and low-functioning patients, which were determined by having these subjects perform a complex task either successfully or not successfully.

RESULTS   We found a significant decrease (mean difference = 22.2°) in glenohumeral range of motion (ROM) in the low-functioning patients as compared to high-functioning patients (F = 9.206, P = 0.010). No other significant changes in scapulothoracic or humerothoracic joint angles were found (Figure 1). We found a significant decrease in mean anterior deltoid activation in the low-functioning patients (F = 5.466, P = 0.039) as compared to high-functioning patients (Figure 2). Conversely, the low-functioning patients exhibited greater posterior deltoid activation during the abduction task (F = 4.955, P=0.048).

CONCLUSION   Rehabilitation treatment should be aimed at improving low functioning patients in the middle deltoid and lower trapezius to enhance shoulder function. Future work will be used to identify associations of both pre-operative kinematics and muscle excitation parameters that could predict functional patients following RTSA. Identifying changes in shoulder muscle coordination of patients

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ADDITIVE ANALGESIC EFFECT OF THE AMPA AGONIST (2R,6R)-HYDROXYNORKETAMINE WITH MELOXICAM IN A MURINE MODEL OF LOW BACK PAIN (LBP)

INTRODUCTION: Cyclooxygenase (COX) inhibiting non-steroidal anti-inflammatory analgesic drugs (NSAIDS), such as meloxicam and naproxen, are the primary pain-relieving agents used by people with back pain, but have a low-ceiling effect limiting analgesic efficacy. Objective of the present study is to find the additive anti-hyperalgesic efficacy of meloxicam with AMPA agonist (2R,6R)-hydroxynorketamine in a model of low back pain.

METHOD: Fifty-four young adult female C57BL/6 mice (20g; 9 weeks) were evaluated for mechanical hyperalgesia in a mouse model of disc puncture producing low back pain (LBP). The L4/5 and L5/6 discs were punctured with a 25G needle the nucleus pulposus (NP) expressed. Mechanical allodynia was assessed starting at 7 days using von Frey filaments. On day 14 & 21 post disc puncture, animals were allocated to six treatment groups: saline, 10mg/kg meloxicam, 10mg/kg (2R,6R)-HNK, 20mg/kg (2R,6R)-HNK, meloxicam+10mg/kg (2R,6R)-HNK and meloxicam+10mg/kg (2R,6R)-HNK. The drug was injected for 3 consecutive days with von Frey testing 23 h after each injection. AUCs were calculated using trapezoidal integration. The primary outcome of the study was the area under the curve (AUC) of the von Frey force thresholds over time (g*d) for the 3 days following the injections. The AUC data following treatment were compared among the treatment groups using the one-way analysis of variance using Bonferroni correction. Differences in means and confidence intervals of the difference were calculated.

RESULTS: AUC's mean difference and 95%CI. diff for saline vs meloxicam+10mg/kg (2R,6R)-HNK (-4.93; 95%CI diff -8.07 to -1.79), saline vs meloxicam+20mg/kg (2R,6R)-HNK (-5.25; 95%CI diff -8.39 to -2.10), meloxicam vs. meloxicam plus 10mg/kg (2R,6R)-HNK (-1.44; 95%CI. diff -4.58 to 1.70), meloxicam vs. meloxicam plus 20mg/kg (2R,6R)-HNK (-1.75; 95%CI. diff -4.89 to 1.39), 10mg/kg (2R,6R)-HNK vs. meloxicam plus 10mg/kg (2R,6R)-HNK (-1.14; 95%CI. diff -4.28 to 2.00) and 20mg/kg (2R,6R)-HNK vs. Meloxicam plus 20mg/kg (2R,6R)-HNK (-0.41; 95%CI. diff -3.65 to 2.83). One-way ANOVA (P<0.0001).

CONCLUSION: The analgesic benefit of the meloxicam, (2R,6R)-HNK and combination of meloxicam with (2R,6R)-HNK) demonstrated significant anti-nociceptive effects compared to saline. The combination of (2R,6R)-HNK with meloxicam did not show statistically significant additivity compared with the single therapies.

Abhayavarshini Sridhar, B.Tech, MS, MS

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EFFECTS OF IN UTERO AND LACTATIONAL EXPOSURE TO DOLUTEGRAVIR-BASED CART IN SPRAGUE DAWLEY RATS

INTRODUCTION: Combination antiretroviral therapy (cART) has dramatically reduced the risk of Mother-to-Child HIV Transmission during pregnancy and breastfeeding. Despite its positive effects, cART increases the risk for osteoporosis in adults and may inhibit bone development in children, which increases the risk of late-life osteoporosis. Recently, the World Health Organization (WHO) has recommended dolutegravir (DTG) as the preferred treatment for pregnant women. However, the effects of early exposure to maternal DTG-based cART on bone are unclear. In the current study, we evaluated the effects of perinatal exposure to DTG/ABC (Abacavir)/3TC (Lamivudine) in uninfected Sprague Dawley (SD) rats to understand its effects on bone independent of HIV.

METHODS: Female SD rats were bred between 10-13 weeks of age. Pregnant rats were treated with DTG/ABC/3TC or vehicle via oral gavage starting at gestational day 6. Maternal treatment continued throughout gestation and lactation. Upon weaning, the offspring received a cART-free rodent diet. On postnatal day 573 (~18 months), offspring were sacrificed. Femoral length was measured using digital hand-held calipers. Micro-computed tomography was used to evaluate trabecular bone architecture in the distal femoral metaphysis. Results were evaluated using a two-way ANOVA. To date, 10 cART and 15 vehicle treated samples have been evaluated.

RESULTS: Trabecular bone volume fraction (BV/TV) was significantly affected by treatment, with a significant 6.6% and non-significant 3% reduction in BV/TV of cART treated female and male rats compared to vehicle treated controls, respectively. cART treatment also affected trabecular number and spacing, with an overall decrease in trabecular number and increase in trabecular spacing. Femoral length was also affected by cART, with a significant increase in length in cART treated males, but not in females.

CONCLUSION: Our preliminary data suggests that exposure to DTG-based cART during early skeletal development has long-lasting negative effects on trabecular bone mass and potentially influences bone growth. Importantly, impaired bone mass accrual can increase the risk for osteoporosis later in life, and therefore children born to HIV infected mothers may be at an increased risk for osteoporosis even if uninfected themselves. Future work is aimed at assessing bone strength, matrix composition, and cellular dynamics.

Anne Timmermann, MS

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SEX-BASED DIFFERENCES FOR PATIENTS WITH BORDERLINE HIP DYSPLASIA UNDERGOING HIP ARTHROSCOPY

INTRODUCTION Evidence from existing studies comparing outcomes of males versus females with borderline hip dysplasia (BHD) may not be applicable in contemporary hip arthroscopy. Within BHD, females represent 72.3% - 89.5% of the cohorts despite very few studies comparing across sex. The purpose of our study is to compare sex-based outcomes of patients with BHD undergoing capsular plication, labral repair, and femoral osteochondroplasty.

METHODS Patients who underwent primary hip arthroscopy for femoroacetabular impingement syndrome (FAIS) were identified from a single institution registry from April 2012 to December 2018. Patients with concomitant hip procedures, history of congenital hip disorders, or without 2 years of follow-up were excluded. Demographics, activity and level of performance, multiple patient reported outcome (PRO) measures, and secondary surgery data were collected. Pre- and post-operative radiographs were evaluated. Categorical variables were analyzed using chi-square and Fisher exact test, while continuous variables were analyzed using t-test.

RESULTS Of the 264 patients eligible for inclusion, 70 males and 70 females were propensity matched on a 1:1 basis by age and BMI. In radiographic imaging, males had a significantly higher alpha angle on Dunn view both pre-operatively (63.8 ± 13.0 versus 54.8 ± 15.1, $p<0.001$) and post-operatively (39.2 ± 4.0 versus 37.0 ± 3.7, $p<0.002$). Females demonstrated significantly worse pre-operative PRO scores than males in Hip Outcome Score Activities of Daily Living ($p=0.005$), Hip Outcome Score Sports Scale ($p=0.030$), and modified Harris Hip Score ($p=0.026$). There was no significant difference between sexes in PROs at a minimum of 2-years after surgery. Reoperation for revision was performed in 3.8% of females and 9.4% of males ($p=0.437$), while reoperation for total hip arthroscopy (THA) was performed in 4% of females and 2% of males ($p=1.000$). Postoperative neuropathy was seen in 1.7% of females and 1.9% of males ($p=1.000$), while infection was seen in 1.7% of females and 0.0% of males ($p=1.000$).

CONCLUSION Males with BHD have larger alpha angles pre and post femoral osteochondroplasty. Despite lower pre-operative PROs, females demonstrate similar post-operative PROs and equivalent or higher achievement of clinically significant outcomes. Both sexes have similar incidence of reoperation, including revision hip arthroscopy and THA.

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OPIOID USE IN IMPENDING VERSUS PATHOLOGIC PROXIMAL FEMUR FRACTURES

BACKGROUND Pathologic and impending fractures commonly occur in the proximal femur, and patients may be prescribed opioids prior to surgery and often require opioids for postoperative pain relief. This study compared postoperative opiate usage and ambulatory functional status in patients with impending versus pathologic fractures in the proximal femur. This study investigated postoperative opioid use, functionality, and overall survival following internal fixation for pathologic or impending fractures at three and six months.

METHODS This was a retrospective review of patients using opioids postoperatively who underwent internal fixation for a pathologic or impending fracture between 2016 and 2022. Preoperative and postoperative opioid usage as well as ambulation status and risk factors at three and six months associated with postoperative opioid use were recorded.

RESULTS Twenty-four pathologic fractures and twenty-three impending fractures were included. Preoperative opioid daily morphine milligram equivalent (MME) was significantly higher in the pathologic fracture group (p=0.021), but there were no significant differences at three or six months. In the impending fracture group, daily MME at three months was significantly higher than preoperative daily MME (p=0.018) but returned to preoperative levels at six months. There was statistically significant improvement in ambulation status in the combined cohort (p=0.008) and impending fracture cohort (p=0.016) at 6 months.

CONCLUSIONS Although patients did not experience a significant postoperative change in opioid use, patients with pathologic fractures notably required higher opioid dosages and there was overall improvement in function following fixation. Future studies should examine postoperative opioid use with careful consideration of concurrent pain management pain therapies and tumor characteristics.

Michael Vogel, B.S.

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PRIMARY AND REVISION HIP ARTHROSCOPY IN BORDERLINE HIP DYSPLASIA SHOW COMPARABLE FUNCTIONAL OUTCOMES AT MID-TERM FOLLOW-UP

INTRODUCTION: Patients undergoing primary hip arthroscopy (HA) for femoroacetabular impingement syndrome (FAIS) in the context of borderline hip dysplasia (BHD) have shown desirable outcomes at 2- and 5-year follow-up; although, limited studies to date evaluate outcomes following revision HA in patients with BHD. The purpose of this study was to compare the outcomes of primary and revision HA in BHD at 5-year follow-up.

METHODS: Following institutional review board approval and informed consent, patients with BHD, characterized by a lateral center edge angle between 18° and 25°, who underwent HA for FAIS with 5-year follow-up were identified in a single surgeon's clinical repository. Cases of revision HA were propensity matched 1:2 to cases of primary HA, controlling for age, sex, and BMI. Collected Patient-Reported Outcomes (PROs) included: Hip Outcome Score Activities of Daily Living and Sport Subscales, International Hip Outcome Score 12, modified Harris Hip Score, and Visual Analog Scale (VAS) for Pain. Achievement of minimal clinically important difference (MCID), patient acceptable symptom state (PASS), and reoperation-free survivorship were compared.

RESULTS: Thirty-four revision HA patients were matched to 68 primary HA patients. The groups were similar in age (31.2±10.0 years vs. 31.5±9.3, p=0.696), sex (68% female vs. 69%, p=1.000), and BMI (26.4±4.9 kg/m2 vs. 25.9±4.6, p=0.636). Average follow-up duration was 5.9±2.2 years. The revision group showed a greater prevalence of prolonged preoperative pain (59% vs. 25%, p=0.001). A significant improvement in all PROs was observed (p≤0.001) with no differences between groups (p≥0.097). The revision group showed inferior achievement of PASS for VAS Pain (33% vs. 59%, p=0.032); otherwise, both groups showed high MCID (86% vs. 87%, p=0.937) and PASS (68% vs. 74%, p=0.588) achievement for at least one PRO. Comparable survival was observed (p=0.280).

CONCLUSION: Patients with BHD undergoing revision HA for FAIS achieve similar functional outcomes and reoperation-free survivorship to their primary counterparts at 5-year follow-up despite inferior pain resolution. These findings support the utility of revision HA in patients with BHD following appropriate counseling on the potential for residual hip pain. Findings from this study are limited by heterogenicity in the reason for reoperation in the revision HA group.

Alexandra Walker, BS

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EFFECT OF CURRENT OSTEOCHONDRAL ALLOGRAFT HARVESTING TECHNIQUES ON REGIONAL CHONDROCYTE VIABILITY

PURPOSE: To investigate the effect of distal femoral osteochondral allograft (OCA) plug harvest and recipient site preparation on regional cell viability when using handheld saline irrigation versus saline submersion.

METHODS: 13 clinically-viable distal femoral hemicondyles were utilized (JRF Ortho). Each hemicondyle had 4 samples harvested: (1) 5mm control slice of cartilage, (2) 15mm OCA donor plug harvested with a powered coring reamer and concurrent handheld saline irrigation ("Traditional"), (3) 15mm OCA donor plug harvested while submerged under normal saline ("Submerged"), (4) 5mm cartilage from the peripheral rim of recipient socket created with a 15 mm cannulated reamer used to remove articular cartilage and subchondral bone to a 7mm depth ("Recipient"). Samples were stained using Calcein and Ethidium. Live-dead images were acquired using a confocal microscope (Figure 1) and ImageJ was used to calculate live cells for the whole plugs as well as regionality of the central 5mm relative to the peripheral 5mm. Groups were compared using Friedman tests.

RESULTS: The Traditional group had higher cell death percentages in all regions (whole: 61.42%±4.98 %, center: 62.38%±6.11%, edge: 60.91%±4.75%) when compared to the Submerged (whole: 71.54%±4.82% [P=0.003], center: 72.76%±5.86% [P=0.005], edge: 70.93% ± 4.51% [P=0.003]) and Control (77.51%±9.23%; P<0.0001 for all regions) groups (Figure 2). There were no significant differences across Control and Submerged samples. There were no intra-group regional differences between the central and peripheral 5mm segments for Traditional (P=0.108) or Submerged (0.061). Recipient (61.10%±5.02%) had significantly less cell viability compared to Control (P<0.001) and Submerged (P=0.009), but was equivalent to traditional (P=0.990).

CONCLUSION: Significant chondrocyte death is induced by OCA plug harvesting with traditional handheld irrigation that is mitigated by harvesting while submerged under saline. A significant amount of cell death occurs at the recipient socket periphery. Mitigating this damage may improve edge integration of OCAs.

Daniel Wichman, BS

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PREOPERATIVE WALKING SPEED IS ASSOCIATED WITH 1-YEAR OUTCOMES FOLLOWING HIP ARTHROSCOPY FOR FEMOROACETABULAR IMPINGEMENT SYNDROME

BACKGROUND: Prior studies have identified demographic, radiographic, and intraoperative predictors of outcomes following hip arthroscopy for femoroacetabular impingement syndrome (FAIS), yet no studies have identified if preoperative gait metrics can predict outcomes. Increased preoperative step count, walking speed, step length, and gait symmetry will be associated with better outcomes following surgery.

