

Class of 2023

Self-Directed Student Scholarly Project

[SDSSP] Course

Research Day Proceedings

March 18th, 2021

Book of Abstracts

Planning Committee:

Arpita Vyas, MD

Valerie Gerriets, PhD

Robyn Noguchi



CALIFORNIA
NORTHSTATE
UNIVERSITY

Research Day Agenda

8:30 – 8:45 am: Introductory remarks – *CNUCOM Dean Silva*

8:45 – 9:30 am: Keynote Speaker - *Dr. Harry Ostrer* – “My Odyssey in Cancer Genomics (via The Supreme Court)

9:30 – 12:00 pm: Oral Presentations

12:00 - 1:00 pm: Lunch Break [Posters will be available for viewing]

1:00 - 3:00 pm: Poster Presentations

3:00 – 3:30 pm: Research Achievements – *CNUCOM Dean Yang*

3:30 – 4:00 pm: Announcements and Awards

CNUCOM Research Day

Thursday, March 18, 2021 – 8:45 AM to 9:30 AM

Zoom Link: <https://zoom.us/j/94757104334?pwd=dU9GYWNVRStHd0NOKzd0a3pMQW1lZz09>

Zoom Password: 300842

My Odyssey in Cancer Genomics (via the Supreme Court)

Our Guest Speaker

Harry Ostrer, M.D. is Professor of Pathology and Pediatrics at Albert Einstein College of Medicine in New York. He is a graduate of the Massachusetts Institute of Technology and Columbia University College of Physicians and Surgeons. He trained in pediatrics and medical genetics at the Johns Hopkins Hospital and in molecular genetics at the National Institutes of Health. For 20 years, he was the director of the Human Genetics Program at New York University School of Medicine.

Dr. Ostrer studies the genetic basis for common and rare disorders. At Morgan and Mendel Genomics, his start-up, he advises about translating the findings of genetic discoveries into tests that can be used to identify people's risks for having cancer prior to its occurrence or for predicting its response to therapy, once it has occurred. Dr. Ostrer is a long-time investigator of the genetics of the Jewish people and Hispanic and Latino people. In 2007, he organized the *Jewish HapMap Project*, an international effort to map and sequence the genomes of Jewish people.

Dr. Ostrer was the successful plaintiff with standing in the landmark 2013 lawsuit, *Association of Molecular Pathology versus Myriad Genetics*. As a grantee from the National Human Genome Research Institute, he explored the impact of genetic testing on health, life and disability insurance. These studies led to his efforts as a member of the New York State Bar Association to promote legislation that would prevent genetic discrimination in insurance and employment in New York State – forerunners to the U.S. Genetic Information Non-Discrimination Act and the Affordable Care Act.



Harry Ostrer, M.D.

Professor of Pathology and
Pediatrics

Albert Einstein College of
Medicine, New York

Oral Presentations

Selected Abstracts for Oral Presentation 2021

9:30 AM – 12:00 PM

1. 9:30 AM – 9:45 AM

Unravelling the Pharmacology of The Middle Eastern Spice Sumac in Causing Cytotoxicity in Pancreatic Cancer: A Feasibility Study

Abala Michael

2. 9:45 AM – 10:00 AM

Discriminatory Capacity of the Physical Functioning Domain of Pediatric Quality of Life Inventory in Traumatic Brain Injury in Children

Simranjeet Benipal

3. 10:00 AM – 10:15 AM

Sirtuin -3 Pharmacologically Promotes Insulin Sensitivity Through PI3/AKT and its Downstream Pathway in Adipocytes

Alexandra Lee and Sabrina Christensen

4. 10:15 AM – 10:30 AM

Effectiveness of Voice-Over Lectures and Jeopardy! Style Review Games

Justin Tang and Pranshul Goel

5. 10:30 AM - 10:45 AM

Impact of metformin-exposure on fetal anthropometric measures in PCOS pregnancies

Rachel Isaacs and Carol Nader

6. 10:45 AM – 11:00 AM

Maternal Substance Use and Incidence of Congenital Heart Defects

Pritha Roy and Nitiya Janardhan

7. 11:00 AM – 11:15 AM

High Prevalence of Diverticular Disease in Low-Prevalence Ethnicity from Integration of Different Dietary Habits

Chloe Sumner and Lillian Jundi

8. 11:15 AM – 11:30 AM

Impact of Pediatric Dermatologic Conditions on Child and Parent Quality of Life

Jasminder Malhi

9. 11:30 AM - 11:45 AM

Dimensional Analysis and anatomical Variation of the Branches of the Celiac Trunk

Christopher Tran, Andrew Maneval and David Lindars

10. 11:45 AM – 12:00 PM

RELT family member-induced apoptosis: elucidation of pathway and relevance to breast cancer

Anusri Yanumula

Oral Presentation Abstracts

1. Unravelling the Pharmacology of The Middle Eastern Spice Sumac in Causing Cytotoxicity in Pancreatic Cancer: A Feasibility Study

¹Michael Anthony Abala*, ²James A*. Lugtu, ²Abneet Sangha, ²Tibebe Woldemariam, ²Linh Ho, ²Ashim Malhotra

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² California Northstate University, College of Pharmacy, Elk Grove, CA

Purpose: Pancreatic cancer is the fourth leading cause of cancer mortality in the United States. Each year, it kills 47,000 Americans and 250,000 people worldwide. It is challenging to treat and there is no cure. Pharmacological intervention strategies remain limited, non-specific, and expensive, with a profound adverse effects profile. The five-year relative survival rate following diagnosis is only about 10%, probably as a result of gaps in addressing its substantial chemoresistance and incomplete understanding of the underlying molecular and genetic drivers. Although, many risk factors influence outcome, the effect of diet on therapeutic outcomes needs examination.

Methods: We conducted a literature survey to identify dietary plants used in other carcinomas, and identified the six spices used in Middle Eastern and Indian cuisines, including sumac (*Rhus coriaria*). We prepared crude aqueous extracts of all these plants by macerating 5 g samples with either water or acetone for 24 hours, followed by freeze drying or solvent evaporation. Subsequently, we tested the effect of the aqueous extract of sumac on cell survival using human pancreatic cancer cell lines with different mutations in the *KRAS* gene, which is mutated in 90% of all pancreatic cancer patients. Initial cytotoxicity screening using the MTT assay demonstrated that sumac, at concentrations of 0.03 mg/mL, 0.3 mg/mL, and 3.0 mg/mL, killed both these pancreatic cancer cell lines *in vitro*, while sparing non-cancerous cells, suggesting selectivity. To elucidate the mechanism of sumac-mediated cytotoxicity, we hypothesized that it resulted in mitochondrial derangement and the induction of caspase-dependent apoptosis. To test this hypothesis, we treated pancreatic cancer cells with sumac and measured the 1) production of reactive oxidative species (ROS), 2) mitochondrial membrane potential, which indicates mitochondrial integrity, and 3) caspase 3 and 7 activity, which evaluates the mechanism for apoptosis. Finally, to identify the specific compound in the aqueous sumac extract that induced the observed cytotoxicity, we conducted HPLC-based fractional analysis combined with NMR.

Results: Our results showed that sumac 1) reduced ROS production and 2) compromised mitochondria in both the pancreatic cancer cell lines, with a more pronounced effect for PANC-1 cells compared to the MIA PaCa-2 cell line. Cytotoxicity, amelioration of ROS production and mitochondrial membrane potential was loosely dose-dependent and was most pronounced with the largest sumac dose. NMR identified to be [(2R,3R,4S,5R)-3,4,5,6-tetrakis[(2-deuterio-3,4,5-trihydroxybenzoyl)oxy]oxan-2-yl] methyl-2-deuterio-3,4,5-trihydroxybenzoate as the active constituent.

Conclusion: Considering the substantial chemoresistance of pancreatic cancer and the high cost and relative ineffectiveness of pharmacological intervention, therapeutic design needs to be holistic and include non-pharmacological therapy. Our cell-based studies suggest potential benefit to the addition of select Middle Eastern dietary component such as sumac in the fight against pancreatic cancer. These studies need to be expanded to animal models and subsequently in clinical trials.

2. Discriminatory Capacity of the Physical Functioning Domain of Pediatric Quality of Life Inventory in Traumatic Brain Injury in Children

Simranjeet Benipal, BS^{1,2}; Nathan Kuppermann, MD, MPH^{1,3}; Daniel J. Tancredi, PhD³; Frederick P. Rivara, MD, MPH^{4,5}; Jin Wang, PhD, MS⁵; and Daniel K. Nishijima, MD, MAS¹

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⁴ Department of Pediatrics, University of Washington, Seattle, Washington

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Introduction: The Pediatric Quality of Life Inventory (PedsQL) is a health-related quality-of-life instrument consisting of physical and psychosocial domain scores that reliably differentiate between children with varying severities of traumatic brain injuries (TBI). The physical domain score of the PedsQL may be less sensitive to external factors unrelated to TBI compared to the psychosocial domain scores. Therefore, our objective was to evaluate and compare the discriminative capacity of TBI injury severity for changes in the overall PedsQL or the PedsQL physical domain score alone.

Methods: We performed a secondary analysis of a study of children with TBI conducted from March 1, 2007 to September 30, 2008. All children younger than 18 years-old and treated for either a TBI or arm injury (control group) in one of ten study hospitals were eligible. The PedsQL survey was administered after injury and at 3, 12, and 24 months. In the current analysis, we used linear mixed models to assess the change of outcome scores from baseline compared to arm injury controls. Somers' D was calculated to compare discriminatory capacity with injury severity as a predictor of change in PedsQL outcome scores.