METHODS: Patients who underwent hip arthroscopy between 2019-2022 download the smartphone app rHip, allowing for retroactive access of gait metric data. Preoperative gait metrics, age, sex, body mass index (BMI) and exercise participation were analyzed via multivariate stepwise linear regression for a relationship with 1-year postoperative patient-reported outcomes (PROs), including Hip Outcome Scale-Activities of Daily Living (HOS-ADL); HOS-Sports Subscale (HOS-SS), 12-item international Hip Outcome Tool (iHOT-12), Patient-Reported Outcomes Measurement Information System (PROMIS) for Physical Function (PROMIS-PF) and Pain Interference Subscale (PROMIS-PI). Thresholds for preoperative gait metrics were analyzed via receiver operator characteristic (ROC) curve. A subgroup analysis was performed to compare those who did and did not reach this threshold.

RESULTS: Forty-three patients (86% female; age: 33.1±13.7 years; BMI: 23.9±4.4 kg/m2) met inclusion criteria. Multivariate regression found that preoperative walking speed was significantly associated with postoperative HOS-ADL, HOS-SS, and iHOT-12 (p≤0.006). A preoperative walking speed threshold of 1.065 m/s was found to be predictive of outcome achievement. Those that failed to achieve this threshold were shown to be significantly older, with larger BMIs, and were less active (p≤0.013). They also showed significantly worse 1-year postoperative scores (p≤0.009) and lower PASS achievement for HOS-ADL, HOS-SS, and iHOT-12 (p≤0.042).

CONCLUSION: Preoperative walking speed is significantly associated with 1-year outcomes following hip arthroscopy and patients who average < 1.065 m/s show significantly worse outcomes following surgery.

Marcus Winogradzki, IBS PhD

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DISCOVERY OF A NOVEL SWITCH IN CYTOSKELETAL MICROTUBULE ISOTYPES DURING OSTEOBLAST DIFFERENTIATION

INTRODUCTION Bone development relies primarily on the differentiation of osteoblasts into osteocytes, making up over 90% of cells in bone tissue. As osteoblasts differentiate, they undergo remarkable changes in gene expression leading to secretion of proteins and mineralization. These processes rely on a network of microtubules (MTs) to support intracellular vesicular trafficking. Here, we aim to better understand the specific changes occurring in MTs during osteoblast differentiation. MTs are cylindrical structures composed of heterodimers of α- and β-tubulin. Their function is influenced in part by post-translational modifications, one of the most studied being acetylation of α-tubulin, which acts to promote MT stability. An understudied aspect of MTs are the different isotypes of α- and β-tubulins that are integrated into its polymer structure. These and other factors that control the properties and "language" of MTs are known as the Tubulin Code.

METHODS Two cell lines were used to model bone differentiation, the mouse IDG-SW3 and fetal human osteoblast (FHOBs). Downstream analysis employed alizarin red staining, western blots, qPCR, and immunofluorescence. Publicly available ChIP-Seq data was used to assess differentiating MC3T3. Immunohistochemistry (IHC) analysis was further performed on C57BL/6 mouse femurs.

RESULTS Differentiation of osteoblasts alters the expression MT isotypes, most notably an increase of TUBB2 and decrease of TUBB3. Both mouse and human osteoblasts demonstrate a sharp drop of TUBB3, whereas differences of TUBB2 are more apparent in the mouse IDG-SW3. This may be explained by a predominant nuclear localization of TUBB2 in FHOBs as shown with immunofluorescence. IDG-SW3 also exhibits differential staining but within the cytoplasm. ChIP-seq analysis of differentiating MC3T3s revealed the recruitment of Runx2 to the TUBB2 gene. IHC of mouse femurs also demonstrates differential staining of these isotypes within the endosteum.

CONCLUSIONS Our study demonstrates a novel switch of TUBB2 and TUBB3 expression during bone development. Increased TUBB2 we believe reflects an increase in MT stability to promote the demands of bone mineralization. A key regulator of this switch appears to be Runx2 via its binding to the promoter of TUBB2. These findings and a better understanding of the Tubulin Code may one day serve to improve targeted therapies for bone diseases.

John Wong, Bachelor of Science

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PROTEOMIC PROFILING OF THORACIC VERTEBRAL BONE IN ALZHEIMER'S DISEASE SHOWS EVIDENCE OF ABERRANT CELL CYCLING THROUGH MINICHROMOSOME MAINTENANCE PROTEINS

INTRODUCTION Osteoporosis and Alzheimer's disease (AD) are two common age-related disorders associated with reduced quality of life and substantial morbidity and mortality. Although these may seem like two separate diseases, there is growing epidemiological data suggesting comorbidity between osteoporosis and AD that may go beyond the shared risk factors. Preliminary work in the Ross lab found associations between bone-related proteins and cognition, suggesting possible sharing mechanisms; however, these proteins were not unique to bone. To investigate the specific role of the skeleton in cognitive decline, this study leveraged vertebral core samples from the Rush Alzheimer's Disease Center (RADC) to examine the proteomic signatures of bone from participants with and without AD. This study aims to investigate differentially regulated proteins and pathways in vertebral core specimens in AD to potentially elucidate crucial mediators that link these diseases.

METHODS 45 age-matched women, 19 with a clinical diagnosis of AD prior to death and 26 without AD, were included in the study. Core samples from thoracic vertebrae (T6-T9) from obtained after death. Protein was extracted from trabecular bone within the cores and analyzed with global proteomics at the Pacific Northwest National Laboratory (PNNL). Statistically significantly changed proteins between AD and non-AD participants (adjusted p-value < 0.05) were quantified and compared according to the global cognitive status proximate to death.

RESULTS Three proteins were identified as being significantly altered in the bone tissue from participants with AD: MCM3, MOB1B, and RAB6D. Interestingly, the skeletal expression of MCM3, a protein essential for cell cycle progression, was significantly suppressed in the AD cohort (p = 0.0355). Furthermore, the expression levels of MCM6 and USP24, a ubiquitin that is protective against Parkinson's disease, were positively correlated with global cognitive scores proximate to death (p = 0.019 and p = 0.042).

CONCLUSION Vertebral core specimens from participants with AD show evidence of aberrant cell cycling through MCM expression. Further work is required to examine what cell types are involved using immunostaining, as well as the role of MCM signaling in the brain.

Alexis P. Jimenez-Uribe, PhD

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PROINFLAMMATORY CONDITIONS STIMULATE SGLT2 EXPRESSION ON MYELOID CELL CELLS

INTRODUCTION: SGLT2 inhibitors have exhibited a wide range of beneficial effects extending beyond their primary role in controlling blood sugar levels, including notable impacts on cardiac function. Given that SGLT2 expression predominantly occurs in kidney proximal tubule cells, the understanding of SGLT2 expression and its pathophysiological functions outside the kidney remains limited. This study aims to investigate the expression of SGLT2 in immune cells and elucidate their roles.

METHODS: Flow cytometry, in vitro myelopoiesis, LPS injection in mice.

RESULTS: Our multicolor flow cytometric analysis revealed the presence of SGLT2 in myeloid cells, with increased expression in inflammatory monocytic cells. Notably, during the process of in vitro myelopoiesis, the stimulation with TNF-alpha significantly expanded the populations of SGLT2+ cells. These SGLT2+ myeloid cells exhibit inflammatory characteristics, as evidenced by their immunophenotype marked by the expression of CD11bhi, HLA-DRhi, CD14+. Consistently, a marked increase of SGLT2+ cells were observed in mouse bone marrow following LPS injection.

CONCLUSION: These findings suggest the beyond the kidney, a subset of myeloid cells expresses SGLT2, and this population is expanded during inflammatory conditions. This implies a novel role of SGLT2 in the immune system, highlighting the potential impact of SGLT2 inhibition in modulating immune responses.

Alexander Kozuch, Master of Science in Biotechnology

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URINARY ACE PHENOTYPING AS A RESEARCH AND DIAGNOSTIC TOOL: IDENTIFICATION OF SEX-DEPENDENT ACE IMMUNOREACTIVITY

INTRODUCTION: Angiotensin-converting enzyme (ACE) is highly expressed in renal proximal tubules, but ACE activity/levels in the urine are at least 100-fold lower than in the blood. Decreased proximal tubular ACE has been associated with renal tubular damage in both animal models and clinical studies. Because ACE is shed into urine primarily from proximal tubule epithelial cells, its urinary ACE measurement may be useful as an index of tubular damage.

 METHODS: We applied our novel approach-ACE phenotyping-to characterize urinary ACE in volunteer subjects. ACE phenotyping includes (1) determination of ACE activity using two substrates (ZPHL and HHL); (2) calculation of the ratio of hydrolysis of the two substrates (ZPHL/HHL ratio); (3) quantification of ACE immunoreactive protein levels; and (4) fine mapping of local ACE conformation with mAbs to ACE. The study was approved by the Ethics Committee of the University of Debrecen and conducted in accordance with the Declaration of Helsinki.

RESULTS: In normal volunteers, urinary ACE activity was 140-fold less than in corresponding plasma/serum samples and did not differ between males and females. However, urinary ACE immunoreactivity (normalized binding of 25 mAbs to different epitopes) was strongly sex-dependent for the several mAbs tested, an observation likely explained by differences in tissue ACE glycosylation/sialylation between males and females. Urinary ACE phenotyping also allowed the identification of ACE outliers. In addition, daily variability of urinary ACE has potential utility as a feedback marker for dieting individuals pursuing weight loss.

CONCLUSION: Urinary samples are simple and inexpensive to obtain and represent a promising new approach for the development of precision medicine screening in ACE-related diseases. Here we demonstrate the potential power and clinical utility of urinary ACE phenotyping by defining novel sex-specific differences in urinary ACE structure and function. These variations are likely due to differential sialylation of the ACE protein, and they provide novel insights into the sex differences observed in some ACE-related diseases. Future work will build upon these insights to further define their precision medicine potential.

Alia Alia, Bachelors of Science in Psychology

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DIFFERENTIAL INFLAMMATORY GLYCAN PROFILE OF IGG IN MATCHED CEREBROSPINAL FLUID AND PLASMA OF ALZHEIMER'S DISEASE PATIENTS AS A READOUT OF CENTRAL NERVOUS SYSTEM HOMEOSTASIS

INTRODUCTION Alzheimer's disease (AD) is characterized by the deposition of neurotoxic amyloid-β plaques that result in synaptic dysfunction, inflammation, and dementia where cognitive symptoms are exhibited later in life. Thus, disease detection is often delayed, hindering the effectiveness of immunotherapy treatments that may have enhanced outcomes in earlier cases with milder cognitive decline. Therefore, there is a critical need for improved disease detection strategies and an overall understanding of IgG glycoforms as indicators of inflammation in plasma and cerebrospinal fluid (CSF) of AD patients and the influence of inflammatory glycans on CNS homeostasis through disease progression. This study aims to investigate alterations in IgG glycans within CSF and plasma of patients with AD to identify biomarkers of inflammation, disease onset and pathology.

METHODS We assessed bulk IgG glycosylation by isolating IgG in patient matched plasma that was collected at the time of diagnosis and CSF collected at the time of death of AD patients. Isolated IgG samples were run on SDS-PAGE gel to separate the heavy chains from the light chains. Heavy chains were then excised, and Time-of-Flight mass spectrometry was performed to identify glycoforms. We then quantified percent glycan traits within the matched samples as well as correlated glycoforms with clinical symptoms.

RESULTS Our results report significantly reduced levels of bisecting fucosylated IgG in AD CSF when compared to healthy control CSF, with a significant influence attributed to the decrease of galactose. Moreover, we found significantly reduced bisecting fucosylated IgG in AD CSF when compared to the plasma collected at the time of diagnosis.

CONCLUSION Our findings establish an inflammatory state marked by decreased fucosylated bisecting IgG within the CNS of AD patients. These results are in accordance with inflammatory glycosylation studies that demonstrate decreases in fucose bisecting IgG species are associated with reduced cell binding and interaction. The implications of these findings are critical to the development and delivery of antibody therapy.

Gabrielle Kooi, BS in Biology; MS in Integrated Biomedical Sciences

Gabrielle Kooi (RUSH), Michelle. Ash (RUSH), Anjelica Reyes (RUSH), Leannie Olivares (RUSH), Amber Virdi (RUSH), Lena Al-Harthi (RUSH), Jeffrey Schneider (RUSH)

BIODISTRIBUTION AND KINETICS OF LABELED IGG, FOLLOWING IP INJECTION IN A HUMANIZED MOUSE MODEL, REVEALS A PEAK AT 48HRS AND MYELOID CELL ASSOCIATION IN THE CNS

INTRODUCTION: The use of monoclonal antibodies(mAbs) as a therapeutic treatment for various diseases has been on the rise over the years. Previous studies have shown tissue-specific antibody penetration, with the Central Nervous System(CNS) having lower penetration compared to other peripheral organs. This has been attributed to the tight regulation of the blood brain barrier, with only 0.1-1% of antibodies crossing into the CNS following intravenous injection. Therefore, there is a need for enhancing drug and antibody delivery into the CNS that target neurodegenerative diseases and viral infections. For example, Human Immunodeficiency Virus(HIV) is a chronic infection that impacts the brain as early as two weeks post-exposure. Because of its compartmentalization, the brain is a major HIV reservoir that poses a challenge to fully clearing the virus due to low penetration of therapeutics such as combination antiretroviral therapy(cART) and neutralizing antibodies.

METHOD: We utilize a humanized NSG mouse model to visualize and track cy5-labeled IgG at various timepoints following intraperitoneally(IP) injection that were necropsied at 6hrs, 24hrs, 48hrs, 72hrs, 1 week. The brain and peripheral tissues(liver, small intestine, and spleen) were sectioned for fluorescent microscopy to visualize antibody distribution ex vivo. Cells were stained for GFAP(astrocytes), Iba1(microglial cells) and F4/80(myeloid-derived cells). Whole tissue brain and spinal cord visualization of Cy5-signal was imaged using the Licor Odyssey. Detection of Cy5-signal was measured in homogenized brain and peripheral tissues via fluorometry.

RESULTS: Fluorescent microscopy revealed that myeloid-derived and microglial cells can uptake IgG, but not astrocytes. Odyssey imaging revealed that peak antibody penetration in the CNS was detected 48-hrs-post-IP injection and confirmed by the fluorometry values. Imaging also highlighted the spinal cord as a possible route of trafficking IgG to the CNS. As expected, the liver had the highest level of Cy5-signal.

DISCUSSION: Understanding the biodistribution of injected antibodies further aids in development of treatments for diseases. Our study begins to characterize the distribution of IgG across peripheral and CNS tissues in vivo. Considering myeloid cells are associated with the injected IgG and are also enriched for FcyRs, there is a potential to enhance binding to these cells through glycoengineering to enhance delivery to the brain.

Brittany Avonts, BA

Brittany Avonts (Rush); Richard G Fessler (Rush); and Brian T David (Rush)

INFLAMMATORY AND LOCOMOTOR CHANGES ASSOCIATED WITH CENTRAL NEUROPATHIC PAIN IN RATS WITH MECHANICAL AND THERMAL SENSITIVITY ABNORMALITIES AFTER SPINAL CORD INJURY

INTRODUCTION Central neuropathic pain (CNP) commonly develops in individuals after spinal cord injury (SCI), causing debilitating symptoms and sensory abnormalities to traditionally non-noxious mechanical and thermal stimuli. CNP regularly presents itself approximately one year after injury in humans, following ostensibly permanent cellular and anatomical changes. Previous scientific studies have demonstrated greater efficacy of treatments when delivered preemptively, but the biological variability in individuals has limited the number of positive outcomes. Thus, it is necessary to investigate the physiological processes contributing to sensory changes that develop over time.

METHODS Using the tail flick and von Frey tests, we performed hierarchical clustering to determine the subpopulation of rats that developed thermal and mechanical sensory abnormalities. To measure inflammation as a potential mediator of CNP phenotypes, we used flow cytometry and immunohistochemistry. Lastly, to assess the secondary effects on locomotor recovery, up to 8 weeks after injury, we used the CatWalk test to assess multiple parameters of gait.

RESULTS Using the von Frey test, a subpopulation of SCI rats was shown to be hyposensitive to mechanical stimuli from 6-8 weeks following injury. Conversely, the tail flick test showed a subpopulation of SCI rats that were hypersensitive to thermal stimuli at 1 week and 3-8 weeks after injury. While there were no differences in inflammatory cells between these subpopulations, we did see significant changes in locomotor recovery between rats with and without sensory abnormalities.

CONCLUSION We conclude that the myeloid cell population is not affected by mechanical or thermal phenotypes of pain, however locomotor recovery is impaired depending on the pain phenotype present. Further investigation into acute inflammatory cells may be insightful for predicting the development of pain phenotypes and provide more treatment options for an individualized approach.

Stefanie Cassoday, B.S.

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SARS-COV-2 DIRECTLY AND INDIRECTLY ENHANCES HYPERACTIVITY OF MEDIAL PREFRONTAL CORTEX PYRAMIDAL NEURONS IN THE CONTEXT OF COMBINED NEUROHIV AND COCAINE ABUSE

INTRODUCTION: Neurocognitive impairments are associated with HIV-associated neurocognitive disorders (HAND, a.k.a. neuroAIDS or neuroHIV), cocaine use disorder (CUD), and more recently COVID-19. As the medial prefrontal cortex (mPFC) is one of the key regulators of neurocognition in the brain, it poses as a location that is vulnerable to neuronal damage from pathologies of these diseases. Determining whether, how, and to what extent SARS-CoV-2 viral protein and the immune response to the virus per se alter the functional activity of mPFC pyramidal neuron in the brain, with or without the influences of neuroHIV and/or CUD, is crucial for understanding the etiology of the neurological and neurocognitive impairments, as well as the potential mechanism of such synergistic epidemics (syndemic), among these patients.

METHODS: HIV-1 transgenic (Tg) and non-Tg rats were trained to self-administer cocaine (Coc-SA) 1mg/kg per 0.1mL infusion, for 2 weeks (w), followed by a 3w withdrawal along with drug-seeking test on days 3 and 21. Saline (SAL)-yoked rats, regardless of genotype, were used as control. After withdrawal, rat brains were removed and sliced for whole-cell patch-clamp electrophysiology evaluation. Slices were perfused with either SARS-CoV-2 spike (S) protein (in µM: 0, 1, 2.5, 5) or human plasma-isolated IgG antibodies (in µg/mL: 2.5, 5) from severe COVID-19 patients. Then the firing activity of mPFC pyramidal neurons was assessed.

RESULTS: We found that both HIV-1 Tg and non-Tg rats displayed similar drug-taking behaviors. However, during the 3w withdrawal the Coc-SA rats showed attenuated drug-seeking behaviors, though that were still associated with significantly increased firing of mPFC pyramidal neurons. Both SARS-CoV-2 S protein and COVID-19 IgG antibodies enhanced the firing activity of mPFC pyramidal neurons in SAL-yoked rats. Additionally, regardless of genotype, both compounds further enhanced the already-increased abnormal firing of mPFC neurons in Coc-SA rats.

CONCLUSION: These novel findings demonstrate that SARS-CoV-2, either directly or indirectly, induce hyperactivity of mPFC pyramidal neurons in the brain, which could cause neurotoxicity and ultimately contribute to the neurocognitive deficits observed in COVID-19 patients; and that could also exacerbate mPFC neuronal dysfunction in neuroHIV and/or CUD.

Michael Chojnacki, BS

Michael R. Chojnacki, Eric B. Thorndike, John S. Partilla, Charles W. Schindler, Michael H. Baumann (Designer Drug Research Unit and Preclinical Pharmacology Section, National Institute on Drug Abuse Intramural Research Program, Baltimore, Maryland), and Kenner C. Rice (Drug Design and Synthesis Section, National Institute on Drug Abuse and National Institute on Alcohol Abuse and Alcoholism Intramural Research Programs, Rockville, Maryland)

NEUROCHEMICAL AND CARDIOVASCULAR EFFECTS OF 4-CHLORO RING-SUBSTITUTED SYNTHETIC CATHINONES IN RATS

INTRODUCTION Synthetic cathinones are stimulants which present a public health threat. The 4-chloro ring-substituted cathinones, 4-chloromethcathinone (4-CMC), 4-chloroethcathinone (4-CEC), and 4-chloro-a-pyrrolidinopropiophenone (4-CaPPP) have not been characterized. We wanted to investigate the pharmacological effects of these drugs in comparison to the better characterized compound, 4-methymethcathinone (mephedrone).

METHODS In vivo rodent procedures were approved by the National Institute on Drug Abuse IACUC. 24 male rat brain synaptosomes were used in assays assessing release and uptake ability of cathinone compounds at dopamine transporter (DAT), norepinephrine transporter (NET) and serotonin transporter (SERT). Data was analyzed by non-linear regression and fit to a model yielding concentrations at half-maximal release.   In vivo biotelemetry monitoring was conducted using 7 male rats. Mean arterial pressure (BP), heart rate (HR), temperature, and locomotion were monitored after exposure to various doses of 4-CMC, 4-CEC, 4-CaPPP and mephedrone. Antagonist studies were conducted to determine possible physiological mechanisms for cardiovascular outcomes observed. Rats were monitored after pre-exposure to the alpha-1 antagonist prazosin, the ganglionic blocker chlorisondamine, or the dopamine D1 receptor antagonist SCH23390. Data was analyzed by 2-way ANOVA with post-hoc analyses.

RESULTS Uptake inhibition and release assays showed that 4-CMC and mephedrone functioned as uptake inhibitors and substrate releasers at DAT, NET, and SERT. 4-CaPPP was an uptake inhibitor at DAT and NET. 4-CEC was a substrate releaser at only SERT.   Telemetry data showed that 4-CMC increased BP, HR, and activity in a dose-dependent manner. Mephedrone, 4-CEC, and 4-CaPPP showed similar effects with these endpoints. 4-CMC had the most robust effects in the dose-response study, so we examined the effect of various antagonist drug pre-treatments. Chlorisondamine pretreatment reversed 4-CMC induced hypertension. SCH23390 pretreatment reduced the effect of 4-CMC on locomotor activity. Prazosin pretreatment reversed 4-CMC induced hypertension.

CONCLUSIONS 4-chloro cathinones interact at DAT, NET, and SERT with substrate-releasing and uptake-inhibiting effects. 4-CMC's transporter releasing effects were like findings from previous studies. All compounds showed cardiovascular effects, with 4-CMC yielding the most prominent effects. This study demonstrates these compounds' varying pharmacological and cardiovascular effects and suggests they may have adverse effects in humans. Future studies should include female rats to generalize findings.

Pamela Shelby Prieto del Rivero, Biotechnology Engineering Bachelor's degree

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DIFFERENTIATION OF OLIGODENDROGLIAL PROGENITOR CELLS TO OLIGODENDROCYTES, IMPLICATIONS FOR MS.

INTRODUCTION: Oligodendrocytes are the myelinating cells in the CNS and multiple sclerosis (MS) is a demyelinating disorder that is characterized by progressive loss of myelin because immune cells induce the apoptosis of oligodendrocytes. Although oligodendroglial progenitor cells (OPCs) should be differentiated to oligodendrocytes, for multiple reasons, OPCs fail to differentiate to oligodendrocytes in MS. Therefore, increasing the maturation of OPCs to oligodendrocytes may be of therapeutic benefit for MS. The β-hydroxy β-methylbutyrate (HMB) is a muscle-building supplement in human and this study underlines the importance of HMB in stimulating the maturation of OPCs to oligodendrocytes.

METHODS: OPC cells from C57BL/6 pups were isolated and purified. After HMB treatment, we studied the differentiation of the cultured OPCs by mRNA, double-label immunofluorescence and immunoblot analyses.

RESULTS: As evident from mRNA analysis HMB treatment upregulated the expression of different maturation markers including PLP, MBP and MOG in cultured OPCs. Double-label immunofluorescence followed by immunoblot analyses confirmed the upregulation of OPC maturation by HMB. While investigating mechanisms, we found that HMB increased the maturation of OPCs isolated from peroxisome proliferator-activated receptor β-/- (PPARβ-/-) mice, but not PPARα-/- mice. GW9662, a specific inhibitor of PPARγ, also could not inhibit HMB-mediated stimulation of OPC maturation. Furthermore, HMB treatment of OPCs led to the recruitment of PPARα, but neither PPARβ nor PPARγ, to the PLP gene promoter.

CONCLUSIONS: These results suggest that HMB stimulates the maturation of OPCs via PPARα and that HMB may have therapeutic prospect in remyelination. This opens the possibility to a novel application of HMB for MS patients.

Christina Rogers, B.Mus., MD Candidate

Christina A. Rogers, B. Mus. Brittney S. Lange-Maia, PhD, MPH Maude Wagner, PhD Christy Tangney, PhD, FACN, CNS Michael E. Schoeny, PhD Shannon Halloway, PhD, RN Zoe Arvanitakis, MD, MS

PROFILES OF HEALTHY LIFESTYLE BEHAVIORS AND POSTMORTEM NEUROPATHOLOGY

INTRODUCTION: High engagement in late-life health behaviors is associated with enhanced cognition and reduced cognitive decline, but its connection to postmortem brain neuropathology remains unexplored.

METHODS: Participants were decedents (n=555; mean baseline age =84 [SD: 6] years, 73% female), initially dementia-free, who completed systematic annual clinical evaluations and underwent postmortem brain autopsy. Lifestyle health behaviors (physical activity, adherence to a healthy diet, cognitive activity, social interaction) were assessed with questionnaires. Latent profile analysis categorized participants based upon baseline levels of engagement in these four lifestyle health behaviors. Presence and degree of neurodegenerative and neurovascular pathologies were determined though brain autopsy using uniform procedures. Linear and logistic regression models with adjustment for age-at-death and sex were used to examine associations of the latent profiles with pathology.

RESULTS: Two latent profiles of lifestyle health behavior engagement emerged, reflecting habits approximately 8 years before death: individuals with low engagement across all four behaviors (n=224) and those with high engagement across all behaviors (n=331). No differences were found between high and low engagement groups for any of the examined neurodegenerative (levels of Alzheimer's disease or otherwise) or neurovascular pathologies (infarcts or vessel pathologies), both in core models and when considering potential confounding factors such as vascular risk factors.

CONCLUSION: While high engagement in lifestyle health behaviors has been linked to less cognitive decline, our findings do not support associations with traditional and common neurodegenerative or vascular neuropathology of dementia. This suggests that alternative mechanisms associated with these behaviors confer neuroprotective effects against cognitive decline.

Han Tong, MBBS, MMed, PhD

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ASSOCIATIONS OF RENIN-ANGIOTENSIN-SYSTEM INHIBITOR USE WITH POSTMORTEM BRAIN INSULIN SIGNALING AND NEUROPATHOLOGY

INTRODUCTION: The use of renin-angiotensin-system (RAS) inhibitors has been associated with both improved peripheral insulin signaling and a reduced risk of dementia. However, whether RAS inhibitor use also improves insulin signaling in the brain and reduces neuropathology remains unclear. The objective of this study was to examine the associations of renin-angiotensin system (RAS) inhibitor use with postmortem brain insulin signaling and dementia-related neuropathology.

METHODS: Among Religious Orders Study participants,150 deceased and autopsied older individuals (75 with diabetes matched to 75 without by age at death, sex, and education) had measurements of insulin receptor substrate-1 (IRS-1) and RAC-alpha serine/threonine protein kinase (AKT1) collected in the prefrontal cortex using enzyme-linked immunosorbent assay (ELISA) and immunohistochemistry. Alzheimer's disease (AD), brain infarcts, and cerebral vessel pathologies data were assessed by systematic neuropathologic evaluations. RAS inhibitor use was determined based on visual inspection of medication containers during study visits. The associations of RAS inhibitor use with brain insulin signaling measures and neuropathology were examined using adjusted regression analyses.

RESULTS: RAS inhibitor users (N=90) included 54 with diabetes and 36 without diabetes. RAS inhibitor use was associated with lower pT308AKT1/total AKT1 (estimate=-0.397, p=0.019), but not with pS307IRS-1/total IRS-1 or the density of cells stained positive for pS616IRS-1. RAS inhibitor use was not associated with the level of global AD pathology or amyloid beta burden, but it was associated with a lower tau-neurofibrillary tangle density (estimate=-0.425, p=0.022). Furthermore, we found a significant interaction between diabetes and RAS inhibitors on tangle density (estimate=-1.174, p=0.001). Lastly, RAS inhibitor use was associated with more atherosclerosis (estimate=0.721, p=0.047), but not with other cerebral blood vessel pathologies or cerebral infarcts.

CONCLUSION: Late-life RAS inhibitor use is associated with lower AKT1 phosphorylation and fewer neurofibrillary tangles in postmortem brains.

Robin Vroman, Master in Biochemistry and Biotechnology

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ANALYSIS OF MATRISOME EXPRESSION PATTERNS IN MURINE AND HUMAN DORSAL ROOT GANGLIA

INTRODUCTION The extracellular matrix (ECM) is a dynamic structure of a large number of molecules that can be divided into six different categories and are collectively called the matrisome. The ECM plays pivotal roles in physiological processes in many tissues, including the nervous system. Intriguingly, alterations in ECM molecules/pathways are associated with painful human conditions and murine experimental pain models. Nevertheless, mechanistic insight into the interplay of normal or defective ECM and pain is largely lacking.

METHODS We used a transcriptome approach to investigate the expression and cellular origin of matrisome genes in murine and human dorsal root ganglia (DRG), containing the cell bodies of sensory neurons. We used bulk RNA sequencing (RNAseq), single cell RNAseq (scRNAseq) and spatial transcriptomics combined with RNAscope in situ hybridization and immunohistochemistry.

RESULTS Bulk RNA sequencing showed that about 65% of all matrisome genes were expressed in both murine and human DRG, with proportionally more core matrisome genes (collagens, glycoproteins, and proteoglycans) expressed compared to matrisome-associated genes (ECM-affiliated genes, ECM regulators and secreted factors). Examination of the cellular origin of matrisome expression by single cell RNA-seq on murine DRG revealed that core matrisome genes, especially collagens, were expressed by vascular leptomeningeal-like (fibroblast) cell types whereas matrisome-associated genes were expressed by neuronal cells. Cell-cell communication network analysis with the CellChat software predicted an important role for the collagen signaling pathway in connecting vascular cell types and nociceptors in murine tissue, which we confirmed by analysis of spatial transcriptomic data from human DRG. RNAscope in situ hybridization and immunohistochemistry confirmed expression of collagens in fibroblasts surrounding nociceptors in human DRG. As a final step, we also found 92 differentially regulated matrisome genes in bulk RNAseq data from patients with and without neuropathic pain.