Results: Children with moderate and severe TBIs had significant decreases in PedsQL physical domain scores alone at 3, 12, and 24 months, similar to the decreases in the overall PedsQL. Discriminative capacity was stronger for the PedsQL using all domain scores than for the PedsQL physical domain score alone at 3 months (-0.08 vs. 0.02), 12 months (-0.11 vs. 0.02), and 24 months (-0.13 vs. -0.02).

Conclusion: The PedsQL physical domain score alone differentiates TBI severity in children after head trauma. However, at all follow-up timepoints, the PedsQL using all domain scores had higher discriminatory capacity than the PedsQL physical domain score alone. Our results suggest that the overall PedsQL should be used more preferentially in children with TBIs, though further investigation is warranted in disease states where physical injuries may predominate.

3. Sirtuin-3 Pharmacologically Promotes Insulin Sensitivity Through PI3/AKT and its Downstream Pathway in Adipocytes

Sabrina Christensen^{a*} and Alexandra Lee^{a*}, Linh Ho^{b#}

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^bCalifornia Northstate University College of Pharmacy, Elk Grove, CA 95757, USA

Introduction: Sirtuin 3 (Sirt3) is a mitochondrial deacetylase enzyme in metabolic tissues that is decreased in diabetes. Sirt3 knockout mice exhibit insulin resistance, glucose intolerance, and accelerated obesity. Elucidating Sirt3's molecular mechanism in regulating insulin sensitivity in adipocytes can contribute to the effort of targeting Sirt3 for treatment of obesity and type 2 diabetes.

Methods: 3T3-L1 cells were treated with increasing concentrations of Sirt3 inhibitor (3-TYP) or Sirt3 activator (Honokiol). Quantitative PCR investigated changes in lipolysis gene markers including peroxisome proliferator-activated receptor gamma (PPAR γ), ATP-citrate lyase (ACL), lipoprotein lipase (LPL), adipose triglyceride lipase (ATGL), and sterol regulatory element binding protein 1 (SREBP1). Western blot identified Sirt3's role in the insulin signaling pathway by comparing specific protein concentrations known to play a role in the insulin signaling pathway, including mammalian target of rapamycin (mTOR), insulin receptor beta (IRB), and Fox O1/FoxO3a/FoxO4. Data analysis used Graphpad Prism Software. Statistical analyses used a two-tailed unpaired followed by *post hoc* Dunnett's multiple comparisons.

Results: For cells treated with Sirt3 inhibitor 3-TYP, phosphorylation of Fox O1/FoxO3a/FoxO4 and protein expression of mTOR and IRB were decreased. There were no significant differences in mRNA levels of ACL and ATGL. However, a significant decrease in LPL and SREBP1 was seen especially with 50uM of Sirt 3 inhibitor. For cells treated with Sirt3 activator Honokiol we found an increase in phosphorylation of FoxO1/FoxO3a/FoxO4 (P-FoxO1/FoxO3a/FoxO4) and of IGF-IR beta. There was also an increase seen in mTOR and IRB. There was a significant decrease in gene expression of PPAR γ and LPL and a significant increase in ACL. There was no significant increase or decrease in gene expression of HSL or SREBP1.

Conclusion: Sirt3 inhibitor decreased LPL, which is associated with insulin resistance, obesity, dyslipidemias, etc. In sharp contrast, Sirt3 activator increased LPL, indicating that activation improves insulin resistance. Additionally, Sirt3 activation upregulated insulin pathway by activating insulin receptors and the downstream member mTOR. These results indicate that Sirt3 activation can improve insulin resistance whereas inhibition leads to insulin resistance.

4. Effectiveness of Voice-Over Lectures and Jeopardy! Style Review Games

Pranshul Goel, Justin Tang, John Cusick PhD, Valerie Gerriets PhD

College of Medicine, California Northstate University, Elk Grove, California

Introduction: As flipped-classrooms and online teaching become more prevalent in the teaching community, there is also a need to research the effectiveness of these methods. The goal of this project was to understand the effectiveness of using both voice-over style lectures and review games in the classroom. By using student feedback and suggestions, the “flipped-classroom” style of lectures will be improved to provide the students with the most effective way of communicating.

Methods: Current second-year medical students at California Northstate University (CNU) were recruited via advertising to participate in the study. The students were then randomly assigned to three groups; group 1 took a 15 question formative quiz based on the lecture before watching the voice-over video or participating in the review game, group 2 took the quiz after watching the lecture but before the review game, and group 3 took the quiz after watching the lecture and participating in the review game. Lastly, all three groups completed a survey to measure their thoughts on the effectiveness of the voice-over lecture and review game. The data was then analyzed via an ANOVA to determine the significance and viability of the experimental hypothesis.

Results: A total of 17 students participated in the study and were randomly assigned to 3 groups. The quiz consisted of 15 questions, however, 2 questions were removed due to an error in question formatting. Group 1 consisted of 5 students and the average total number of correct answers on the quiz was 4.4/13. Group 2 consisted of 5 students and the average total number correct was 7.4/13. Group 3 consisted of 7 students and the average total number correct was 8.9/13. There were statistically significant differences between group means as determined by a single-factor ANOVA ($F(2,14) = 15.03, p < 0.001$). Post-hoc comparisons indicated that group 1 ($M=4.4, SD=3.3$) was statistically different from group 2 ($M=7.4, SD=2.8$) and group 3 ($M=8.9, SD=0.5$). However, group 2 did not differ significantly from group 1. The final survey on effectiveness of the voiceovers and jeopardy sessions showed that on a 7-point Likert scale, students agreed on the following with the associated average Likert score: they enjoyed voiceover lectures over in-class lecturers (5.18), they enjoyed having embedded questions in the voiceovers (6.27), shorter high yield voiceover lectures are preferred (5.8), usage of BigBlueButton and Kahoot are viable alternatives during the COVID-19 pandemic (5.93).

Conclusions: There is a statistically significant increase in the number of correct answers by the group who answered the quiz questions after watching the voice-over and attending the review game compared to those students who completed the quiz before watching the lecture and attending the review game, confirming our hypothesis that voice-over lectures and review games enhance student learning.

5. Impact of metformin-exposure on fetal anthropometric measures in PCOS pregnancies.

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¹ California Northstate University College of Medicine, Elk Grove, CA

² Valley Children's Hospital, Madera, CA

Introduction: Polycystic ovarian syndrome (PCOS) is the most common endocrine disease in women of reproductive age. Obesity occurs in 40-80% of women with PCOS. The condition is associated with an increased risk of pregnancy related complications including gestational diabetes and premature deliveries. Metformin, used in the management of PCOS, has recently shown to have beneficial effects on pregnancy outcomes. However, the role of in-utero exposure to metformin on fetal growth in PCOS pregnancies is not clear. We hypothesize that in-utero exposure to metformin would differentially alter fetal anthropometric measures in PCOS pregnancies.

Methods: This retrospective study included women with PCOS who were seen for prenatal care at Valley Children's Hospital in Madera, California over the course of the last 10 years. The medical charts of patients diagnosed with PCOS were randomly selected to be included in data collection. For each patient, past medical history, past obstetric/gynecologic history, family history, current medications or substances, BMI, age, gravity and parity, and fetal anthropometric measurements (Ratios*: CI, FL/BPD, FL/AC, estimated fetal weights at 20 weeks, and rate of weight gain) were recorded. Fetal growth measures for different maternal BMI groups (obese and non-obese) were compared for metformin and no metformin groups. We used a 2-tailed independent t-test for parametric data analysis and Wilcoxon signed-rank test for non-parametric data. A significance level of alpha = 0.05 was assumed throughout the study. The statistical analysis was performed using SPSS software.

Results: In total, 127 patients were included and randomly selected from Valley Children's Hospital. 21 patients with PCOS were excluded from data analysis as they presented for pre-pregnancy counseling. 106 patients with PCOS pregnancies were studied. Of these, 27.4% were on metformin, 20.8% had GDM, 71.3% were obese, and 21.7% were advanced maternal age. 11 fetuses had ≥ 1 congenital anomaly. Metformin had no impact on fetal morphometric measurements in the non-obese PCOS pregnant group. However, metformin did significantly alter certain fetal morphometric measurements in the obese PCOS pregnant group. The average FL/AC ratio significantly differed (*p-value* 0.02) between Obese PCOS-metformin vs Obese PCOS-no metformin group (20.9 +/- 0.15 n=15 vs 21.5 +/- 0.13 n=54 respectively). The average FL/BPD ratio tended to be different (*p-value* 0.07) in the Obese PCOS-metformin vs Obese PCOS-no metformin group (71.5 +/- 1.01 n=16 vs 73.8 +/- 0.65 n=54 respectively). No differences were seen in rate of weight gain or estimated fetal weight around 20 weeks gestation.

Conclusion: Metformin had a BMI specific effect on fetal growth measures. Exposure to metformin in obese PCOS pregnancies led to significantly lower FL/AC ratio (elevated FL/AC ratio is associated with IUGR). In contrast, metformin exposure was not associated with any fetal measure differences in the non-obese PCOS pregnancies. Further studies are required to assess the significance of such differing results in fetal measures with metformin exposure on postnatal outcome.

6. Maternal Substance Use and Incidence of Congenital Heart Defects

Nitya Janardhan¹, Pritha Roy¹, Viktor Limanskiy MD², , Joseph Izzo MD², Arpita Vyas MD¹

¹ California Northstate University, College of Medicine, Elk Grove, California

² San Joaquin General Hospital, French Camp, California

Introduction: Congenital heart defects (CHDs) are the most common type of birth defects, affecting 40,000 births every year in the United States. Previous research has shown associations between maternal use of tobacco, alcohol, and illicit drugs and higher neonatal prevalence of CHDs. We hypothesize that there is a significant association between any maternal substance use and CHD incidence in newborns.