CONCLUSION This study supports the idea that the DRG matrisome may contribute to neuronal signaling in both mouse and human. The identification of the cellular distribution of murine and human matrisome genes provides a framework to study the role of the ECM in peripheral nervous tissue and its effects on pain signaling in for example heritable connective tissue disorders.

Neal Wrobel, B.S.

Neal Wrobel (RUMC), Richard G. Fessler (RUMC), Brian T. David (RUMC)

A LONG-TERM CHARACTERIZATION OF THE SPINAL CORD IMMUNE RESPONSE FOLLOWING CONTUSIVE INJURY IN MICE

INTRODUCTION In traumatic spinal cord injury (SCI), a primary mechanical insult to the spinal cord causes immediate tissue damage and neurological dysfunction. The primary injury is followed by a protracted series of events, termed "secondary injury", which takes place over weeks or months and results in additional tissue damage. Primary injury also rapidly sparks a robust immune response within the spinal cord, consisting of activation of central nervous system (CNS) resident immune cells and infiltration by peripheral immune cells. The spinal cord immune response persists chronically and is regarded as a major influencer of the progression and severity of secondary injury.

METHODS We present an extensive, long-term characterization of the post-injury immune response in spinal cords of adult (10-12-week-old) female wild type (C57BL/6) mice, following a moderate (50 kdyn) spinal cord contusion at T9. For each cohort, one group of mice received a T9 laminectomy and spinal cord contusion (n=8/cohort), while the control group remained naïve (n=6/cohort). Nine terminal assessment time points were included, ranging from 1 day to 6 months post-injury. At each terminal time point, relative levels of helper T cells, cytotoxic T cells, regulatory T cells, as well as macrophages and microglia, were assessed via flow cytometry. Measures of locomotor (open-field task) and sensory (tail flick) function were used to identify correlations between behavioral recovery and the prevalence of certain immune cell types.

RESULTS The spinal cord immune response exhibits a biphasic pattern, with one peak of peripheral immune cell infiltration between 1- and 2-weeks post-injury, then a second peak at 2 months post-injury. Both T cells and peripheral macrophages remain elevated at 6 months post-injury. At 6 months post-injury, higher immune cell infiltration correlates with more normalized sensory function but may also be associated with spleen hypertrophy.

CONCLUSION Our results highlight the persistent and highly dynamic nature of the SCI immune response and indicate that certain effects of the spinal cord immune environment on behavioral function and on the peripheral immune system are still developing even in the chronic phase of the injury.

Kayvon Yazdanbakhsh, MPH

Kayvon Yazdanbakhsh (Rush); Lillian Hallmark (Rush); Jacob Riccio (Rush); Annabelle S. Volgman, MD (Rush); Neelum T. Aggarwal, MD (Rush)

THE PREVALENCE OF COGNITIVE IMPAIRMENT IN PATIENTS WITH IMPLANTABLE CARDIAC DEVICES AT RUSH UNIVERSITY MEDICAL CENTER IN CHICAGO, ILLINOIS

INTRODUCTION Little is known about the correlation between cognitive impairment (CI) and type of cardiac implantable electronic devices (CIED). We postulated that patients with an implantable cardiac device (ICD) had a higher risk of CI than patients with pacemakers due to worse cardiovascular disease (CVD).

METHODS A retrospective chart review from the Rush device clinic (07/01/2020-2022) identified patients who had a CIED (pacemaker or ICD), had clinically documented CI, or were on any of the following medications: donepezil, galantamine, rivastigmine, or memantine. Demographic characteristics and past medical history were assessed.

PARTICIPANTS/RESULTS: 1900 participants were screened and 366 were excluded by criteria. 53 patients had at least one prescription medication for CI. An additional 57 patients were not on a CI medication but had clinically documented CI and/or dementia. In total, 110 patients with CIED had documented CI (Table 1). Preliminary analysis noted no correlation between the CIED type and CI. Among patients with CI, those taking dementia medications were more likely to have pacemakers than ICDs ($X2(1, 110)=8.34$, $p=0.004$).

DISCUSSION/CONCLUSION: Within the Rush device clinic, a small percentage (7.1%) of patients had both CIED and CI. There was no correlation between the type of CIED and the presence of any CI, however pacemakers, not ICDs, were associated with medication prescription. Further analyses are ongoing to assess the severity of CVD among these patients and its relationship to these findings.

Ankita Batra, Bachelor of Science

Ankita Batra (RMC); Dr. Nina Goyal (RMC)

EVALUATING THE USABILITY OF NOVEL EYE DROP DEVICE AIDS

INTRODUCTION Glaucoma is a chronic condition characterized by degeneration of the optic nerve. It is the leading cause of irreversible vision loss worldwide. Elevated IOP remains one of the most important risk factors in the progression of glaucoma. Thus, pressure-lowering drugs have been at the forefront of management and prevention. Eye drop medications are the most common route for treatment and aim to reduce high IOPs. However, many patients face difficulties with self-administration of eye drop medications due to poor aim, excess leakage, contamination, and physical disabilities. We assessed the safety and efficacy of two novel eye drop aid devices in conjunction with a conventional bottle of artificial tears. We hypothesize that device #1 will be the favorable method of eye drop delivery because it has a more stabilizing component.

METHODS We propose a prospective, questionnaire-based, cross-sectional study to assess subjective data on the usability of novel eye drop aid devices. The two devices originated from Northwestern's Design Thinking and Communications (DTC) program. If eligible to participate, patients will receive three items: a conventional eye drop bottle of artificial tears and two prototypes of eye drop aid devices. Patients will self-administer one drop of artificial tears into each eye by first using the conventional bottle. They will repeat the process with each device. Subjective data on user experience will be collected via a patient questionnaire. The patient questionnaire is based on the Visual Function Questionnaire (VFQ-25). Aim, stability, mechanism of squeezing, and usability of devices will be evaluated. The secondary aim is to assess the relationship between device usability with other clinic/demographic data such as age, gender, and race.

RESULTS The data have shown inconclusive results since the sample size is currently 28 patients. A larger sample size can yield more significant data.

CONCLUSION Although further research is warranted, these findings contribute greatly to a more positive user experience. With a better solution to medication application, glaucoma patients can have better outcomes. This project addresses patient-focused medical innovation, socioeconomic differences, access to care, and quality improvement.

Mohan Bhadriraju, BA

Mohan Bhadriraju (Rush Medical College) Andrea Cuamatzi-Castelan (Rush Medical College) Mathew MacCumber (Department of Ophthalmology, Rush University Medical Center)

THE EFFECT OF ANTI-VEGF INTRAVITREAL INJECTIONS ON CORNEAL HYSTERESIS

INTRODUCTION Anti-vascular endothelial growth factor (VEGF) intravitreal injections (IVIs) are the gold-standard treatment for common retinal disorders. However, they have been associated with increased IOP which can increase a patient's risk for developing glaucoma. In addition to IOP, we can use corneal hysteresis (CH), an indicator of the cornea's ability to absorb and dampen the impact of intraocular pressure fluctuations, to provide further insight into corneal biomechanics. This longitudinal study aims to investigate the relationship between the number of anti-VEGF IVIs received and CH in patients undergoing treatment for diabetic retinopathy (DR), retinal vein occlusion (RVO), and neovascular AMD (nAMD).

METHODS: IOP and CH measurements were conducted, prior to IVI administration, using the Reichert Ocular Analyzer in 46 eyes, at initial and follow-up visits to compare the change in CH over time. Of the 46 eyes, 26 received IVIs while 20 did not, serving as our control group. Participants were >18 years old with a diagnosis of nAMD (10 patients; 11 eyes), RVO (6 patients; 8 eyes) and DR (7 patients; 7 eyes). The average time elapsed in months between the first and last injections was 7.92, with a standard deviation of 3.77 and a range from .95 to 12.12 months.

RESULTS: Paired samples T-test revealed no difference between CH initial and final measurements in eyes that received IVIs, t(df) = (-.697, 25), (p > .05). Linear regression analysis revealed no correlation between the number of injections and difference observed between initial and final CH measurements ($R2$ =.012, F (1,24) =.293, p > .05). The mean number of IVIs administered between the initial and final CH measurements and their standard deviations were calculated for each diagnosis: AMD (mean = 3.36, SD = 1.63), RVO (mean = 4, SD = 1.98), DR (mean = 2, SD = 1.29). Statistical testing revealed no change in CH over the period for any condition and no correlation between the number of injections and the difference in CH.

CONCLUSION: Our study did not identify a significant relationship between IVIs and CH. Future research with a larger sample size may elucidate the potential impact of anti-VEGF treatment on CH.

Fae Kayarian, B.S.

Fae Kayarian, BS (RUSH); Jordan Johnson, DO (South Bay Hospital, FL); Gary D. Peksa, PharmD, MBA (RUSH); Michael Gottlieb, MD (RUSH)

DIFFERENCES IN MEAN OPTIC NERVE DIAMETER MEASUREMENTS BASED ON DEPTH

BACKGROUND The measurement of optic nerve sheath diameter (ONSD) using point-of-care ultrasound (POCUS) is a well-tolerated procedure that assesses intracranial pressure. Conventional protocol requires the POCUS operator to measure ONSD 3mm posterior to the globe, which corresponds to the bulbous portion of the optic nerve. While some studies suggest 3mm is ideal for measurement of ONSD as it represents the site of maximal pressure within the nerve, others studies haven't found a difference in ONSD between 3mm and 5mm. This investigation compares mean ONSD measurements at various depths to assess whether a significant difference exists.

METHODS This was an IRB-approved, prospective, observational study of Emergency Department adults (age ≥ 18 years) who underwent computed tomography maxillofacial scan. Patients who had not undergone computed tomography maxillofacial or had facial trauma were excluded. A single ultrasound fellow performed POCUS using a C1-5 transducer at depths of 2mm, 3mm and 4mm posterior to the globe in the sagittal, transverse and coronal planes. The fellow recorded a six-second video clip for each depth in each plane and reported a real-time ONSD measurement (centimeters).

RESULTS We enrolled 15 patients (67% women), comprising 30 total eyes. At a depth of 2mm, 3mm, and 4mm, the mean (SD) measured ONSD was 4.61 (1.02), 5.07 (0.94), and 5.38 (0.91), respectively. In a pairwise comparison, mean difference and correlation between 4mm and 3mm depths was 0.31 (95%CI 0.23-0.39; $p < 0.001$; r2 0.98) and between 3mm and 2mm depths was 0.46 (95% CI 0.34 to 0.59; $p < 0.001$; r2 0.97). Using repeated measures ANOVA with depth as the independent variable and ONSD as the dependent variable, Greenhouse-Geisser corrected analysis revealed a significant main effect of the depth ($F_{(1.226, 35.565)} = 109.164$; $p < 0.001$; $\eta^2 = 0.790$).

CONCLUSION The results of our investigation suggest that optic nerve sheath diameter (ONSD) measured by point-of-care ultrasound (POCUS) consistently increases with depth, with statistically significant differences of ONSD measurements at 2mm depth, 3mm depth and 4mm depth. This suggests that the prior conventional use of 3 mm depth for measurement of ONSD with POCUS should be maintained as differences in ONSD at different depths could introduce clinically misleading variability.

Jake Lesher, BA

Jake Lesher, BA (Rush) Andrew Zolot, MD (Rush) Anjali Hawkins, MD, PhD (Rush)

A RETROSPECTIVE ANALYSIS OF ADHERENCE TO THE AMERICAN ACADEMY OF OPHTHALMOLOGY GUIDELINES FOR HYDROXYCHLOROQUINE RETINOPATHY SCREENING

INTRODUCTION Adherence to hydroxychloroquine (HCQ) retinopathy screening guidelines as set by the American Academy of Ophthalmology (AAO) in 2016 has not yet been studied in a clinical setting. These guidelines include initiating optical coherence tomography (OCT) and Humphrey Visual Field (HVF) testing only after five years of HCQ therapy, and maintaining dosages of HCQ under 5 mg/kg/day based on real body weight. The purpose of this retrospective study was to assess the Rush University Department of Ophthalmology's compliance with the AAO HCQ retinopathy screening recommendations.

METHODS A retrospective chart review from 1/1/2017-12/31/2019 was done. All 391 patients taking HCQ without any baseline retinal pathology were included. Rates of testing and communication with rheumatologists about dosage were recorded.

RESULTS Rates of excessive optical coherence tomography (OCT) and visual field (VF) testing during the first five years of HCQ therapy were 56.3% and 48.2%, respectively. Rates of missed OCT and VF testing after five years were 11.6% and 15.8%. Among 118 patients (30.2%) taking over 5mg/kg/day of HCQ, a rheumatologist was contacted for dosage reduction at 64.5% of visits, with lower dosages noted at 25.0% of follow-up visits.

CONCLUSION Overtesting occurs early in HCQ treatment, while undertesting rates remain relatively low, suggesting that a significant proportion of patients receive OCT and HVF tests before there is any substantial risk of retinopathy. Consistent communication with rheumatologists for dosage adjustment is crucial to minimize unnecessary risk. However, rheumatologists often maintain the same dosage despite ophthalmologists' recommendations.

Matthew Lim, BS

Matthew Lim, BS (Rush); Oscar Chen, MD, MS (Rush); and Anjali Tannan, MD (Rush)

COMPARING GOLDMANN, ICARE, TONO-PEN, AND OCULAR RESPONSE ANALYZER MEASUREMENTS IN PATIENTS WITH CORNEAL EDEMA AFTER CATARACT SURGERY

INTRODUCTION   Although Goldmann applanation tonometry (GAT) remains the gold standard for intraocular pressure (IOP), alterations in corneal parameters can impact the accuracy of GAT-IOP. We aim to compare IOP measurements across GAT, iCare Rebound Tonometry (RT), Tono-Pen XL (TXL), and Ocular Response Analyzer (ORA) in patients with corneal edema after cataract surgery.

METHODS   A prospective and comparative study was performed on patients who had undergone cataract surgery. The study is IRB-approved and informed consent was obtained for all research subjects. The study population included Rush University Eye Center Physicians and University Ophthalmology Associates patients. Central corneal thickness (CCT) was measured via ultrasound pachymetry and IOP values across GAT, RT, TXL, and ORA were obtained from 57 eyes of 57 patients. The average of three measurements per device was used for analysis on Microsoft Excel. Corneal-compensated IOP (IOPcc) and Goldmann-correlated IOP (IOPg) were obtained via ORA. Exclusion criteria were patients younger than 18 years of age, history of glaucoma, ocular hypertension, use of antiglaucoma medication, keratoplasty, refractive surgery, and inability to complete testing.

RESULTS   Mean GAT-IOP was 16.6 ± 5.7 mm Hg (range, 10-33), and mean CCT was 586.4 ± 54.6 μm (range, 474.3-698.3). Mean RT-IOP was 16.7 ± 6.9 mm Hg (range, 8-34), which was not statistically different than GAT-IOP (p = 0.92). Mean TXL-IOP was 18.5 ± 6.1 mm Hg (range, 5-33.3), which was statistically higher than GAT-IOP (p = 0.02). Mean IOPcc was 22.1 ± 8.4 mm Hg (range, 11.4-45.8), which was statistically higher than GAT-IOP (p = 0.00). Mean IOPg was 20.1 ± 7.9 mm Hg (range, 8.2-40.2), which was statistically higher than GAT-IOP (p = 0.00).

CONCLUSION   Corneal edema due to cataract surgery may lead to an overestimation error of IOP based on different modalities. There was no significant difference in IOP between GAT and RT. However, TXL and ORA measurements were significantly greater than GAT-IOP. These findings may be useful in understanding which tonometer would give the most accurate IOP in patients with corneal edema after cataract surgery who require treatment.

Dylan Raikar, BA

Oscar Chen, MD, MS; Jake A. Lesher, BS; Matthew J Lim, BS; Christopher W. Skaggs, BS; Romney V. Hansen, BS; Durdana Shah, BS; Anjali Tannan, MD

THE EFFECT OF SEASONAL CLIMATE VARIATIONS ON POSTOPERATIVE CATARACT SURGERY COMPLICATIONS

INTRODUCTION/PURPOSE: While the interplay of environmental factors and ocular health has been well documented, the effect of the environment on the outcomes of ophthalmic procedures has been poorly studied. The aim of this study is to determine if seasonal climate variations influence postoperative cataract surgery outcomes.

METHODS: A retrospective chart review was conducted. Patients ages 18 and older who underwent cataract surgery from 2017 to 2022 were identified from two clinics at Rush Medical Center. Patients were excluded if they were lost to follow-up within 90 days of the procedure. Study parameters were evaluated prior to the procedure and during all follow-up appointments within the postoperative period following cataract surgery. Postoperative complications includes retinal tears and detachments, endophthalmitis, rebound iritis, bullous keratopathy, cystoid macular edema, and posterior capsule opacification. Meteorological data will include temperature, humidity, precipitation, and atmospheric pressure.

RESULTS: 1613 patients were eligible for the study with 1488 patients meeting the inclusion criteria and 125 patients excluded. A total of 2157 eyes were included in the study. 946 (63.6%) of the patients were female and 542 (36.4%) were male with an average age of 68.3 years old. 885 (59.5%) of cases were performed by residents at the resident continuity clinic (ECP) while 603 (40.5%) were performed by attending physicians in a private office. Analysis of the postoperative complications in relation to the various climate parameters is currently in process.

CONCLUSIONS: This study has been IRB approved and is in the process of data analysis. It is hypothesized that the different environmental parameters will not have an effect on the majority of post-cataract surgery complications. However, the rate of rebound iritis may be influenced by different climate parameters based on previous studies.

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EXPLANATORY FEEDBACK IS A RELIABLE MARKER OF HIGH-QUALITY NARRATIVE ASSESSMENT OF SURGICAL PERFORMANCE

INTRODUCTION: The goal of this study was to determine the quality and characteristics of short narrative assessments collected using a mobile application-based workplace-based assessment (WBA) tool.

METHODS: We evaluated the quality of comments collected via a short WBA tool in a single ophthalmology residency training program between July 2017 and June 2020. The tool captured a single-item, entrustment competency question alongside brief comments. The tool was available through a smartphone-based application to faculty and residents to collect feedback provided directly after cataract surgery. Comments were evaluated using a Quality of Assessment of Learning (QuAL) score (range 0-5) and on whether the assessor had provided a rationale for the feedback. QuAL scores greater than or equal to 3 were considered to be of high quality.

RESULTS: Comments were brief, with a median length of 11 words for 838 unique WBAs collected from 15 attending evaluators, yet the majority (61.3%) were rated as high quality (QuAL ≥3). Comments with high QuAL scores were more likely to have addressed the rationale for the feedback provided. Longer comments were associated with a higher QUAL score (mixed effects model, $P<0.05$) and higher QuAL scores correlated with later postgraduate years (mixed effects model, $P<0.05$). However, a higher entrustability score was correlated with a lower QuAL score, with a larger effect when controlling for postgraduate year (PGY) level.

CONCLUSION: The majority of WBA comments from attending physicians evaluated using the QuAL score were found to be high quality despite their brevity. Residents in later years of training and with lower entrustability scores received higher quality comments. Narrative assessments that were higher in quality were longer and addressed rationale or "why" as part of the comment.

Tiana (T.Kay) Kimble, B.S.

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EFFECTIVENESS OF COACHING ON WELL-BEING: SEX DIFFERENCES IN POSITIVE GOAL PROGRESSION AMONG PHYSICIANS

INTRODUCTION: Physician burnout continues to be an area of significant harm to individuals, patients, and the health care system with a recent study reporting that over 62.8% of physicians report experiencing burnout, more severe in female physician populations. One factor of burnout is a reduced sense of personal accomplishment. In this study, we utilized a 12-week virtual coaching program to measure the effectiveness of targeting specific factors of burnout in academic faculty physicians.

METHODS: A virtual pilot 12-week coaching program was offered to all academic physicians at Rush University Medical Center with a limited enrollment. 34 physicians enrolled in the program which included 26 hours of coaching in individual and group settings. Surveys were administered to participants before, at the midpoint and after the intervention. The primary outcome of positive goal progression (PGP) was measured by asking physicians their perceived progress of the goals they self-identified as important to them. Secondary outcomes of self-compassion, self-valuation and impact of work on relationships were assessed using the Neff's Self-Compassion Scale-Short Form (SCS), Clinician Self-Valuation Scale (SVS) and the Stanford impact of work on relationships scale (IWR).

RESULTS: 34 physicians (22 female, 12 male) participated in the coaching program. There was an overall improvement in PGP from an initial score of 17.91 to 20.64 (P=0.01). Female physicians self-reported feeling less on track to accomplishing their goals at each timepoint compared to male physicians (baseline, p=0.09; 12 weeks p=0.169). Male physicians demonstrated a significant increase in self-reported PGP (p=0.05) though women trended towards an improvement, it was not statistically significant. For secondary measures, male physicians were more likely to score higher on the SCS at baseline and 12-week. There was a significant increase in the SVS (p=0.026) for all physicians, and a non-significant decrease on the IWR, with female physicians reporting a greater negative impact than male physicians.

CONCLUSION: A 12-week coaching program can effectively decrease burnout by teaching physicians' tools needed to make progress on self-identified goals and improve self-valuation. Significant gender differences exist in all measures, suggesting newer paradigms are needed to support women in academic medicine.

Andrew Mohama, BA

Andrew Mohama, BA (Rush); Santosh Basapur, PhD (Rush); Raj Shah, MD (Rush)

THE BIKE LISTENING TOUR: UNDERSTANDING LONELINESS AND HUMAN CONNECTION ACROSS AMERICA

INTRODUCTION Loneliness is one of the biggest public health concerns today: a root cause and contributor to many of the epidemics impacting the world-from alcohol and drug addiction to violence to depression and anxiety. While research has quantified the impact on a population-wide level, there is a gap in understanding the nuance and depth of what loneliness looks like within individual communities and lives. In effort to capture these perspectives, I embarked on a bike listening tour from San Francisco to Chicago in which I interviewed 50+ people about their experiences of community, connection, and loneliness. There were three objectives: First, determine how individuals feel in terms of levels of perceived loneliness. Second, explore how individuals feel in terms of social connection and community. Third, understand what people want to have, but currently do not, that would help them feel better about their levels of loneliness and connection to community.

METHODS This IRB-approved study utilizes qualitative description using semi-structured interviewing. Constant comparison from the tradition of grounded theory supports the analysis process. The study cohort was open-ended, including anyone interested in sharing a narrative. The collection of stories occurred between July 10, 2023, and August 11, 2023. This data was recorded using Rush Microsoft One drive. Using a phone, it recorded, stored, and automatically transcribed audio.

RESULTS Currently, the transcripts are being coded and analyzed. Next, the research team will provide an in-depth analysis of the underlying themes. There are three themes noted in the preliminary analysis. First, the younger the age, the more challenges there are with loneliness. Second, the rural/urban divide changes loneliness experiences, paradoxically made worse in more populated areas. Third, romantic partnerships are prophylaxis for loneliness and also causes of loneliness.

CONCLUSIONS If one is lonely, everything else in their life, including health, falls by the wayside. These narratives and themes could inform how we interact with one another, how physicians consider loneliness as part of the etiology and exacerbation of disease, and even how policymakers consider large-scale interventions aimed at reducing levels of loneliness.

Yoo jin Ahn, BA

Lindsay Fleischer MD, Yoo Jin Ahn BA, Katie Holland MD, Matthew Urban MD, Peter Revenaugh MD, Ryan Smith MD, Michael Eggerstedt MD

ANALYSIS OF FEMALE REPRESENTATION IN THE ONE-HUNDRED MOST CITED ARTICLES IN FACIAL PLASTIC AND RECONSTRUCTIVE SURGERY

INTRODUCTION   Though females now represent over half of all medical students in United States, women trail behind their male colleagues in representation among the majority of all surgical fields. Understanding the impact of female representation among the most impactful academic articles is critical to the creation and promotion of further initiatives to close the gender gap at the highest level of academic advancement and achievement. The primary objective of this study is to characterize female representation among the top one hundred most cited articles in facial plastic surgery.

METHODS Cross sectional analysis was conducted using Elsevier Scopus database for top 100 most cited articles in facial plastic surgery journals. Through review of article topic and discussion, each entry was designated either reconstructive or aesthetic in nature by two authors. Gender of author was identified using the US Social Security Administration Baby Names Database along with institutional websites. Pearson chi square analysis with < 0.1 significance threshold was used to compare gender representation of authors by year, citation quartile, and country of origin. Two tailed t testing was preformed to compare the average number of citations in articles published by male vs female authors.

RESULTS This study is the first of its kind to analyze representation of female representation among the top 100 most cited articles in facial plastic and reconstructive surgery. Overall, men greatly outnumbered women in authorship by a ratio of approximately 9:1. Despite evaluation across a 70-year timeframe during which the number of female facial plastic surgeons has increased, our study revealed no difference in the relative representation of female authorship over time, suggesting further efforts are needed to advance women in academic contributions. No significant difference in female authorship by representation across nationality, suggesting that this issue challenges academic medical communities across the globe.

CONCLUSION Overall, women continue to be underrepresented in both number and academic publications in the field of facial plastic and reconstructive surgery. Although there are increasing numbers of female facial plastic surgery trainees, additional efforts are needed to include and foster women in academic contributions, mentorship, and advancements.

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FOR YOU PAGE MEETS DIEP: EVALUATING THE QUALITY AND IMPACT OF TIKTOK VIDEOS ON AUTOLOGOUS BREAST RECONSTRUCTION WITH DIEP FLAPS

BACKGROUND: With TikTok's ascent as a hub for health-related dialogue, among countless topics, the platform streamlines access of information to over 1.677 billion users. Regardless of the reliability of such sources, TikTok disseminates videos daily regarding nuanced medical procedures like the deep inferior epigastric perforator (DIEP) flap breast reconstruction. This study scrutinizes the content's educational value and its influence on the audience's understanding.

METHODS: Our approach involved a curated review of TikTok videos on DIEP flap reconstructions, alongside a meticulous collection of user engagement data. We transcribed the video content verbatim and applied natural language processing to discern prevalent themes. The Modified DISCERN scale was utilized to evaluate the trustworthiness and educational quality of the content, correlating these with user engagement to measure impact.

RESULTS: Our analysis presented a robust level of engagement: 4.7 million views, over 10,000 shares, more than 10,000 comments, and in excess of 153,000 likes. However, the mean DISCERN score of 2.02 highlighted a discrepancy between content popularity and its quality. High-quality information was not always synonymous with high engagement, indicating a critical need for credible content.

CONCLUSION: The study underscores TikTok's expanding role in health education, attracting a large audience to content about complex surgical procedures. Nevertheless, the variable quality of the information demands active involvement from healthcare professionals to ensure that TikTok becomes a reliable resource for medical information. This is crucial for maintaining the integrity of health communication and empowering patients with accurate knowledge.

Sydney Arnold, MD

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SINGLE LAYER ALLOGRAFT WOUND MATRIX FOR GENDER AFFIRMING URETHROPLASTY

INTRODUCTION Metoidioplasty and phalloplasty with urethral extension may be complicated by urinary fistula or stenosis. Different strategies are employed to mitigate these risks, including staged urethral reconstruction and/or muscle or fasciocutaneous flaps. To our knowledge the use of single layer wound matrix (SLWM, Integra, Princeton, NJ) for soft tissue reinforcement in gender affirming genitourinary reconstruction has not been described. The aim of this study is to describe a novel surgical technique using SLWM in primary and revision masculinizing genital gender affirming urethroplasty.

METHODS A retrospective review was performed of seven patients who underwent masculinizing genital surgery with the use of SWLM. All patients underwent multi-disciplinary evaluation consistent with WPATH Standards of Care, Version 8.1 Demographics, intraoperative details, and outcomes were recorded including urinary function and complications (fistula formation, infection, seroma). SLWM was placed as soft tissue reinforcement of the urethral reconstruction. [Figure 1].

RESULTS Eight transgender males between 24 to 60 years of age underwent either primary or revision urethroplasty. Indications included recurrent urethral fistula (n=2), primary urethral lengthening with gracilis flap (n=4), and third stage urethroplasty in phalloplasty (n=3). No urethral fistula or stricture occurred in 1 to 4 month follow-up. Two patients were treated for urinary tract infections following the procedure.

CONCLUSION Single layer wound matrix may have a role in masculinizing genital surgery, especially when local tissue is limited or compromised. SLWM has a seemingly low risk profile and may be an option for primary or revision masculinizing genital gender affirming urethroplasty.

Sarah Beckwith, MD

Sarah Beckwith, MD (RUMC/CCH), Melissa Rangel, MD (RUMC/CCH), Richard R. Keen, MD (CCH), Neha Sheng, MD (CCH), Margaret C. Rigamer, MD (CCH), Erin C. Farlow, MD (CCH)

SYNDACTYLIZATION: A SURGICAL REVISION TECHNIQUE FOR ARTERIOVENOUS FISTULA STENOSIS

OBJECTIVE: Management of arteriovenous fistula (AVF) stenosis and non-maturation remains a major challenge in patients requiring hemodialysis (HD) access. While endovascular intervention is often the first-line therapy, surgical revision is preferable in certain circumstances and may require fewer overall interventions. We describe a surgical technique for the revision of AVF stenosis during planned brachiobasilic AVF transposition.

METHODS: A 54-year-old woman with CKD5, not yet on HD, presented for planned transposition of left upper extremity brachiobasilic AVF. Pre-operative ultrasound demonstrated stenosis in distal arm measuring 4.1 mm in diameter with peripheral pulsatility. Intraoperatively, the basilic vein was dissected circumferentially with a 3 cm segment of narrowing identified near the antecubital fossa. A substantial side branch near this stenosis was preserved, dissected circumferentially, and ligated 4 cm from the branch point. After obtaining proximal and distal control, a venotomy was created through the branching vein, the basilic vein stenosis, and continued onto normal appearing vein, essentially spatulating the side branch (Fig 1). Old fibrin and thickened valves were removed from narrowed segment of basilic vein. Five-millimeter dilators easily passed peripherally and centrally beyond the narrowed segment of basilic vein. The spatulated branch, with its base left in-situ, was rotated and sutured in place using running 7-0 Prolene sutures alleviating the stricture (Fig 2). The vein was flushed with heparinized saline and sutures tied during ongoing flow. A palpable thrill and radial pulse were present following transposition of the revised basilic vein and skin closure.

RESULTS: The patient recovered as anticipated and was cleared for use of the brachiobasilic AVF six weeks post revision.

CONCLUSIONS: In cases of patients with AVF stenosis undergoing an open procedure, use of a branching side vein as an autologous, in-situ patch is a repair option warranting further study. This patch technique, by incorporating the base of the branching vein, further aids in increasing vessel diameter and avoids the circumferential suture otherwise required for traditional patch revision and possible restenosis due to purse stringing. This technique also maintains AVF length compared to a resection with end-to-end anastomosis or longitudinal incision and transverse suture technique.

Renuka Chepuru, B.S.