Methods: A retrospective chart analysis of Maternal Fetal Medicine data from San Joaquin General Hospital between 2018 - 2020 was used to identify newborns with CHD (n=102). The following maternal data was collected: race, age, height, weight, gestation weeks, delivery mode, medications, past medical history, insurance status, tobacco use, illicit drug use, alcohol use, and maternal current gestational health including parity. The following fetal data was collected: sex, birth weight, type of CHD detected on fetal echo. A randomly selected control group of age matched patients seen during the same time period was used (n=50). Mothers with substance use during pregnancy were compared to mothers with no substance use during pregnancy for prevalence of CHD in newborns. Chi squared test was used to analyze the association between maternal substance use and CHD incidence using SPSS software. Furthermore, univariate analysis was conducted controlling for covariates including gestational diabetes mellitus, advanced maternal age, and BMI > 30 with post hoc Bonferroni.

Results: In our analysis, we noted maternal substance use associated with increased incidence of CHD. 21 of the 25 (84.0%) babies born to mothers with maternal substance use did have CHD, whereas 67 of the 114 (58.8%) babies born to mothers with no history of maternal substance use had CHD (*this figure will likely decrease as we gather more control data*). Pearson Chi-Square test yields a value of 12.483 ($p=0.002$) for these two variables. Univariate analysis testing with substance use (2.255) noted as a fixed factor and gestational diabetes (1.154), advanced age (0.515), and BMI > 30 (0.373) indicated that both gestational diabetes and substance use are significant factors ($p = 0.02, 0.006$). A further analysis split by type of CHD was performed, compared to maternal substance use (p value = 0.166). In these categories, VSDs occurred in 14.3% of births to mothers with substance use, as opposed to 27.3% of births to mothers with no history of maternal substance use, ASDs occurred in 38.1% of births to mothers with substance use, as opposed to 31.8% of births to mother with no history of maternal substance use, and PDAs occurred in 19.0% of births to mothers with maternal substance use, as opposed to 31.8% of births to mothers with no history of maternal substance use.

Conclusion: While these results are still preliminary, we found a significant association between incidence of CHD in babies born to mothers with a history substance use when compared to mothers with no history of maternal substance use. This information could be crucial in identifying and screening individuals with risk factors that place their offspring for high risk of development of CHD, and designing early interventions to reduce the effects of CHDs in these vulnerable populations.

7. High-Prevalence of Diverticular Disease in Low-Prevalence Ethnicity from Integration of Different Dietary Habits

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Introduction: Diverticular disease (DD) has been thought to be more prevalent in westernized societies and low fiber diets. Immigration trends suggest that previous trends in DD may be changing. This study aims to understand the prevalence of DD among San Joaquin General Hospital patients in a multi-ethnic community in Northern California's Central Valley.

Methods: A retrospective chart review identified patient age, gender, and ethnicity to understand the prevalence of DD confirmed by CT or colonoscopy (2018-2019) at an academic hospital in the Central Valley of California. Comparisons were analyzed using chi square analysis and one way ANOVA with Tukey's post hoc test.

Results: 4300 charts were reviewed, and 2822 included after exclusion criteria, with confirmed DD in 280 charts. In patients with DD, median age was 60.4 years (40-94), and mode 54 years. There is increased prevalence among males (147) compared to females (133). The most common ethnic group was White (99/280), followed by Hispanic (90/280), Black (39/280), Other (32/280), Asian/Pacific Islander (API) (27/280), and American Indian/Alaskan Native (3/280). Chi square analysis of gender and ethnic group (χ^2 (5, N=302)=1.8021, p=0.8758) and gender and age (χ^2 (5, N=280) = 5.3952, p=0.3696) revealed non-significant relationships. One-way ANOVA of age and ethnicity revealed statistical significance (F(5, 285)=3.849, p=0.00217), with post hoc analysis revealing significance that APIs with DD are on average 8.3 years older than Hispanics (p=0.0024874).

Conclusion: Our data reflects general trends for prevalence of DD in men vs. women, and prevalence of DD between ages 40-69, but differs from the general trends above those ages. A significant difference between the ages of Hispanics and APIs with DD was found. This prompts the consideration of lifestyle factors such as diet as significant contributors to the development of DD.

8. Impact of Pediatric Dermatologic Conditions on Child and Parent Quality of Life

Jasminder Kaur Malhi ¹, Mildred Min, Raja Sivamani MD ^{1,2}

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²Pacific Skin Institute, Sacramento, California

Introduction: The effect of pediatric dermatologic conditions goes beyond the skin, impacting child and parent life quality. The purpose of our study is to learn if and how this impact varies per diagnosis and to determine which aspects of life quality are most affected.

Methods: Patients between 7 and 18 years old receiving care at the Pacific Skin Institute and their parents were recruited to participate in a survey study; Through SurveyMonkey, participants completed the Family Dermatology Life Quality Index (FDLQI) and Children’s Dermatology Life Quality Index (CDLQI). Total scores for the FDLQI/CDLQI and scores for distinct life quality domains for the CDLQI were computed as averages for each condition. FDLQI scores can range from 0 to 30, with higher scores corresponding to a larger impact. CDLQI total scores correspond to the following categories: no effect, small effect, moderate effect, very large effect, and extremely large effect on child life quality.

Results: CDLQI sample size is 27 children, with diagnoses including: acne (12), eczema (4), psoriasis (2), undiagnosed (3), vitiligo (1), warts (1), cysts (1), port-wine stain (1), multiple diagnoses (2). FDLQI sample size is 26 parents. Average CDLQI score for eczema, acne, cysts, and vitiligo, with eczema scoring highest, indicate moderate effect on life quality. Average CDLQI score for warts, psoriasis, undiagnosed, and multiple diagnoses indicate small effect on life quality. Average CDLQI score for port-wine stains indicate no effect on life quality. Based on average scores for all diagnoses, the “symptoms and feelings” domain was the most negatively impacted aspect of child quality of life, followed in order by the “leisure” and “personal relationships” categories. FDLQI scores were the highest for parents with children diagnosed with cysts (13/30), eczema (10/30), and acne (8.5/30).

Conclusion: The significance of pediatric skin condition impacts on child and parent quality of life correlates to diagnoses. Negative feelings and symptoms contribute the most to lower child life quality. Life quality is an aspect of wellbeing that is important for physicians to address.

9. Dimensional Analysis and Anatomical Variation of the Branches of the Celiac Trunk

David Lindars ^a, Andrew Maneval ^a, Christopher Tran ^a, Sailabala Vanguri MD ^b

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Introduction: By understanding the prevalence and types of anatomic variations of the celiac trunk, surgeons and radiologists can be better prepared in order to avoid iatrogenic complications in gastrointestinal and hepatobiliary procedures and operations. The normal anatomy of the celiac trunk includes the left gastric artery (LGA), common hepatic artery (CHA), and splenic artery (SA). Anatomical variations in the celiac trunk branches were found in 10.85% of about 17,000 samples of a 2020 meta-analysis.

Methods: Using 15 cadavers (8 male, 7 female) donated by UCSF to California Northstate University, the celiac trunk was dissected for full visibility. The dimensions of each branch point were photographed and recorded using a Vernier caliper, and anatomic variation in branching was noted. Branch diameter was measured and compared based on a variety of factors (e.g. age, sex, cause of death). The data were compared to previous literature, and ANOVA and t-tests were performed for statistical analysis.

Results: Fifteen (15) cadavers (8 female and 7 male) were used in the study. Mean arterial diameter of the celiac artery was 7.79 ± 0.45 mm, splenic artery was 6.54 ± 0.24 mm, common hepatic artery was 5.84 ± 0.32 mm, and left gastric artery was 3.53 ± 0.18 mm. Anatomic variation was observed in 1/15 cadavers (6.67% of specimens). Splitting the analysis by sex, we found that the mean diameter of the celiac artery was 8.3 ± 0.76 mm in female cadavers and 7.21 ± 0.39 in male cadavers. The mean diameter of the splenic artery was 6.45 ± 0.25 mm in females and 6.64 ± 0.44 mm in males. The mean diameter of the common hepatic artery was 5.58 ± 0.48 mm in females and 6.13 ± 0.40 mm in males. And lastly the mean diameter of the left gastric artery was 3.67 ± 0.30 mm in females compared to 3.36 ± 0.18 mm in males.

Conclusion: The data we gathered from a limited sample size of cadavers is consistent with previously published papers, both in terms of the arterial diameters as well as the % prevalence of recognized anatomic variance.

10. RELT family member-induced apoptosis: elucidation of pathway and relevance to breast cancer.

Anusri Yanumula, Dr. John Cusick, Ph.D.

California Northstate University, College of Medicine, Elk Grove, California

Introduction: Receptor Expressed in Lymphoid Tissues (RELT) is a Tumor Necrosis Factor Receptor member that has two homologous binding partners, RELL1 and RELL2, and collectively, these three proteins are described as RELT family members. RELT family member expression has previously been shown to induce apoptosis in human epithelial cells and one goal of the project was to explore whether RELT family members could induce death in breast cancer cell lines. MyoD family inhibitor domain-containing protein (MDFIC) is a protein that binds RELT family members, and this study also sought to elucidate whether co-expression of MDFIC deletion mutants influence RELT-induced death.

Methods: Lipofectamine was used to transiently transfect DNA expression plasmids into cell lines and western blotting was used to confirm expression of the expected RELT family members. The breast cancer cell lines MDA-MB-231 (231) and MCF-7 were utilized in addition to the embryonic epithelial kidney cell line HEK-293 (293). A luciferase assay was used to assess cell viability by measuring the amount of cellular ATP present in cells following transfection of expression plasmids. T tests were used to determine statistical significance.