Renuka Chepuru (RMC), Stephanie Erickson (RMC), Anna Dray (U of ND), Mae Bradbury (RMC), Kaylee Lindahl (RMC), Sara Hock MD (RUMC), Jose Velasco MD, FACS (RUMC), Nicole Siparsky MD, FACS, FCCM (RUMC)   Presenting/First Author: Renuka Chepuru   RMC: Rush Medical College   U of ND: University of Notre Dame RUMC: Rush University Medical Center

NOVEL SIMULATION-BASED SURGICAL COMMUNICATION TRAINING IMPROVES MEDICAL STUDENT CONFIDENCE AND COMPETENCE.

INTRODUCTION: Bi-directional communication remains a challenging topic to teach medical trainees and practicing clinicians. Prior studies have demonstrated a link between poor communication and dissatisfaction of both patients and providers. Our initial investigation demonstrated deficiencies in bi-directional communication skills at all levels of trainee and faculty experience. Based on a successful pilot program, we designed a high-fidelity simulation curriculum to provide learners with the opportunity for both subjective and objective assessment with an individualized and interactive training session on bi-directional communication.

METHODS: We recruited medical students for voluntary paid participation in the study, which was conducted at the Rush University Medical Center's Center for Clinical Skills and Simulation. A 70-minute individual experience was delivered using a one-on-one training session in bi-directional communication. Students completed pre- and post-intervention surveys. Two video-recorded surgical case-based interactions were conducted using scripted professional medical actors. Recordings were scored by a single trained rater.

RESULTS: Thirty-seven medical students were recruited to participate in this study. All participants (n=37) reported no prior formal training on bi-directional communication. With training and case-based simulation, learners demonstrated increased confidence from pre- to post-intervention surveys in each of the domains of communication. The subjective, reported improvement reached statistical significance in only three areas ($p<0.05$). However, objective, standardized video-based scores of learner performance demonstrated statistically significant improvement in seven domains ($p<0.05$).

CONCLUSION: This study demonstrated statistically significant improvement in learner proficiency and confidence in bi-directional communication with a single 70-minute intervention, which was delivered in a personalized manner using a realistic, surgical case-based learning environment. Surprisingly, learners appeared unaware of their measurable growth achieved with this intervention. Further study is needed in an active clinical environment to assess the longitudinal efficacy of this training.

Neil Jain, MD

Neil Jain (Rush); Evan Hernandez (TTUHSC); Caleb Gottlich (TTUHSC); Yasier Medina (TTUHSC); Brendan Mackay (TTUHSC)

INTRAMEDULLARY PLATE FIXATION AND VIABLE BONE ALLOGRAFTING IN A COMPLEX INTRA-ARTICULAR DISTAL RADIUS FRACTURE NONUNION: A CASE REPORT

INTRODUCTION: Nonunion of distal radius fractures are an uncommon occurrence and treatment is challenging due to no consensus on the best approach to management. In this report, we describe an intra-articular left distal radius fracture that went onto nonunion after initial bridge plate fixation and the subsequent construct used to treat this complex problem.

METHODS: Given our patient's poor subchondral bone stock that would not support repair using a volar plate and refusal of bone autograft, we designed a construct using a dorsal spanning plate and an intramedullary fragment specific plate as a volarly placed strut in combination with viable bone allograft and cancellous bone chips.

RESULTS: After interval removal of the dorsal spanning plate, the intramedullary fragment specific plate was retained. Intraoperative stress examination under fluoroscopy noted no motion of the fracture site. At subsequent follow up appointments, the patient's motor exam remained intact and motion was advanced without difficulty. Repeat cross sectional imaging at one year demonstrated interval callus formation around the prior site of nonunion.

CONCLUSIONS: The construct described provided stability through an intramedullary fragment specific plate and grafting to support the articular surface. This technique offered the opportunity to honor the patient's autonomy while providing a stable construct with preserved alignment. While this is not an ideal construct for the average patient, this case and individual preferences dictated an unorthodox solution. This report highlights the importance of ingenuity that orthopedic surgeons should demonstrate when trying to accommodate patients' wishes as well as creativity that can be portrayed in using implants in a manner unique from their manufactured purpose. Furthermore, additional data is needed to assess whether there are long term failures associated with the proposed construct.

David Katz, B.S.

Jamie Yoon, David Katz (presenting author), Christopher Ly, Avinash Mamgain, Morgan Sturgis, Ephrem O. Olweny

HEALTH UTILITY ASSESSMENT IN PATIENTS WITH URETERAL STENTS, AND ASSOCIATION WITH URETERAL STENT SYMPTOM QUESTIONNAIRE (USSQ) SCORES

INTRODUCTION   Health utilities define the strength of individuals' preferences for specific health states, recorded on a scale ranging from 0 (representing death) and 1 (representing perfect health.). Data on health utilities in patients with ureteral stents are sparse. We assessed health utilities in stented patients and evaluated their statistical association with USSQ scores.

METHODS   Adult (≥ 18 years) kidney stone patients undergoing ureteroscopic lithotripsy at with planned stent insertion at a single academic institution were recruited. Each participant completed 4 surveys during the study period: demographics and SF-36 v2 surveys preoperatively, and SF-36 v2 and USSQ surveys postoperatively (at time of stent removal). Health utilities were assessed using the SF-6D, which is derived from the SF-36. Relationship between health utility and USSQ scores was evaluated using univariable and multivariable regression analyses.

RESULTS   37 patients have been enrolled to date to date; mean (SD) age was 52.7 (15.8), 64.9% were female. Mean preoperative utility score was 0.68 (0.13), decreasing to 0.64 (0.12) after stent insertion (p=0.06). Mean USSQ pain, urinary and general health (GH) scores were 21.2 (9.5), 31.1 (8.0) and 16.1 (4.4) respectively. Statistically significant association between SF-6D utility and USSQ scores was observed only for the USSQ GH score, which explained 24.6% of the variance in Sf-6D utility score on multivariable analysis (p=0.016).

CONCLUSION   Preference-based assessment of quality of life in patients with ureteral stents can adequately be assessed using SF-6D utilities, which bear statistical association with the USSQ sub-domain score for general health perception. Quantifying utilities in stented patients provides value in estimating the disease burden associated with stent discomfort, and in providing metrics than can be incorporated in future healthcare econometric analyses.

Omair Kazi, MS

Omair Kazi (Rush), Ron Gilat (Rush), Alexander Alvero (Rush), Michael Vogel (Rush), Joel Williams (Rush), Shane Nho (Rush)

STAGED HIP ARTHROSCOPY WITH LABRAL REPAIR, FEMOROPLASTY, AND CAPSULAR PLICATION FOLLOWED BY PERIACETABULAR OSTEOTOMY FOR HIP DYSPLASIA RESULTS IN IMPROVED OUTCOMES AND 100% SURVIVORSHIP AT MINIMUM 2-YEAR FOLLOW-UP

INTRODUCTION Combining periacetabular osteotomy (PAO) and hip arthroscopy has emerged as a useful treatment to address concomitant hip dysplasia and femoral acetabular impingement syndrome (FAIS). Dysplasia and FAIS are common causes of hip pain in young patients and if left untreated may lead to the progression of osteoarthritis. No studies to date have assessed outcomes when staging these procedures. The purpose of our study was to assess patient-reported outcomes (PROs), clinically significant outcomes (CSOs), and survivorship following staged hip arthroscopy and PAO for the management of hip dysplasia and FAIS.

METHODS A prospectively maintained database was queried to retrospectively identify patients who underwent staged hip arthroscopy and PAO between 1/2018-10/2021 and had a minimum 2-year follow-up. PROs and CSO achievement rates for the Hip Outcome Score Activities of Daily Living/Sports Subscale (HOS-ADL/SS), international Hip Outcome Tool-12 item questionnaire (iHOT-12), and Visual Analog Scale for Pain (VAS Pain) were recorded. Rates of reoperation, including hardware removal, revision hip arthroscopy, and conversion to total hip arthroplasty were evaluated.

RESULTS Thirty-nine patients met criteria for inclusion, of which 35 patients had minimum 2-year follow up (89.7% compliance). Mean age was 25±9.1 years and 91.7% of patients were female. Respective pre- and postoperative radiographic outcomes were: Alpha angle 53.2±11.3 to 39.7±2.6�, Tönnis angle 14.6±5.6⍟ to -1.0±2.9⍟, lateral center-edge angle 16.6±5.5⍟ to 36.6±4.6⍟, and anterior center-edge angle 15.6±9.1⍟ to 36.1±3.8⍟, with statistically significant differences pre- to postoperatively for all (P<0.001). Patients demonstrated significant improvement in all PROs pre- to postoperatively (P≤0.004). Minimal clinically significant difference (MCID) and patient-acceptable symptomatic state (PASS) achievement rates for any PRO were 93.9% and 78.8%, respectively. There were no revision hip surgeries or conversion to total hip arthroplasty (THA) at a mean 2.7±1.1-year follow-up. Four patients (11.1%) underwent hardware removal. One patient (2.8%) experienced a postoperative infection treated with incision and drainage.

CONCLUSION Staged hip arthroscopy and PAO for the management of hip dysplasia demonstrated improvement in PROs, high CSO achievement rates, and 100% survivorship at minimum 2-year follow-up.

Arsalan Khan, MD

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MINIMALLY INVASIVE PNEUMONECTOMY FOR NSCLC IS ASSOCIATED WITH IMPROVED SURVIVAL COMPARED TO OPEN PNEUMONECTOMY

INTRODUCTION/OBJECTIVE: To determine if minimally invasive pneumonectomy for non-small cell lung cancer (NSCLC) provides a survival advantage over open pneumonectomy.

METHODS: Patients who underwent pneumonectomy for NSCLC between 2015 and 2020 were queried from the National Cancer Database. Surgical approach was categorized as robot-assisted (RP), video-assisted thoracoscopic (VP), or open pneumonectomy (OP). Univariate and multivariate regression analyses were used to examine the association between surgical approach and 30-day and 90-day mortality, and a Cox proportional hazards model was used to assess overall survival between surgical approaches.

RESULTS: A total of 3784 patients were examined, including 81% OP (n=3074), 13% VP (n=494), and 6% RP (n=216). Comparing 2015 to 2020, the percentage of OP decreased by 11% (743/878 vs. 241/326) and the number of RP increased by 6% (33/878 vs. 34/326). On univariate analysis, there were no differences between OP, VP, and RP 30-day mortality (8.9% vs 8.1% vs 5.8%, respectively) or 90-day mortality (14.1% vs 11.8% vs 8.4%, respectively). However, RP was associated with improved median overall survival compared to OP (70.9 months vs 49.4 months, p=0.011). On multivariate analysis, after controlling for age, sex, race, Charlson-Deyo score, tumor stage, and systemic therapy, 90-day mortality was lower with RP compared to OP (OR 0.50, CI 0.27-0.86, p=0.019) and overall survival was improved with VP compared to OP (HR 0.85, CI 0.73-0.99, p=0.035) and RP compared to OP (HR 0.70, CI 0.54-0.89, p=0.004).

CONCLUSION: Minimally invasive pneumonectomy is associated with improved overall survival compared to open pneumonectomy in patients with NSCLC.

Amy Kim, BA

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2 YEARS SHY OF 100: A CASE REPORT ON MECKEL'S DIVERTICULUM ASSOCIATED SMALL BOWEL OBSTRUCTION IN A 98-YEAR-OLD FEMALE

INTRODUCTION: Meckel's diverticulum (MD) stands as the most prevalent congenital malformation of the gastrointestinal tract. This case report is about a rare occurrence of symptomatic MD in a 98-year-old female, compelling a Meckel's diverticulectomy to address her small bowel obstruction.   CASE

DESCRIPTION: A 98-year-old Caucasian female presented to the emergency department with abdominal pain, nausea, and vomiting. Past surgeries included appendectomy and cholecystectomy in her 20s. CT scan showed small bowel dilation, raising concern for obstruction. An NG tube was inserted, but obstruction persisted. Exploratory laparotomy revealed an adhesion from the gastrocolic omentum wrapped around Meckel's diverticulum. The adhesion was incised, and the diverticulum was removed. Pathology confirmed Meckel's diverticulum with inflammation. The patient recovered well and was discharged on day five postoperatively after regaining bowel function.

DISCUSSION: While instances of late-onset symptomatic MD in adults have been documented, the majority involve patients under 40 years old. As of 2005, the oldest reported case of symptomatic MD requiring surgery was at 91 years old (2). Our patient, at 98 years old, surpassed this record when she presented with SBO due to MD, necessitating exploratory laparotomy. The "rule of 2's" estimates a 2% prevalence of Meckel's Diverticulum (MD) in the general population, with challenges in precise determination due to asymptomatic cases. A systematic review from 2000 to 2017 suggests MD prevalence between 0.3% and 2.9%, with 4% to 9% manifesting symptoms. Pediatric cases show 46.7% with obstruction. Prophylactic removal of asymptomatic MD is controversial; a 2008 review suggests increased complications. Minimally invasive techniques impact recommendations. A 2013 study recommends prophylactic removal, while Mayo Clinic's study associates symptomatic MD with males, those under 50, and MD over 2 cm. With no definitive guidelines, decisions on asymptomatic MD excision remain patient-dependent.

CONCLUSIONS: This report discusses a rare symptomatic MD in a 98-year-old, requiring resection for small bowel obstruction. It underscores the importance of reevaluating the prophylactic removal of asymptomatic MD in the elderly. The case deviates from the typical "rule of 2s" of MD, highlighting the need for physicians to consider MD in differential diagnoses, even in older patients.

Jimmie Knight, MD

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INCEPTION OF A PELVIC FLOOR PRACTICE IN AN URBAN COUNTY HOSPITAL

INTRODUCTION: There are significant barriers to identifying, diagnosing, and treating patients with pelvic floor diseases (PFDs). PFDs are often underdiagnosed due to patient's embarrassment about discussing the issue, and practitioners not initiating conversation about symptoms or knowing available resources. Limited resources at county hospitals impact the care provided to vulnerable and underserved populations experiencing PFD. To address issues of access and quality care at an urban county hospital, the first pelvic floor surgical practice was started by a colorectal surgeon in 2018. The hospital serves the most racially diverse patient population in the state. It is critical to better understand the patient population and determine institutional and patient barriers surrounding pelvic floor care at an urban county hospital in order to develop effective interventions.

METHODS: A review of the electronic medical record was performed in September 2023 to understand the demographic characteristics of the patients served in the clinic since 2018. Through internal discussion, institutional barriers and limitations were identified by members of the pelvic floor clinic faculty and staff.

RESULTS: The pelvic floor clinic has provided care to 68 patients. The diagnostic groupings included fecal incontinence (17.6%), pelvic floor (64.9%), and rectal prolapse (17.6%). While most patients are female, males make up 30.9% of the population. The majority were African American (36.8%) and Hispanic (41.1%) and identified their preferred language as English (55.9%) or Spanish (39.7%). Most were uninsured (44.1%) or had Medicaid (29.4%). The top three discharge zip codes for patients at the hospital are predominantly African American (83.8%), have an education level of high school or less (78.2%), and are unemployed (52%). The team identified diagnostic equipment (anorectal manometry, biofeedback software, and anorectal high-quality ultrasound) and treatment options (injectables or sacral nerve stimulation (SNS) for fecal incontinence, trained biofeedback therapists) that were not available at the county hospital.

CONCLUSION: The initial query revealed the pelvic floor surgical practice at county provides necessary care for many underserved and vulnerable patients. Improving the diagnosis and treatment of patients with PFDs requires a multi-pronged approach - increasing institutional resources including diagnosis and treatment options, working with primary care providers, and addressing individual barriers.

Jacky Kwong, MD

Jacky Kwong (Rush) Gwyneth Sullivan (Rush) Marsha Yelen (Rush) Jose Velasco (Rush) Brian Gulack (Rush) Ami Shah (Rush)

IDENTIFYING BARRIERS TO SCREENING FOR SOCIAL DETERMINANTS OF HEALTH IN GENERAL SURGERY RESIDENTS

INTRODUCTION Social determinants of health are non-medical needs that influence health outcomes. The presence of these needs, such as lack of transportation and stable housing, has been associated with worse overall surgical outcomes. Physicians infrequently screen patients for social needs citing barriers including lack of time and training. Although curricula to train primary care residents to improve screening have been studied and implemented, similar training modules for general surgery residents are lacking. We sought to identify potential barriers to screening in our general surgery residents to inform the design of a simulated intervention to improve screening for social needs. We hypothesize that the intervention will decrease perceived barriers and encourage screening.

METHODS We conducted a single-center cross-sectional study of general surgery residents at a tertiary academic hospital. Residents were surveyed about their perceptions of five common barriers to screening for social needs on a 5-point Likert scale. Barriers included lack of time, training, comfort in asking, knowledge of resources to refer patients for their needs, and one's own role in screening. Residents were also given a free-text section to describe other barriers to screening.

RESULTS Thirty-six general surgery residents participated in the study. The primary barriers were lack of time (n = 22, 61%) and knowledge of resources to refer patients for their needs (n = 16, 45%). Most residents were comfortable asking patients about social determinants of health (n = 27, 75%) and felt that it was their role to contribute to screening (n = 29, 78%). No additional barriers were identified.

CONCLUSION Lack of time and knowledge of resources were the most significant barriers to screening for social needs in general surgery residents. These findings informed the design of a simulated intervention focused on reducing barriers to screening. Assessments of residents' perceptions of these barriers after the intervention are ongoing.

Taylor Laskowski, MPH

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RARE CASE OF NUTCRACKER SYNDROME AND PELVIC CONGESTION SYNDROME IN A PATIENT WITH EHLERS DANLOS SYNDROME

INTRODUCTION Iliocaval venous obstructive disorders and compression Syndromes (CS) have various clinical presentations which are often misdiagnosed, leading to delayed treatment. Nutcracker syndrome (NCS) and May-Thurner Syndrome (MTS) are two rare compression syndromes (CS) wherein the vein is compressed by a high pressure arterial vessel. Pelvic congestion syndrome (PCS) is often associated with NCS, whereby the increased left renal vein pressure gradient results in the development of gonadal vein valvular incompetence and pelvic varicosities and congestion, resulting in debilitating pelvic pain. Concurrent PCS and NCS has historically been treated with renal vein transposition and gonadal vein ligation. However, recent reports have described successful treatment of these two pathologies with left ovarian vein transposition. There are scarce reports in the literature describing these CS in patients with connective tissue disorders, like Ehlers Danlos Syndrome (EDS). Previous case reports suggest a cumulative effect of these CS and EDS, with the suggestion of poorer post-op surgical outcomes. However, there is a significant lack of literature describing guidelines on how to manage this special patient population. To date there are no reports of managing patients with EDS who are diagnosed with PCS and NCS.

METHODS This case report describes a 24-year-old woman with a complicated medical history of complex regional pain syndrome (CRPS), restless leg syndrome (RLS), postural orthostatic tachycardia syndrome (POTS), anxiety and depression, irritable bowel syndrome, and EDS who presented with right flank pain and hematuria as well as pelvic pain, heaviness and occasional left leg pain worsened with menstruation. She had radiographic evidence of compression of the left renal vein, a dilated left ovarian vein and compression of the left common iliac vein. She underwent a venogram with IVUS and pressure gradients confirming PCS, NCS and mild to moderate MTS. She underwent a left ovarian vein to IVC transposition as treatment for NCS and PCS.

RESULTS Post operatively, the patient experienced significant pain relief. NCS and PCS symptoms had resolved.

CONCLUSION This is the first case report describing successful surgical management of NCS and PCS in a patient with EDS. This highlights the lack of consensus related to the management of these venous diseases, specifically in patients with connective tissue disorders.

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UPDATE TO SURGICAL, INTERVENTIONAL, AND MEDICAL APPROACHES OF AMPUTATION-RELATED PAIN TREATMENTS

INTRODUCTION: Amputation-related pain can consist of phantom limb pain (PLP), residual limb pain (RLP), or a combination of both pathologies. Estimated of lifetime prevalence of pain and after amputation range between 8% and 72%. This narrative review aims to summarize the most effective surgical and non-surgical treatment options for amputation-related pain in hopes of helping develop an optimized multidisciplinary and multimodal treatment plan that leverage multidisciplinary care.

METHODS: A comprehensive search of the English literature using the following keywords: phantom limb pain, Stump pain, surgical treatment, non-surgical treatment, neuroma, medical management, regional anesthesia, peripheral block, neuromodulation, spinal cord stimulation, dorsal root ganglia, and peripheral nerve stimulation were each used.

RESULTS: Targeted muscle reinnervation and regional peripheral nerve interface are the leading surgical treatment options for reducing neuroma formation and reducing post amputation pain. These procedures target the distal free nerve endings and reinnervates the nerves into local muscle, reducing neuroma formation, improving quality of life, increasing prosthetic control and decreased amputation-related pain. Non-surgical options include multimodal pharmaceutical treatment plans and regional anesthesia. There is growing evidence that neuromodulation at the spinal cord or the dorsal root ganglia and/or peripheral nerves can reduce amputation-related pain.

CONCLUSIONS: Multimodal approaches combining pharmacotherapy, surgery and invasive neuromodulation procedures appear to be the most efficacious preventive and treatment strategies. Future efforts should focus on cross-disciplinary education to increase awareness of treatment options and exploring best practices for preventing pain at the time of amputation and enhancing treatment of chronic postamputation pain.

Michael Murray, Bachelor of Science

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CLINICAL AND RADIOGRAPHIC FINDINGS IN PATIENTS WITH ARTHROSCOPICALLY CONFIRMED MEDIAL MENISCUS POSTERIOR ROOT TEARS

BACKGROUND: Medial meniscus posterior root tears (MMPRT) can lead to significant complications resulting in subsequent pain and reoperation, including cartilage damage and the rapid onset of osteoarthritis. Identifying root tears can be challenging in chronic cases due to varying presentations which warrants further investigation into their clinical and radiographic presentations. Therefore, this study aimed to outline the prevalence of clinical and radiographic findings in arthroscopically confirmed isolated MMPRT cases. Additionally, it explored associations between specific findings and the presence of either an inciting event or an indolent presentation.

METHODS: Patients who underwent arthroscopic isolated meniscal root repair by a fellowship-trained surgeon between 2019 and 2023 were retrospectively analyzed. The procedures were performed at Midwest Orthopaedics at Rush and data was collected by orthopedic trained clinicians. Clinical data included variables in the history of present illness (HPI), past medical history (PMH), and physical examination. Radiographic outcomes included presence of bone bruise, ghost sign, truncation sign, linear hyperintensity perpendicular to the meniscus, meniscal extrusion, tibial slope, and mechanical axis. The cohort was stratified based on previous inciting event or indolent presentation to assess differences in outcome variables.

RESULTS: Seventy-two patients met the inclusion criteria, with 45.8% reporting an inciting event. Common HPI findings included knee swelling (72.2%), mechanical symptoms (62.5%), and patient-perceived instability episodes (45.8%). Physical exam observations revealed medial joint line tenderness (93.10%) and a positive McMurray's test (69.4%). Ghost sign was identified in 91.7% of MRI cases, followed by truncation sign (83.3%) and a linear signal perpendicular to the meniscus (68.1%). Cases with an inciting event were typically younger, presented acutely, and exhibited a positive McMurray test. Cases with indolent presentation were older and showed higher rates of bone bruising, particularly with varus malalignment.

CONCLUSION: MMPRT presents with variable clinical and radiographic features. Those with an inciting event were typically younger, presented acutely, and showed a positive McMurray's test, while indolent cases were older patients, presented with chronic symptoms, and showed increased bone bruising, especially with varus malalignment.

Elizabeth O'Neill, MD MPH

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DEFINING THE CONTOUR: PREVALENCE PATTERNS OF BODY CONTOURING PROCEDURES AMONG INJECTABLE GLUCAGON-LIKE PEPTIDE-1 RECEPTOR AGONIST USERS

INTRODUCTION: The advent of injectable GLP-1 receptor agonists such as Ozempic and Wegovy has revolutionized weight management, leading to significant changes in body composition, often resulting in excess skin and thus an increased interest in body contouring procedures. There is a paucity of data exploring the correlation between the use of these drugs and the subsequent demand for surgical body contouring. Our study aims to explore trends of these procedures in this patient population.

METHODS: We utilized the PearlDiver database for retrospective analysis of prescription claims data on four injectable GLP-1 receptor agonists: Ozempic, Wegovy, generic Semaglutide, and generic Liraglutide. Medical claims data were obtained for body contouring procedures from 2011-2022 across 30 states. Multimodal statistical methods were utilized to compare surgery rates between GLP-1 receptor agonist users and matched non-users. Dosage and time interval patterns were also evaluated.

RESULTS: We found statistically significant correlations between GLP-1 receptor agonist usage and secondary body contouring surgeries. Ozempic users showed moderate correlations with brachioplasty ($r = 0.23$) and abdominoplasty ($r = 0.21$). Wegovy was strongly correlated with breast procedures ($r = 0.28$). Generic semaglutide and liraglutide exhibited consistent correlations across surgeries. The median time to surgery varied significantly, from 87 days (Wegovy) to 1,018 (generic liraglutide) days. Comparative analyses revealed significantly higher surgery rates among users ($p < 0.01$). Time series forecasting suggested a gradual increase in surgery rates, while chi-squared tests highlighted dose-related surgery rate differences, notably in Ozempic and Wegovy users.

CONCLUSIONS: Our study establishes a significant link between the use of these newly popular injectable GLP-1 receptor agonists and an increase in secondary aesthetic body contouring surgeries in a dose-dependent manner. This research highlights the multifaceted intersection between pharmacological weight management and aesthetic plastic surgery. Our findings may serve as a call for surgeons to adapt to these trends; next steps include prospective, longitudinal exploration into the broader implications of these drugs on aesthetic surgical outcomes and patient satisfaction.

Zachary Palmisano, BS

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SURGICAL PREFERENCE CARD MAINTENANCE: CURRENT PRACTICES AND SURGEON PERSPECTIVES

INTRODUCTION: Refinement of surgical preference cards offers a potential solution to reducing operating room waste, which accounts for 30% of waste produced by hospitals. Our aim was to characterize surgeon perceptions of preference card maintenance, identify barriers to updating preference cards, and explore whether environmental stewardship relates to preference card maintenance.

METHODS: Surgeons at a large academic medical center completed surveys regarding preference card maintenance, including questions on accuracy, frequency of updates, and perceived environmental impact. Responses were compared by years in practice post-training (1-10 vs 11+ years) using Kruskal-Wallis, chi-squared, and Fisher's exact tests.

RESULTS: Response rate was 46.4% (n=89). Among respondents, 46.1% rarely or never updated their preference cards. Nearly all (98.9%) said at least some of their cases had unused items on their preference cards. Most (87.6%) made updates via verbal requests to operating room staff. Surgeons with more years in practice were less likely than those with fewer years to update their preference cards annually or more often (n=7/37, 18.9% vs n=24/42, 57.1%, p<.001). No other responses varied significantly by years in practice. Most agreed that more frequent updates may reduce waste, but did not feel knowledgeable about the environmental impact of items on their cards (Figure). Unfamiliarity with review processes and effort required for reviews were implicated barriers to card maintenance.

CONCLUSIONS: Surgeons acknowledge the utility of surgical preference card reviews and updates, but opaque systematization hinders surgical waste reduction. Streamlined systems are needed to facilitate card maintenance and promote environmental stewardship in surgical care.

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METABOLIC MODULATION: AN ANALYSIS OF PRESCRIPTION PATTERNS OF GLP-1 RECEPTOR AGONISTS IN SPECIALTY-SPECIFIC SURGICAL CARE

INTRODUCTION: Initially developed for the management of type II diabetes mellitus and more recently used for weight loss, GLP-1 receptor agonists have expanded their clinical use both on- and off-label, calling for a greater understanding of their efficacy and safety. This study aims to analyze these trends across various surgical specialties, focusing on the application and integration of these agents within the context of plastic surgery across 30 U.S. states.

METHODS: Prescription records for GLP-1 receptor agonists, including Ozempic, generic semaglutide, and generic liraglutide, across 30 U.S. states from 2010 to 2022 were extracted from the PearlDiver database. Rstudio was used to conduct a chi-squared analysis to identify differences in prescription rates across plastic surgery versus "other surgical specialties".

RESULTS: A total of 459 prescription records under plastic surgery were analyzed, compared to a total of 23, 842 prescription records across 28 other surgical specialties. Plastic surgery records revealed 314 (68%) and 145 (32%) total prescriptions for females and males, respectively. Other surgical specialties showed an average of 18, 333 (77%) and 5,509 (23%) total prescriptions for females and males, respectively.   Significant differences were found in the distribution of prescription rates across age groups (p=0.009), age range (p=0.0004), and gender (p=2.6x10^-05) between plastic surgery and all other surgical specialties. No significant difference was observed between plastic surgery and all other surgical specialties in number of prescription days. A significant difference was observed in the distribution of prescription rates across different insurance or payment plans (p<2.2x10^-16). A significant difference was also found in the distribution of mean family income between the two groups (p < 2.2x10^-16).

CONCLUSIONS: This study's analysis of GLP-1 receptor agonist prescription rates in plastic surgery compared to other surgical specialties reveals distinct, specialized usage trends. Differences in prescription rates across gender, age group, and socioeconomic backgrounds underscore a more targeted approach in plastic surgery compared to other surgical fields. These findings highlight the unique role of metabolic modulation in plastic surgery patient management. Further research into optimizing GLP-1 receptor agonist use within the surgical context is necessary in order to enhance patient outcomes and care equity.

Savan Shah, MD

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SOCIAL VULNERABILITY INDEX IS ASSOCIATED WITH MAJOR MORBIDITY AFTER VATS LUNG RESECTION

INTRODUCTION/OBJECTIVE: To determine if social vulnerability (SVI) is associated with major morbidity after video-assisted thoracoscopic (VATS) lung resection for early-stage non-small cell lung cancer (NSCLC)

METHODS: The study population consisted of patients who underwent VATS lung resection for stage IA-IIB NSCLC at a single institution between 2007-2002. The Society of Thoracic Surgeons General Thoracic Surgery Database definition of major morbidity, consisting of 14 adverse postoperative events, was used. SVI was determined by geocoding the permanent addresses of Illinois residents, mapping them to US census tracts, and using the Centers for Disease Control and Prevention calculator for census-tract level SVI. Univariate and multivariate logistic regression analyses were used to examine the association between SVI and major morbidity. Cut-point analysis was performed to determine the SVI cutoff that most strongly correlated with major morbidity.

RESULTS: A total of 667 patients met inclusion criteria, of which 64% (428/667) underwent lobectomy, 3% (22/667) segmentectomy, and 33% (216/667) wedge resection. The ideal SVI cutoff was determined to be 0.833 (p= 0.036). In the high SVI cohort (HSVI), 55% (31/56) were black, compared to 9% (55/611) in the low SVI cohort (LSVI) (p<0.0001). Upon univariate analysis, HSVI patients experienced a higher rate of major morbidity than LSVI patients (OR 2.35, CI 0.03-1.59; p=0.03). In the multivariate analysis, after controlling for age, sex, procedure type, smoking history, and FEV1, this difference persisted (OR 2.47, CI 1.04-5.40, p=0.030).