Results: RELL2 and RELT expression enhances cell death in the breast cancer cell line 231. An additional finding was that co-expression of a MDFIC mutant lacking the carboxy-terminus enhances RELT-induced death in 293 cells.

Conclusions: RELL2 and RELT induces death in a metastatic breast cancer cell line. This area of investigation is significant since autoantibodies directed against RELT are strongly correlated with breast cancer. Co-expression of a MDFIC mutant lacking the carboxy-terminus enhances RELT-induced death in 293 cells, providing the first evidence of a separate protein that influences RELT-family member induced cell death.

Poster Presentations

Poster Number and Title	Students	Mentor
11. Effectiveness of novel compounds on HIV envelope entry	Husni Abdul-Rahman,Rajpaul Gill, Matt Hurst	Dr. Ghalib Alkhatib
12. Variations in the Anatomical Position and Size of the Appendix - A Cadaveric Study at California Northstate University	Jemma Akkad,Tasha Nasrollahi, Shadi Salimi, Alyssa Jones	Dr. Sailabala Vanguri
13. Medical Student Anxiety Levels and Help-Seeking Behavior	Ara Albert Alexanian, David Lindars, Jimmy Ziegenbein, Kate Wigginton	Dr. Valerie Gerriets
14. Point-of-Care Ultrasound Use in the Identification of Fournier Gangrene	Alexis Wildman, Kathleen Barnett,Trina Amog	Dr. Leonard Ranasinghe
15. Case Report: Neuroretinitis as a complication of Cat Scratch Disease	Kimberly Lau, Kirk Harter, Azaam Mamoor, Jaycob Avaylon	Dr. Edward Durant
16. Emergency room triaging practices for Pediatric Diabetic Ketoacidosis	David Chirikian, Sohun Awsare	Dr. Arpita Vyas
17. Case Report: Management of Dengue Fever in the U.S., a rising threat?	Albert Kim, Esther Bartlett	Dr. Leonard Ranasinghe
18. Mental health disorders in pediatric patients with Diabetes Mellitus: Are we doing enough?	Yohanna Khachiyani, Natalie Li, Joyce Chen, Shirley Kim	Dr. Arpita Vyas
19. Adherence to Personal Protective Equipment Guidelines During the COVID-19 Pandemic Among Healthcare Personnel in the United States	Oliver Darwish	Dr. Sailabala Vanguri
20. A Case Report of Atypical Hyponatremia Caused by Diarrhea Following a Course of Ferrous Sulfate Supplements	Yosof Katiby, Krista Tenerelli, Adithya Shekhar, Nasrin Dhapa	Dr. Leonard Ranasinghe
21. Accidental Ingestion of 35% Food Grade Hydrogen Peroxide: A Case Report	Hansel Lim, Jason Tang, Sylvia Dinh	Dr. Sameir Alhadi
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Poster Presentation Abstracts

11. Effectiveness of Novel Compounds on HIV Envelope Entry

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The human chemokine receptors CCR5 and CXCR4 serve as coreceptors for the human immunodeficiency virus type 1 (HIV-1). HIV-1 utilizes CD4 as a primary receptor and either CCR5 or CXCR4 as a coreceptor to infect susceptible CD4+ cells. CCR5-using viruses (R5 viruses) appear early during the asymptomatic stage of HIV-1 infection while CXCR4-using viruses (X4 viruses) tend to appear late during the symptomatic stage of the disease. Maraviroc is an FDA-approved drug that blocks the coreceptor activity of CCR5 but not CXCR4. Drugs that block both coreceptor activities have not been identified. It is hypothesized that drugs that block both coreceptors would block new infections by both R5 and X4 strains.

We used a small compound drug library previously generated against the G-protein coupled receptors (GPCR) to isolate a compound that blocks HIV-1 infection by inhibiting the coreceptor activities of CCR5 and CXCR4. This library of compounds was analyzed at Eli Lilly and company in Indianapolis and was found effective against GPCR signaling. Since CCR5 and CXCR4 share considerable homology with CCR5 and CXCR4 we hypothesized that they may block their coreceptor activities needed for HIV-1 internalization into the host lymphocytes. We have identified 2 drug candidates block R5 and X4 fusion. Our preliminary data demonstrated efficient blocking of CCR5 and CXCR4-mediated cell fusion. One of the compounds showed a dose-response effect of envelop-mediated fusion that represents the first step in HIV-1 entry. Future analysis of these small compounds will focus on their biological effect on chemotaxis and G-protein signaling and the mechanism of their blocking activities.

12. Variations in the Anatomical Position and Size of the Appendix – A Cadaveric Study at California Northstate University

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Introduction: The vermiform appendix is an abdominal structure with variations in its position, length and width. Our cadaveric dissections and measurement of these values will increase the sample size of previous studies and is hypothesized to improve the prognosis of acute appendicitis.

Methods: All cadavers within the California Northstate cadaver lab were dissected, and the vermiform appendix analyzed for position, length, width, presence of mesoappendix and its relation to McBurney's point. The position was determined by observation of its relation to the cecum. The length was measured by using a divider caliper. The width was measured by using a vernier caliper. Due to changes in the width of a single appendix as a function of its length, the width was measured at three separate points, and these values were averaged. The presence of a mesoappendix was done by visual observation. Finally, the relation of the appendix to McBurney's point was done by measuring $\frac{1}{3}$ of the way from the iliac crest to the umbilicus with a ruler, and then comparing that value to the value of the iliac crest to the appendix. If these were within 0.5 cm from each other, the appendix was said to be correlated to McBurney's point.

Results: We had a total of 16 cadavers to examine, but 4 of the 16 did not have an appendix and thus were excluded from the study. Of the 12 cadavers that had appendices present (6 male, 6 female), 11/12 contained the mesoappendix. In order of most common positioning, 4 were retrocecal (33.3%), 3 were postileal (25%), 2 were subcecal (16.7%), 2 were pelvic (16.7%), and 1 was pre-ileal (8.3%). Fourteen of the 20 reviewed studies also reported retrocecal as the most common (46%), with the other 6 reporting pelvic as the most common location (29%). Furthermore, the average length we recorded was 6.77 cm +/- 1.86 as compared to an average of 8.6 cm in 9 previous studies. Finally, we measured an average width of 5.76 mm +/- 1.91, with 11/12 appendices located within 0.5 mm of McBurney's point.

Conclusion: We have concluded that the retrocecal position is the most common position of the vermiform appendix in both our sample population and the worldwide population. We have additionally concluded that in our sample, Mcburney's point proved to be an accurate clinical measurement of appendix location.

13. Medical Student Anxiety Levels and Help-Seeking Behavior

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Introduction: There is limited knowledge of the care-seeking behavior in persons with anxiety, especially at the medical school level. With the considerable rigor and stress of medical school, we have sought to better understand how medical students seek to address high/moderate anxiety levels by quantifying the utilization of counseling services and wellness events in medical students experiencing anxiety. This abstract describes the project and its outcomes.

Methods: Well-being data has been collected over three years. A 20-minute online survey has been provided to all medical students at CNUCOM biannually. The survey includes demographic data, wellness events attended, and whether the student has seen a mental healthcare provider over various intervals. The bulk of the data are in the form of a Likert scale, or ordinal values, testing for levels of anxiety, burnout, etc. The anxiety quantifier used in the survey is the GAD-7 scale, the most commonly used self-reporting scale for generalized anxiety disorder.

Results: Of responders who utilized mental health services in the form of either attending wellness events or counseling, 9.52% qualified as having high anxiety. Of responders who did not utilize any mental health services, 5.21% qualified as having low or no anxiety. Though this demonstrates a correlation between anxiety and attendance of either wellness events or counseling, this correlation was not statistically significant (p-value 0.221). When isolating help-seeking behavior in the form of attending wellness events, there was still no significant correlation with high anxiety (p-value 0.848). However, when isolating for help-seeking in the form of attending counseling, there is a statistically significant correlation with high/moderate anxiety level (p value 0.00169).

Conclusion: Determining how mental health services at medical school are utilized by students to either maintain or improve anxiety can encourage more educational institutions to provide such resources for their students, as more than 70% of students with high/moderate anxiety utilized wellness resources.

14. Point-of-Care Ultrasound Use in the Identification of Fournier Gangrene

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Introduction: Fournier gangrene (FG), a necrotizing soft tissue infection (NSTI) of the perineum or genitals, is a surgical emergency with significant morbidity and mortality. Early, aggressive surgical debridement has the greatest impact on prognosis. Swift recognition and treatment are imperative to minimize complications. While computerized tomography (CT) and magnetic resonance imaging (MRI) are considered the most sensitive imaging modalities of detecting NSTI, they can be time-consuming, expensive, and are often not available, particularly in the emergency department where these patients most often present. Point-of-care (POC) ultrasound is a fast and highly-specific diagnostic alternative for suspected FG, potentially leading to decreased time between presentation and operation, thus improving health outcomes.

Case description: A 49 year old male presents to the Emergency Department with a primary complaint of groin pain for the previous five days. He had associated bilateral testicular swelling, fever, and chills. The patient's medical history is significant for diabetes and a scrotal abscess 6 years prior. On examination, the patient exhibited tenderness to palpation of bilateral testicles, swollen to the size of a grapefruit compared to baseline size of an orange, and had malodorous purulent discharge draining from the left inguinal region. His abdomen was nontender without rebound or guarding. Additionally, he had new onset atrial fibrillation with rapid ventricular rate at 170 that improved to 110 after administering cardizem. The patient met SIRS criteria and had a central line placed in the right internal jugular vein. POC ultrasound revealed air in the scrotum, concerning for NSTI. Follow up noncontrast CT of the abdomen and pelvis revealed subcutaneous air in the soft tissue of the left posteromedial thigh, medial inguinal, and buttock regions extending into the left scrotum, which raised concern for an infectious and/or inflammatory process. A diagnosis of scrotal NSTI was made, and surgical debridement of the left scrotum and inguinal region was performed. Patient was post-operatively treated with antibiotics and remained hospitalized while being hemodynamically stabilized.