CONCLUSION: High social vulnerability index is associated with major morbidity after VATS lung resection for early-stage NSCLC.

Johanna Stecher, MD

Johanna Stecher, MD - Rush University Medical Center Gweniviere Capron, MD - Stroger Cook County Frederic Starr, MD, FACS - Stroger Cook County Faran Bokhari, MD, FACS - Stroger Cook County William Brigode, MD - Stroger Cook County

THE AAST-OIS IS ASSOCIATED WITH ENDOSCOPIC AND PERCUTANEOUS BILIARY PROCEDURES IN HEPATIC INJURIES

INTRODUCTION: The American Association for the Surgery of Trauma (AAST) Organ Injury Scale (OIS) for the liver (and other organs) was created in 1989. It has been validated, perhaps best by Tinkoff et al in 2008, to predict mortality, need for operation, length of stay (LOS), and intensive care unit (ICU) LOS. It does not consider mechanism of trauma in its interpretation.

METHODS: We analyzed the Trauma Quality Improvement Program (TQIP) database from 2017-2019, including all patients with a liver injury. Outcomes included the rates of mortality, operation, liver-specific operation, hepatic embolization, endoscopic retrograde cholangiopancreatography (ERCP), and percutaneous drainage procedures. Odds ratios and 95% Confidence Intervals (OR, CI) for outcomes were calculated for each grade compared to the immediately lower grade.

RESULTS: 58627 patients had a liver injury with an OIS grade. In penetrating trauma, mortality rates increased at each grade level ($p<0.001$). Operative and percutaneous hepatobiliary drainage rates increased in grades III-V ($p<0.03$). Embolization and ERCP rates increased in grades III-IV ($p<0.001$). In blunt trauma, mortality and operative rates increased in grades IV-VI ($p<0.002$). Hepatic embolization, ERCP, and hepatobiliary drainage rates increased in grades III-V ($p<0.005$).

CONCLUSION: AAST-OIS is associated with endoscopic and percutaneous biliary procedures in addition to being previously validated for mortality, operative intervention, and hepatic angioembolization. In addition, the AAST-OIS does not appear to equally evaluate penetrating and blunt hepatic injuries.

Gwyneth Sullivan, MD, MS

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TO DELAY OR NOT DELAY: COST ANALYSIS OF EARLY VS DELAYED OUTPATIENT REPAIR OF INGUINAL HERNIAS IN PREMATURE INFANTS

INTRODUCTION: Premature infants diagnosed with inguinal hernias after hospital discharge require overnight observation for apnea monitoring following repair until 50-60 weeks adjusted gestational age (AGA). However, delaying repair to avoid overnight monitoring increases the risk of incarceration. These competing priorities lead to practice variation in the timing of repair. This study aimed to evaluate costs associated with early versus delayed outpatient repair of inguinal hernia in premature infants. We hypothesized that there would be an AGA before which early repair would result in lower average cost.

METHODS: A decision analysis model was used to compare the cost for premature infants undergoing early vs delayed repair of inguinal hernia. Costs were estimated using the average total costs to the hospital at a single institution for three scenarios: 1) delayed repair not requiring an overnight admission ($16,267 USD), 2) early repair requiring overnight admission for apnea monitoring ($24,081), and 3) incarcerated inguinal hernia successfully reduced but requiring 48-hour delayed repair to decrease edema with postoperative apnea monitoring ($32,093). All models began at 35 weeks AGA. The base model used 50 weeks AGA as the point repair could be done without apnea monitoring and a 0.5% incarceration rate per week based on literature review. The rate of incarceration was assumed to follow an exponential distribution. Sensitivity analyses varied AGA at delayed repair to 55 and 60 weeks and weekly incarceration rate from 0.1% to 4%.

RESULTS: In the base model, delayed repair was always associated with a lower average cost than early repair, with the average cost of a case diagnosed at 35 weeks being $1,146 lower. In sensitivity analyses, no average cost for delayed repair rose above the threshold cost of early repair until estimated incarceration risk reached >3%/week or the protocol for not requiring apnea monitoring reached 55 weeks (incarceration risk: 3%/week) or 60 weeks (incarceration risk 4%/week).

CONCLUSION: It is less costly to delay repair of inguinal hernias in premature infants diagnosed as an outpatient to when they no longer need apnea monitoring. This must be weighed against concerns such as strangulation risk and surgeon availability.

Nicholas Walenga, BS

Nicholas Walenga, Brian C. Gulack, Gwyneth Sullivan, Ami N. Shah

PROLONGED INPATIENT LENGTH OF STAY AFTER SURGICAL TREATMENT OF ADOLESCENT PRIMARY SPONTANEOUS PNEUMOTHORAX: CAN WE DO BETTER?

INTRODUCTION: Surgical management of Primary Spontaneous Pneumothorax (PSP) in adolescents traditionally involves a blebbectomy and pleural procedure to prevent recurrence, however this procedure has been considered to be plagued by prolonged hospital length of stay due to prolonged air leaks. Current data on inpatient outcomes following surgical management PSP is lacking, and therefore we set to analyze current case data to establish them.

METHODS: The American College of Surgeons National Surgical Quality Improvement Project participant user files were queried between 2012-2021 for adolescents aged 12-18 years (4380 - 6569 days) undergoing surgical management of primary spontaneous pneumothorax. Standard summary statistics were utilized to describe post-operative morbidity. A logistic regression was used to determine risk factors for a prolonged postoperative hospital length of stay which was defined as greater than 3 postoperative days based on historical outcomes. Postoperative complications were also analyzed for frequency.

RESULTS: A total of 572 adolescents were included (median age: 16.34 years, 13.81% female), among which the median postoperative length of stay was 3 days (interquartile range [IQR]: 2-4 days). 258 cases had a prolonged post-surgical length of stay while the remaining 314 were discharged normally. Postoperative morbidity also included a reoperation rate of 6.47% and a 30-day readmission rate of 5.77%. The adolescents which were operated on by an adult thoracic or general surgeon as opposed to a pediatric surgeon was 8.39%. Preoperative risk factors correlated with a prolonged postoperative length of stay included female sex, (Odds ratio: 2.09, 95% confidence interval: 1.29, 3.42) and oxygen support (odds ratio: 1.76, 95% confidence interval: 1.05, 2.99). The most common post-operative complications were oxygen at discharge (23), nutrition at discharge (22), and pneumonia (4).

CONCLUSION: Nearly half of adolescents undergoing surgical procedures for treatment of spontaneous pneumothorax suffer from a prolonged postoperative length of stay. Data does not suggest that post-operative complications occur in high enough frequency to be a significant contributor to a prolonged length of stay. More research is needed to establish the cause of prolonged length of stay and to improve outcomes among female patients.

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NAVIGATING ACCESS TO CONTRACEPTIVE EDUCATION: ESTABLISHING BASELINES FOR CONTRACEPTIVE USE AND COUNSELING

INTRODUCTION Patients delivering an early preterm infant (< 34 weeks gestation) have unique challenges in accessing postpartum care and contraception, such as managing postpartum and medical complications as well as a prolonged neonatal intensive care unit (NICU) stay. They will often prioritize time at the infant's bedside, delaying or neglecting their own health needs inadvertently contributing to low postpartum visit attendance. Delivering an early preterm infant is the strongest predictor for repeat preterm birth, but less than half of patients are counseled about contraception and the risk of future preterm birth. This increased risk combined with missing the opportunity to discuss reproductive life planning demonstrates a need for more patient education and contraception access.

METHODS We conducted a retrospective chart review of patients who delivered early preterm infants at Rush University Medical Center (RUMC) in 2022. Our primary outcome identifies baseline rates of contraception usage by 8-weeks postpartum. Secondary outcomes include rates of contraception counseling, patient interest in contraception, and standard 6-week postpartum visit attendance. The patients' charts, including notes in CareEverywhere, were reviewed to assess for these baseline rates. Exclusion criteria encompassed LARC placement or sterilization prior to hospital discharge and neonatal demise.

RESULTS Of 144 patients who delivered early preterm infants admitted to the NICU during the study period, 88 met eligibility criteria. Of these eligible patients, 26% had documented contraception given by 8 weeks postpartum. During their inpatient stay, 45% of patients expressed interest in contraception, and 88% of patients did not have a documented contraception prescription before discharge. The rate of 6-week postpartum visit attendance was 57%. While 49% received contraception counseling prior to 8-weeks postpartum, only 33% of patients expressed interest in contraception at a postpartum appointment.

CONCLUSION Our data suggests that patients delivering preterm infants express interest in contraception before postpartum discharge, yet few are prescribed a method prior to discharge or within 8 weeks following delivery. These low rates demonstrate an opportunity for interventions in the postpartum period, such as additional visits to provide timely contraception counseling and prescription/placement of birth control for patients with early preterm infants in the NICU.

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EVALUATION OF PAIN AND PELVIC ORGAN PROLAPSE AMONGST A DIVERSE PATIENT POPULATION

INTRODUCTION: Pelvic organ prolapse (POP) is common among women, with a peak prevalence of 5% reported in women ages 60-69, although some degree of prolapse is present in up to 50% of women based upon pelvic exam. There is no consensus about the association of POP with pain, or the quality of POP-related pain. Furthermore, there are few studies documenting this association in a racially and ethnically diverse population. Our primary objective is to describe POP prevalence and quality of POP-related pain in a diverse patient population.

METHODS: This is a cross-sectional study of patients presenting for urogynecologic care at RUMG Urogynecology and Urology clinics. Patients with a known history of a chronic pain diagnosis or recurrent urinary tract infections were excluded. Physical exam was used to categorize the stage of POP. Patients completed validated pelvic floor symptom and pain surveys, including the Modified McGill Pain Questionnaire, Pelvic Floor Distress Inventory, and Patient-Reported Outcomes Measurement Information System.

RESULTS: 19 women completed the surveys. Mean age was 58 +/- 16 years. 37% percent were White, 26% Hispanic or Latino, 21% 1+ race, 16% African American. The majority of patients had stage II or stage III prolapse (79%). The minority of patients with POP had myofascial tenderness upon exam (Stage I: 25%, Stage II: 33%, Stage III: 0%). Women with POP of all stages had a median pain score of 22/100 (IQR 3.5-59). 92% of women with Stage I and II POP experienced pain, with a median pain score of 46, while only 83% of patients with Stage III experienced pain, with a median pain score of 13. The most reported quality of pain was "cramping," with 42% of women endorsing this symptom (50% Stage I, 55% Stage II, 16% Stage III).

CONCLUSION: In this small cohort, women with stage III POP were less likely to report pelvic pain. Pelvic pain was most commonly noted to have a cramping pain. A minority of women with POP had myofascial tenderness on exam. Larger samples are required to determine differences in pain presence and quality among women with different stages of POP.

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INITIAL EVALUATION OF PELVIC ORGAN PROLAPSE IN THE EMERGENCY DEPARTMENT

INTRODUCTION To describe the presenting characteristics and management amongst women seeking initial care for pelvic organ prolapse (POP) in the emergency department (ED). Also sought to determine rates of follow-up post-ED visit and factors associated with accessing urogynecologic care.

METHODS Retrospective study of patients who presented at 3 separate EDs associated with a single tertiary referral center and received an ICD10 code diagnosis of POP between January 1, 2016 and September 30, 2022. Patients who had previously undergone evaluation for POP or presented for a complication or treatment related to established POP were excluded. Data elements extracted from the EMR include demographic variables, chief complaint, assessment and treatment in the ED, and whether there was follow-up care with a urogynecologist within 3 months post-ED discharge. Descriptive statistics and bivariate analyses were used to determine statistical significance and compare characteristics amongst women who did not follow-up for urogynecologic care.

RESULTS Fifty-six female patients met inclusion criteria, mean age of 61.2 + 17.1 years. Most identified as Black or African American (57.1%) and Hispanic or Latino (21.4%). English was the primary language for the majority (89.3%). Most common chief complaint was vaginal bulge (42.9%) followed by pelvic pain (28.6%). Evaluation principally was comprised of physical examination (98.2%) and imaging (44.6%), with main imaging modalities being CT abdomen and pelvis (30.4%) and pelvic ultrasound (23.0%). Predominant intervention was manual reduction of the prolapse (23.2%). Consultation with gynecology and urogynecology was performed in 28.6% and 8.9% of patients, respectively. Approximately one-third (35.7%) underwent follow-up care with a urogynecologist within 3 months of ED discharge. There was no statistically significant difference in race, ethnicity, language, or insurance among patients who ultimately did and did not access timely follow-up.

CONCLUSION POP can cause sufficient distress to prompt a visit to the ED. Our study is the first to investigate the relationships between the utilization of the ED for initial evaluation of prolapse and follow-up care. Further research is needed to understand factors associated with the use of the ED as a contact point for new POP presentation and detect any differential variables amongst patients accessing urogynecology follow-up care.

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HUMAN IGG GLYCAN PATTERN AND AUTOREACTIVITY IS ASSOCIATED WITH NEUROINFLAMMATION IN COVID-19

INTRODUCTION: A spectrum of neurologic complications in mild and severe COVID-19 cases are well documented. While inflammation in the central nervous system of COVID-19 patients likely contributes to these complications, the mechanisms of neuroinflammation and correlates of neurologic complications remain elusive, especially since the etiologic pathogen of COVID-19, SARS-CoV-2, minimally invades the CNS.

METHODS: The glycosylation pattern of immunoglobin G (IgG) may denote extent of inflammation and disease progression. Long-chain glycosylation of IgG is associated with anti-inflammation whereas short chain glycosylation is associated with inflammation. In this study, we assessed the relationship between cerebrospinal fluid (CSF) IgG glycosylation pattern in COVID-19 and neuroinflammatory markers. Specifically, we describe the CSF IgG glycosylation pattern of 11 deceased COVID-19 patients (median age 69 [IQR 61-77], 7 males, 4 females) through glycoproteomic analysis and assessed their association with soluble and cellular markers of neuroinflammation, and histologic brain neuropathology. An 11-rank Spearman bootstrap confirmed statistically significant correlations.

RESULTS: SARS-CoV-2 was undetectable in all CSF samples, yet 10 out of 11 donors had anti-SARS-CoV-2 IgGs in the CSF. Glycoform analysis showed an inflammatory glycan profile of decreased galactosylation and sialylation. Inflammatory IgG glycans positively correlated with CSF neuroinflammatory markers (sCD14 $r=0.63$, $P<0.05$) while anti-inflammatory glycan patterns were inversely associated with total anti-Spike IgG ($r=-0.74$, $P<0.05$) and sCD163 ($r=-0.60$, $P<0.05$). Inflammatory glycosylation patterns were also associated with more infiltrating CD4+ T cells in the brains of COVID-19 deceased individuals. Moreover, high levels of microgliosis in the brain was associated with CSF neuroinflammatory markers (RANTES and IL-4), and donors with evidence of hemorrhage had significantly higher levels of IP-10 and neopterin compared to those without hemorrhages. Lastly, CSF IgG antibodies of COVID-19 donors were self-reactive to human brain antigens, as evaluated ex vivo.

CONCLUSION: Together, these data demonstrate that antibody glycosylation patterns are associated with neuroinflammation in COVID-19 and suggest autoimmunity may contribute to neuroinflammation in COVID-19.