Discussion: NSTI case reports of the extremity are much more common than those of the perineal and perianal region seen in FG. In this patient, a POC ultrasound was performed first, then followed by a CT scan less than one hour later. Other case reports of NSTI and FG vary in the use of imaging utilization between CT only, CT and POC ultrasound, and POC ultrasound only. Use of ultrasound is not as well-documented in FG as it is with other NSTI cases, but utilization may increase in these cases moving forward. Point of care ultrasound use is increasing. When doing bedside ultrasound, clinicians look for subcutaneous thickening, air, and fascial fluid as indication for NSTI. These findings were present in the patient's ultrasound, creating increased suspicion for FG and allowing faster transition to surgical evaluation. The use of POC ultrasound to aid diagnosis of NSTI, and FG, is still new; in the future ultrasound may aid in reducing the door to OR window for these time sensitive cases.

15. Case Report: Neuroretinitis as a complication of Cat Scratch Disease

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Purpose: To report a case of neuroretinitis in a patient with *Bartonella Henselae* infection and provide insight on methods to distinguish these cases from more common etiologies of optic nerve edema.

Case Summary: A 21-year-old female presented to the Emergency Department (ED) with occipital headache, fever, dizziness, nasal congestion and blurry vision without pain in the left eye for one day. Her lumbar puncture was significant for a high opening pressure, though negative for meningitis. The patient was diagnosed with a viral illness and she was discharged with outpatient follow-up. The patient, however, had persistent central vision loss of 20/200 OS and recurring headaches. Subsequent ultrasound of the patient's optic nerve revealed significant optic nerve swelling. A new working diagnosis of idiopathic intracranial hypertension was made and the patient was started on oral acetazolamide. She was seen by ophthalmology the next day and recent scratches from her cat were noted on her arm. She tested positive for *Bartonella Henselae* and was started on doxycycline and rifampin. Nearly 2 weeks after the initial presentation, a macular star pattern, indicative of neuroretinitis, was noted on fundoscopic exam. The patient had completely recovered her vision by three months later.

Conclusion: In ED cases with unilateral vision loss, early use of point of care ultrasound and infection with *Bartonella Henselae* should always be considered. Early serology testing may be warranted to allow for earlier treatment since classic signs of neuroretinitis may not be apparent at onset.

Keywords: neuroretinitis, bartonella henselae, cat scratch disease

16. Emergency room triaging practices for Pediatric Diabetic Ketoacidosis

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Pediatric diabetic ketoacidosis (DKA) is a life-threatening condition arising in children or adolescents with Type 1 or Type II Diabetes Mellitus. DKA patients require extensive therapeutic intervention and staffing support, often involving one-on-one nursing observation and close monitoring of fluids and electrolytes on admission. Patients with DKA frequently present to their local emergency room (ER) for initial evaluation, management and triaging decisions for level of care on admission. Although pediatric DKA standard of care have been established, triaging practices for the level of care and management protocols often differ widely from institution to institution across the United States. In this project, we aim to determine the contributing factors for admission of pediatric DKA patients to the pediatric intensive care unit (PICU). We hypothesize that there will be variability in utilization of standardized DKA protocol in the ER and variability in factors influencing DKA admission to the ICU.

Method: To determine admission criteria across California Emergency Departments, a thirty-seven questions telephone survey was created to collect demographic, admission criteria, and treatment related information. This study was deemed IRB exempt.

Results: We identified 88 ERs across the state of California and thus far have surveyed 17 ERs. Of the hospitals surveyed, 29.4% have an identified pediatric ER and 88.9% have a pediatric department attached to their hospital. Additionally, 88.2% of hospitals have an established DKA protocol and 58.8% of the hospitals have at least one pediatric endocrinologist on staff. For admitting practices, 68.8% of the hospitals surveyed admit all suspected pediatric DKA patients to the ICU/PICU. Regarding admitting criteria, all hospitals reported altered mental status as a consideration to admitting to the PICU, 93.3% of hospitals reported that Kussmaul breathing is always considered when admitting to the PICU, and 85.8% of hospitals reported sometimes or always considering the age of the patient. Finally, 93.8% of hospitals considered a venous pH between 7.2-7.3 and bicarbonate level less than 15 as a factor and all hospitals reports that a pH less than 7.2 accompanied with a bicarbonate less than 10 when considering admission to the ICU.

Conclusion: Our preliminary survey shows some variability in triaging pediatric DKA to the ICU. All ERs considered Kussmaul breathing, altered mental status and pH values that were less than 7.2 and bicarbonate levels that were lower than 10 mmol/L as factors influencing admission to ICU. We saw some variability in considering factors such as age and hospital staffing in triaging to the ICU. Further emergency room data is required to draw a more complete picture regarding the admitting practices for pediatric DKA.

17. Case Report: Management of Dengue Fever in the U.S., a rising threat?

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Introduction: A patient diagnosed with dengue fever was recently treated at a hospital in Sacramento, California. This rare case raises the concern that dengue fever may become a larger threat in the future for the contiguous United States, which is not currently considered endemic for the disease. Over the past decade, there has been an increase in the number of cases; therefore, dengue fever must be given greater consideration in the differential diagnosis, especially with a patient travel history to endemic parts of the world.

Case Description: A 58-year-old female presented to the emergency department with a five-day history of bilateral, “sharp” temporal headache (8/10) radiating to the occiput. The patient reported pruritic rashes on extremities and abdomen. She had nausea, vomiting, intermittent fever (100.4°F at home), chills, body aches, light sensitivity, and phonophobia. She returned from Mexico five days prior, where she was bitten by mosquitos and in contact with two family members with active dengue. The patient denied dysuria, hematuria, diarrhea, abdominal pain, shortness of breath, and chest pain.

On arrival, the patient was alert but in pain with vital signs significant for elevated blood pressure. On examination, she appeared hemodynamically and neurologically stable, with full neck range/mobility and no photophobia. She presented with petechiae on the posterior soft palate and both lower extremities. Upon testing, her white count and kidney function were normal. She had significant thrombocytopenia, bandemia, leukocytosis, ketonuria, bilirubinemia, hematuria, and +2 bacteria. Liver function tests revealed elevated ALT (289), AST (573), and ALP (209). The patient had an elevated glucose level of 163 mg/dL and was found to have a urinary tract infection. She also had acute hepatitis, for which the physician ordered an additional acute hepatitis panel.

Following hospital admission, the patient was given Norco© and Rocephin© (Ceftriaxone) with procalcitonin. The infectious disease specialist diagnosed her with dengue fever, likely a second strain. The patient tested positive for hepatitis C with a negative ultrasound of the liver; this presentation is likely secondary to the dengue fever. For the dengue fever, she was treated with supportive IV fluids and closely monitored for hemorrhagic syndrome. She was given acetaminophen and told to avoid aspirin.

Discussion: This case report examines the management of a patient presenting with dengue fever and demonstrates that continued vigilance, prompt testing, and patient education can improve patient care and decrease disease prevalence in the future.

Given the progressive geographical spread of the *Aedes aegypti* and *Aedes albopictus* mosquito vectors, this case brings to question the potential risk of the dengue virus (DENV) becoming endemic in California and other regions in the United States. For future encounters with this virus, physicians should always inquire about travel history and consider dengue virus as a differential when indicated.

18. Mental health disorders in pediatric patients with Diabetes Mellitus: Are we doing enough?

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Introduction: Research indicates that mental health disorders such as depression, anxiety, bipolar disorder, and eating disorders are prevalent in pediatric patients with diabetes mellitus, more frequent in type 1 (T1DM) compared to type 2 diabetes (T2DM). In this review, we highlight the epidemiology of mental health disorders in pediatric diabetes and the underlying mechanism of their manifestation in this population. We will review current mental health screening protocols and management of these patients by pediatric endocrinologists and mental health providers.

Methods: Our method consisted of extensive searching for peer-reviewed publications on PubMed, OVID, and GoogleScholar using the following search keywords:

- “depression; diabetes; pediatrics”
- “anxiety; diabetes; pediatrics”
- “bipolar disorder; diabetes; pediatrics”
- “antipsychotic drugs; weight gain”
- “eating disorder; diabetes; pediatrics”
- “psychiatric illness; diabetes protocol”
- “psychiatric illness; diabetes follow up”
- “psychiatric illness; diabetes intervention”
- “psychiatric illness disorder diabetes psychological interventions”
- “psychiatric illness disorder diabetes cognitive behavioral therapy”
- “diabetes; (mindfulness OR CBT) AND (pediatric OR adolescent) AND (depression OR anxiety OR eating disorder OR mental health)”
- “psychobehavioral management in diabetes”
- “psychobehavioral management in diabetes adolescent”
- “psychobehavioral management in diabetes pediatric”
- “compassion diabetes depression”
- compassion diabetes psychiatric disorder”

We identified 130 relevant peer-reviewed articles consisting of research and review articles in the field of mental health and pediatric diabetes mellitus

Summary/Conclusion: We have found that comorbid diabetes and psychiatric disorders have a significantly increased risk of adverse health outcomes. Despite increased morbidity and mortality, data on the utility of standardized screening protocols to diagnose and manage mental health issues in these patients are limited. These co-occurring disorders can have severe consequences on health outcomes, thus it is important to develop and utilize standardized methods of screening pediatric diabetic patients to avoid delays in treatment.

19. Adherence to Personal Protective Equipment Guidelines During the COVID-19 Pandemic Among Healthcare Personnel in the United States

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Objectives: Protecting frontline healthcare workers with personal protective equipment (PPE) is critical during the COVID pandemic. Through an online survey, we demonstrated variable adherence to the Center for Disease Control and Prevention's (CDC) PPE guidelines among health care personnel (HCP).

Methods: CDC guidelines for optimal and acceptable PPE usage in common situations faced by frontline healthcare workers were referenced to create a short online survey. The survey was distributed to national, statewide, and local professional organizations across the United States and to HCP using a snowball sampling technique. Responses were collected between June 15 and July 17, 2020.

Results: 2245 responses were received from doctors, nurses, midwives, paramedics, and medical technicians in 44 states. Eight states with $n > 20$ (Arizona, California, Colorado, Louisiana, Oregon, South Carolina, Texas, and Washington) and a total of 436 responses are included in the quantitative analysis. Adherence to CDC guidelines was observed to be highest in the scenario of patient contact when COVID was not suspected (86.47%) and lowest when carrying out aerosol generating procedures (AGPs) (42.47%).

Conclusions: Further research is urgently needed to identify the reasons underlying variability between professions and regions to pinpoint strategies for maximizing adherence and improving the safety of HCPs.

20. A Case Report of Atypical Hyponatremia Caused by Diarrhea Following a Course of Ferrous Sulfate Supplements

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Hyponatremia, defined as a serum sodium level less than 135 mg/mL, can be euvolemic, hypovolemic, or hypervolemic. Its presentation can be subtle or severe depending on whether the hyponatremia is acute or chronic. This case investigates a geriatric patient who suffered diarrhea and hyponatremia following a course of ferrous sulfate pills for anemia treatment. Given that ferrous sulfate pills usually result in constipation, this presentation was abnormal. Literature review and comparison to prior atypical situations resulted in the conclusion that the patient's diarrhea was likely a result of her Crohn's diagnosis. The subsequent resulting hyponatremia was likely due to this diarrhea coupled with her prescription thiazide diuretic which can cause hyponatremia as a common side effect. This report allows for physicians to understand potential causes behind atypical electrolyte abnormalities in their patients and hence, find an effective treatment plan.

21. Accidental Ingestion of 35% Food Grade Hydrogen Peroxide: A Case Report

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Introduction: Hydrogen peroxide, a common household chemical, has numerous caustic and cytotoxic effects when ingested. Recent alternative health practices include hydrogen peroxide as a part of their regimen which has increased the use of and accidental ingestion of hydrogen peroxide by members of the public. This study will primarily examine the situation of an individual who accidentally ingested 35% hydrogen peroxide and will explore similar cases in which others also ingested hydrogen peroxide. This investigation will further the knowledge of hydrogen peroxide toxicity and will look towards potential solutions to reduce its accidental ingestion.

Case Presentation: A 19 year old male, with no significant past medical history, presented to the emergency department with moderate to severe upper epigastric pain after drinking one sip of 35% “food grade” hydrogen peroxide from the refrigerator, after mistaking the hydrogen peroxide for water. Following the accidental ingestion, the patient first experienced chills, nausea, hematemesis, and then dysphagia and odynophagia.

Physical exam was only remarkable for epigastric tenderness. Basic laboratory tests were within normal limits. A chest x-ray showed no evidence of an acute cardiopulmonary process. Due to his significant tenderness and severe odynophagia, he was kept NPO, started on Pantoprazole IV infusion, and was admitted to this hospitalist service along with a gastroenterology consultation. An esophagogastroduodenoscopy (EGD) revealed gastritis and a LA Grade D esophagitis. The patient fully recovered and was discharged on the third day with 40mg daily Pantoprazole tablets and no dietary or activity restrictions.

Discussion: Hydrogen peroxide poisoning frequently occurs with 3% solution of hydrogen peroxide, a clear household chemical; however, the incidence has increased in recent years due to marketing of alternative health companies and improper storage, as reported in other case reports of toxicity from both accidental and intentional ingestion of 35% hydrogen peroxide. This case illustrates the complications and treatment of incidental ingestion of 35% hydrogen peroxide from improper storage.

22. Naloxone Variability Throughout Different Counties of California

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Introduction: Naloxone is an opioid receptor antagonist that is administered to reverse the effects of opioid overdose. We investigate several variables to understand why we see differences in naloxone availability to gain insight into how availability and barriers impact the opioid epidemic. As we expand our research to urban and rural areas, we expect to see a greater amount of pharmacies stock naloxone in San Francisco County (SF) compared to Sonoma County (SO) due to higher population density and implemented legislation.

Methods: A list of pharmacies was obtained from the California State Board of Pharmacy. A phone survey was administered to pharmacists and pharmacy technicians to geographically assess and analyze naloxone availability in Sacramento County (SC). This phone survey will be expanded to other counties.

Summary of Results: Of all pharmacies participating in our study in 2020, we found 100% of pharmacies stocking Naloxone in SC 100% of retail chain pharmacies, 80% of food store chain pharmacies, and 0% of independent pharmacies furnished naloxone without a prescription. In SF, 93.6% of participating pharmacies stocked naloxone and 91.2% of retail chain pharmacies, 77.8% of food store chain pharmacies, and 25% of independent pharmacies furnished without a prescription. In SO, 97.3% of pharmacies stocked naloxone while 78.3% of chain pharmacies, 72.7% of food store chain pharmacies, and 0% of independent pharmacies furnished without a prescription in SO.

Conclusions: We found pharmacies in SC both carrying and furnishing naloxone without a prescription at the highest rate. SF and SO both differed when comparing naloxone carrying and furnishing without a prescription percentages to one another as well as SC. Covid-19 presented as a significant confounding variable when analyzing overdoses. However our data over the years shows overdose numbers remain unchanged, so a multipronged approach may be needed rather than just allowing pharmacies to simply carry and dispense naloxone without a prescription.

23. Pet Ownership and Relationship to Anxiety Levels in Medical Students

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California Northstate College of Medicine

Introduction: The goal of this project is to determine if there is a correlation between pet ownership and levels of perceived stress in 1st through 4th year medical students at California Northstate University. This project is significant because if a correlation between pet ownership and decreased levels of perceived stress is established, further studies can be done to determine if pet ownership is the cause of the decreased perceived stress. Based on previous studies linking decreased perceived stress and anxiety levels with pet ownership and contact, we hypothesize that a medical student pet owner will experience lower levels of perceived stress than their classmates who are not pet owners.

Methods: M1 classes for the past 4 years responded to survey questions regarding their anxiety levels and pet ownership, amongst other questions. Participants were asked to rate their present stress levels by choosing: never, almost never, sometimes, fairly often, and very often. Participants also answered if they owned a dog, cat, other pet, or no pet. The survey answers were then analyzed for correlation between anxiety levels and pet ownership.

Results: Survey answers regarding stress levels were assigned the following numerical values: never (1), almost never (2), sometimes (3), fairly often (4), and very often (5). The average numerical stress levels were then calculated for each category of pet ownership: dog ownership (3.61 in 59 respondents, $P=0.46$), cat ownership (3.695 in 28 respondents, $P=0.42$), other pet (4.33 in 3 respondents, $P=0.19$), and no pet (3.43 in 161 respondents, $P=0.46$). Overall average stress levels for all respondents was (3.52 in 250 respondents, CI +/- 0.114, SD=0.92).

Conclusion: There is no significant difference between stress levels in medical students who own dogs, cats, or other pets compared to medical students who do not own pets.

24. The Role of Benzodiazepines in the Management of Ventricular Tachycardia Storm and Cardiac Arrest Secondary to Alcohol Withdrawal

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Introduction: The role of benzodiazepines in the management of delirium tremens is well established. Separately, ACLS protocols have been established as a standardized approach for the management of cardiac arrest. When delirium tremens patients experience cardiac arrest however, the utility of and indications for benzodiazepines use are not well established.

Case Report: We present a case report of a middle-aged male presenting in delirium tremens with subsequent cardiac arrests. During the resuscitation, benzodiazepines were successfully used to break a ventricular tachycardia storm non-responsive to other ACLS medications and the patient survived for six days after initial cardiac arrest, but eventually succumbed to nosocomial complications.

59-year old male with past medical history of alcohol abuse, diabetes mellitus, and hypertension presented to emergency department (ED) with generalized tremors that began 1 week prior. Additional symptoms included abdominal pain, neck pain, and confusion. Of note, patient reported drinking multiple beers daily until complete cessation six days prior to ED presentation. Initial vitals were heart rate 116 min⁻¹, respiratory rate 19 min⁻¹, 97% oxygen saturation on room air and blood pressure 130/86 mmHg, BMI 32.11. Physical exam revealed patient was tremulous with tongue fasciculations. Initial labs revealed elevated thrombocytopenia, anion gap with metabolic acidosis, elevated BUN:creatinine, and elevated liver enzymes. A nurse practitioner initially diagnosed the patient with alcohol withdrawal and administered 2mg of lorazepam and 1 liter of normal saline intravenously. After five hours, patient began seizing and lost pulses at which point code blue and ACLS protocol was initiated. Upon placement of cardiac monitoring that patient was revealed to be in ventricular fibrillation. In addition to ACLS protocol, a 6mg and 12mg dose of lorazepam were administered. Return of spontaneous circulation (ROSC) was achieved within 26 minutes, and patient was given additional two doses of lorazepam of 12mg followed by 6mg. Patient went into second code and standard ACLS protocols were initiated without addition of lorazepam. ROSC was achieved within 20 minutes with patient severely hypotensive and bradycardic. Patient was sent to intensive care on norepinephrine and epinephrine intravenous drip. He then went into respiratory distress and was subsequently intubated. Patient remained on full life support with hypotension managed by norepinephrine, epinephrine, vasopressin, and phenylephrine for two days. Patient's condition continued to deteriorate with worsening circulatory and neurological function. Patient passed six days after initial presentation to ED.

Discussion: Benzodiazepines may have a role in the pharmacological management of ventricular tachycardia storm and cardiac arrest caused by alcohol withdrawal.

25. The Impact of SB 159 on the Provision of HIV Pre- and Post- Exposure Prophylaxis in Sacramento, California

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Introduction: California State Senate Bill 159 (SB159) became law in 2019, intended to improve the rapid delivery of medications in prophylaxis of human immunodeficiency virus (HIV)-caused disease progression and spread to high-risk communities. SB 159 allows state-licensed pharmacists with board approved training to initiate and dispense pre- and post-exposure prophylaxis (PrEP and PEP) for HIV directly to patients without the need for a prescription from a physician. HIV PrEP and PEP are drug regimens utilized by HIV-negative high-risk individuals to protect against HIV infection. The goal of our research project is to study the implementation of SB 159 in pharmacies located in Sacramento County, a population of 1.5 million residents. With the implementation of SB 159, the goal is for patients to have easier access to PrEP and PEP, and thus reduce their risk of morbidity. An objective of this project is to learn of the plans of pharmacies in Sacramento County to implement SB 159 and consequently to achieve more efficient and effective prophylactic care for HIV-infected individuals, in line with their newly assigned responsibilities per SB 159.

Methods: The method of our study was to conduct telephone surveys with a total of 50 pharmacies selected randomly based on postal zip codes within Sacramento County. The survey was conducted with pharmacists or pharmacy technicians working at chain retail and independent pharmacies regarding their efforts to achieve compliance with SB 159 with respect to training pharmacists about the new law and altering business policies on providing HIV prophylaxis. Data analysis was conducted with R Studio and Microsoft Excel to generate summary statistics and to identify the number of county pharmacies providing PrEP and their plans for stocking and completing the board-approved training to furnish PrEP and PEP. Stratification based on pharmacy type such as chain retail or independent was used to compare, contrast, and present data. Rank order tests and t-test were used to compare ordinal data and frequency among the two pharmacy groups.

Results: Analysis of the initial dataset obtained from interviews with pharmacists or pharmacy technicians working at chain (n=41) and independent (n=9) pharmacies located within Sacramento County revealed that 68% (34/50) were not well informed about SB 159, 64% (32/50) maintained HIV PrEP and PEP stock at the time of data collection, and 53.8% (7/13) of those that do not maintain a stock and stated that it is more cost-effective to order PrEP and PEP when there is a patient request with a prescription from their physician. Only 14% of all pharmacies interviewed had a working pharmacist or pharmacy technician who had already completed the board-approved training.

Conclusion: Among the surveyed pharmacies in Sacramento County, 86% have not implemented the board-approved training and only 2% have set a date to complete the training. Pharmacist training for compliance with SB 159, and the authorization process will require significant effort. We intend to further this work by contracting more pharmacies to create a larger dataset and understand how rapidly and if they are moving towards legal and regulatory compliance.

26. The Effects of Route of Administration of Amiodarone in Prehospital Care on Clinical Outcomes

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Introduction: Protocols for amiodarone use in prehospital care generally state that amiodarone administration can be given either intravenously (IV) or intraosseously (IO). This study investigates the route of administration for amiodarone on survival during cardiac arrest. The clinical hypothesis is there is no difference in the survival between those who received amiodarone IV vs. IO. Results can potentially impact prehospital protocols for first responders.

Methods: All patients who received amiodarone from Cosumnes Fire Department from 2018-2019 were included in the study. Survival of each patient after leaving the scene was either unknown or deceased. The statistical software SPSS v27 was used to analyze the data using a logistic regression with patient survival as an outcome and age, gender, dose of amiodarone, number of doses of amiodarone, and route of administration (IV or IO) as independent variables

Results: Forty-five patients with cardiac arrest complaints were analyzed, 32 with IV access and 13 with IO access (27 males, 18 females). Twenty-four patients received 1 dose of 300mg of amiodarone and 21 received two doses of amiodarone, 1st of 300mg and 2nd of 150mg. The mean age for patients was 66 years (SD 13, range 32-88). The model predicted survival with 66.7% accuracy (Hosmer-Lemeshow test >0.05). IO access compared to IV showed an odds ratio from survival of 0.204, 95%CI [0.035, 1.205], p=0.072. Two doses compared to one dose showed an odds ratio of 2.208, 95%CI [0.557, 8.752] p=0.260,

Conclusion: No statistical difference was found in the survival rate between the groups who received amiodarone IO compared to IV; or one dose versus two doses. however, the odds ratio of 0.204 for administration IO vs IV warrants further investigation. Limitations of this study were the number of patients, knowledge of survival of thirty patients after being transported, comorbidities, and other medications of patients. Future studies should incorporate more patients, inclusion of other variables, and possible investigation of differences in drug pharmacokinetics when administered IV vs IO.

27. Educational robotic model demonstrating motor manifestations of specific neurodegenerative diseases secondary to insults of the direct and indirect basal ganglia pathways by degeneration of respective anatomic structures

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Introduction: The basal ganglia is an important anatomical structure in the central nervous system due to its numerous pathological correlates. However, many medical students find the pathway difficult to master. The purpose of this project was to create a hands-on visual aid for students to gain an understanding of the different aspects of the basal ganglia and the way they affect movement in the setting of different diseases. Based on our review of the literature, we suggest the hypothesis that a hands on model of the direct and indirect pathways of the basal ganglia will significantly improve learning and understanding.

Methods: A Lobotech™ robotic arm was first built to simulate the movements of various basal ganglia pathologies. Then, an intuitive and user-friendly menu was developed using LabView™ which allows the students to make on/off alterations to various nodes within the basal ganglia. These nodes include the subthalamic nucleus, substantia nigra pars compacta and the caudate nucleus. Each alteration corresponds to a video of the Lobotech™ arm with the movement pattern seen in the corresponding disease. Before and after using the program, students will answer 10 multiple choice questions to assess their understanding of the pathway. These questions will be mostly objective multiple choice questions with 1-2 subjective questions regarding student perception of the efficacy of the model. Students' "before" answers will be measured against "after" answers serving as an individualized control group. All subjective answers will be evaluated together in a qualitative manner.

Results: Results for the study are currently pending. The next steps include subject recruitment and data collection. (We will work with Dr. Puglisi to analyze our data and then add a more specific section on statistical methods into our methods section once we have done so).

Conclusion: Conclusion is currently pending per results.

28. Sex-Specific Impact of Exercise on Cardiovascular Remodeling

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Introduction: Cardiovascular diseases (CVD) remain the leading cause of death in men and women. Biological sex plays a major role in cardiovascular physiology as well as pathological remodeling. Traditionally, pathological remodeling of cardiovascular system refers to the molecular, cellular and morphological changes that result from insults, such as myocardial infarction; however, it may also take place in healthy states. Exercise-induced cardiovascular remodeling (EICR) is one of the many beneficial effects that occur in response to exercise training. However, not all of the changes seen in EICR are the same in males and females.

Methods: We conducted a review of the literature to compare and contrast sex-specific manifestations of EICR. We collected over 250 references using OVID and PubMed. Keywords used for the review included “exercise induced cardiovascular remodeling”, “sex differences in cardiovascular health”, “cardiovascular effects of different exercise intensities”, “ventricular hypertrophy”, “cardiac output”, “vascular resistance”, “heart rate”, “blood pressure”, “estrogen”, “testosterone”.

Summary: In this review we addressed how biological sex influences the structural and functional changes in the cardiovascular system that result from exercise. Moreover, we discussed how these changes are influenced by different types, intensities and durations of exercise training, in addition to how these outcomes impact overall cardiovascular health. This review highlighted both animal and human studies that address underlying mechanism(s) leading to EICR; providing an all-encompassing view, which shed light on the gaps in the literature relating to the sex differences in EICR.

29. Thyroid Storm as a Multifactorial Disease: A Case Report

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Introduction: Thyroid Storm is an elusive topic to many researchers and clinicians. It is an emergency medical condition which is very difficult to diagnose, is associated with many precipitating factors, and has a mortality rate of 10% with treatment. (Chicha 2015) Further study is required for clinicians to be able to identify risk factors, recognize the symptoms of the disorder, and expedite diagnosis and treatment.

Case Description: In this report, we discuss the case of a 37-year-old Asian female brought in by ambulance for right flank pain associated with subjective fever. Of significance in the patient's history is amphetamine abuse and hyperthyroidism for which she is non-compliant with her medication. Laboratory results in the Emergency Department (ED) corroborated a diagnosis of thyroid storm and urinary tract infection. She was significantly tachycardic with evidence of atrial fibrillation for which direct current (DC) cardioversion was attempted unsuccessfully in the ED. The patient was admitted to the intensive care unit (ICU) for thyroid storm and treated with PTU, propranolol, oral potassium iodide and hydrocortisone along with antibiotics for UTI. She was then stabilized and downgraded to the floor later the same evening for observation. The patient was in the hospital for 5 days, after which she left against medical advice (AMA).

Discussion: We discuss the treatment and management of Thyroid Storm as well as the unique and multifaceted implications of our patient's case including drug abuse and medication non-compliance, which increased her risk for developing thyroid storm. We also discuss the implications for identifying and counseling at-risk patients.

Key terms: Thyroid Storm, Propylthiouracil, Methimazole, Propranolol, Graves Disease, Atrial fibrillation, Amphetamines, Against medical advice (AMA), Counseling

30. Impact of estimated metabolic expenditure, environmental exposure, and physical material burden of people experiencing homelessness (PEH)

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Introduction: Little is known about the physical activity and metabolic demands of people experiencing homelessness (PEH). In this study, we aim to compare the physical activity levels between PEH living in urban (Sacramento, CA) and rural (Yuba City, CA) areas, as well as variations due to seasonal climate changes. We hypothesize that rural individuals will have greater metabolic expenditure in high temperatures, yet physical material burden will be greater for individuals in urban settings.

Methods: Data collected included a week-long pedometer reading, individual body mass index (BMI), the weight of personal items, and a survey regarding activity and living circumstances; measurements were repeated in 7 days, and participants were compensated \$20 for their return. Results of only the single urban, winter reading were analyzed independently as data collection was not repeated due to COVID-19 restrictions.

Results: We found that 18 (60%) participants completed follow-up, of which 16 returned pedometers, and only 12 were functional and worn regularly. A maximum of 99,999 steps limited the utility of 4 pedometers. Follow-up surveys revealed improvements in the availability of drinkable water (36% vs 17%) and sufficient food availability (46% vs 61%), and a larger fraction of participants with incomes less than \$500/month (61% vs 78%). There was a weak positive correlation ($R^2=.29$) between BMI and steps, which was weaker ($R^2=.20$) when adjusting for item weight. There was a positive correlation ($R^2=.49$) between BMI and personal item weight. Average basal metabolic estimates and total steps taken revealed a positive correlation ($R^2=.45$). Those with foot problems took almost 12,000 (18.71%) fewer steps.

Conclusion: Although comparison data was unable to be collected, we showed that a study that requires the return of PEH is possible, allowing for countless similar studies to be conducted. By doing so, we will better understand the demands placed on PEH and move closer to improving their health care and outcomes.

31. Pulmonary Gangrene due to a Septic Emboli in a Young Female

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Introduction: Necrotizing pneumonia is a highly lethal and rapidly progressive disease affecting young adults. 1-10% can be attributed to Staphylococcus aureus as the pathologic organism [2]. About 0.8-7% of all community-acquired pneumonia cases manifest as necrotizing pneumonia [3]. Some studies correlate necrotizing pneumonia to a primary viral illness, such as influenza virus, which superimposed bacterial infection [2]. The likely source in this patient is the soft tissue injury, given that three of her other softball team members endorsed similar injuries, which were infected with MRSA. Given that the patient was a softball player and recently multiple players were diagnosed with MRSA infections, we propose a case of a primary septic deep venous thrombosis, leading to seeding pulmonary emboli, with resultant MRSA necrotizing pneumonia. With the bilateral multifocal nature of lung injury, this was the result of septic emboli, primarily from infected DVT as evident on MRI initially.

Case Presentation: We present a case of an 18-year-old non-smoker female with right knee pain and shortness of breath. On admission, vitals were stable, saturating well on room air. MRI of knee confirmed parietal gastrocnemius tear along with some hyperintensity of bone marrow of femur. Chest X-ray (CXR) on admission revealed bilateral multifocal opacities. Ultrasound doppler of the right lower extremities revealed deep vein thrombosis (DVT). Computerized tomography angiogram chest revealed subsegmental pulmonary embolism (PE) within the right lower lobe, with bilateral opacities. Heparin drip was initiated for management for acute PE and DVT. The patient's oxygen saturation deteriorated to 93%, requiring 4 L/min of oxygen via nasal cannula. Patient underwent emergent intubation due to continued hypoxia and hypotension. Blood cultures returned positive growing methicillin-resistant Staphylococcus aureus (MRSA). Repeat CXR showed bilateral pneumothoraces requiring bilateral chest tube placements. Patient's hospital stay was further complicated by heparin induced thrombocytopenia, transitioned to argatroban drip. Due to continuing worsening oxygenation and increasing FiO2 requirement, the patient was eventually started on veno-venous ECMO (VV-ECMO) via right internal jugular Avalon cannula. Veno-arterial ECMO (VA-ECMO) was initiated the next day due to hemodynamic deterioration. The patient continued to require FiO2 of [1] via ECMO and FiO2 of 0.4 via pressure controlled mechanical ventilation. Thoracic washouts were done to minimize risk of infection, in addition to appropriate infectious control measures. Due to irreversible pulmonary gangrene, the patient's lungs were deemed unviable, thus was evaluated for lung transplant for a better outcome. Patient was transferred to a higher level of care facility where she will receive VA-ECMO, CRRT and be evaluated for lung transplant. At the time of writing of this report, the patient is still pending lung transplant.

Discussion: This case highlights the importance of maintaining suspicion for rare complications in young patients with MRSA induced necrotizing pneumonia. It also demonstrates appropriate use of ECMO in young patients with limited comorbidities and severe acute hypoxemic respiratory failure.

32. Generating Hepatitis B Virus Cell-based Infectious System for Drug Screening

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Introduction: Approximately 2 billion people have been infected by hepatitis B virus (HBV), with 250 cases of chronic infection worldwide. Current anti-HBV drugs often require lifelong use, due in part to transcriptionally active HBV-DNA in the host nucleus not being directly targeted. To find a “*functional cure*” of chronic HBV infection, a cell-based HBV infectious system must be established to screen new antiviral molecules. This project aims to establish a cell culture system that supports the complete life cycle of HBV.

Methods: The proposed cell culture system uses the cell line Huh7, which are unable to mediate HBV entry, as they do not express the functional HBV receptor sodium taurocholate cotransporting polypeptide (NTCP). A purified plasmid containing NTCP and a gentamicin resistance marker gene was transfected into the Huh7 cells, then cultured in complete media containing 500 µg gentamicin/mL after 24 hours. Fresh media was added every 2-3 days for 3 weeks.

In addition, an HBV stock was prepared using HepDE19 cells. Cells were cultured in 10% FBS media until 100% confluence, after which the media was collected every 48 hours for two weeks. Polyethylene glycol (PEG) precipitation was used to concentrate the virus, and viral titer was determined via real time PCR.

We also look to investigate whether culturing Huh7 cells in HS-media will result in increased expression of endogenous NTCP, by culturing Huh7 cells in 2% human serum (HS) media and comparing against Huh7 cells grown in 10% FBS.

Results: Three weeks after transfection of Huh7 cells with NTCP plasmid, only the cells expressing the transfected plasmid survived. >80% of transfected cells were shown to highly express NTCP via immunofluorescence (IF) assay using NTCP mAb. The PEG-precipitated HBV stock was measured to have a concentration of 2.0×10^7 HBV genome/µL.

Currently, we are in the process of differentiating the Huh7 cells using HS media. Both the HS-Huh7 cells and NTCP-Huh7 cells will be infected with HBV stock, with infectivity measured via IF assay.

Future direction: This cell-based infectious system will be used to investigate the anti-HBV activities of several plants and biological materials obtained through an international collaboration with Airlangga University, Indonesia and Assiut University, Egypt.

33. Management and Treatment of Recurrent Spontaneous Pneumothorax within an Emergency Setting

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Introduction: A pneumothorax is a serious medical condition in which gas fills the parietal and visceral pleural space and ultimately causes the lung to collapse. It is more prevalent in males than females, with an incidence of 7.4 per 100,000 population of men in the United States (Light et al., 2013). A pneumothorax may either be caused by an external trauma or may be spontaneous. The presentation of a spontaneous pneumothorax may either be primary (PSP), when a patient may not have had preceding lung conditions due to a rupture of apical subpleural cysts, or secondary (SSP), when a patient may have had a more serious underlying lung disease. After a diagnosis of PSP is considered, it is important to first assess the size limits and stability of PSP within patients through a chest radiography or chest computed tomography (CT). Despite the urgency in treatment for spontaneous pneumothorax, international management guidelines are limited, and oftentimes, hospital recommendations are left at the discretion of emergency providers (Kepka et al., 2019).

Case History: A 22 year-old Asian American male was brought to the emergency department in an ambulance January 10th 2020, after presenting to an urgent care for a sudden onset shortness of breath and rib pain. The patient had a coughing fit the previous night when he was out with friends after coming into contact with second hand smoke. He attempted to sleep, but woke up feeling unwell, and went to urgent care, where a right pneumothorax was observed in his chest radiograph. The patient was transferred to the emergency department, where a standard 20 French chest tube was placed without any complications, resulting in reexpansion of lung and resolution of symptoms. The patient was admitted for further observation. At the time of admission, the patient did not appear to be in respiratory distress, with an oxygen saturation at room air at 96%. He had no cough, chest pain, nausea or vomiting. He has not had any serious medical conditions in the past, nor has he had any surgeries. He is currently prescribed topical acne medication. The patient also occasionally drinks alcohol and also recreationally smokes marijuana. On the morning of the 13th, the aforementioned large bore chest tube was discovered to be displaced, along with collapse of his right lung on CT. At that time, the attending physician placed a small-caliber anterior chest tube to reexpand his lung. A persistent air leak was noted over the following two days. On the 15th, a CT scan was ordered, which showed a persistent pneumothorax, though reduced compared to his first pneumothorax, with a correctly-placed tube. Thoracic surgery was consulted, and an operative intervention was recommended. On the morning of the 17th, as he had been on suction the entire time, the attending physician placed him on waterseal to assess if the lung would remain expanded. After 6 hours of waterseal, x-ray showed a recollapse of the lung, which resolved after he was placed back on suction. On January 20th, Patient underwent a bronchoscopy and right VATS, right upper lobe wedge and talc pleurodesis, and intercostal blocks. At this time, evidence of an abnormal whitening bleb on the apex of the affected lung was noticed. Remainder of the lung appeared normal. Bleb was removed for analysis, while the rest of the procedure continued without complications. Pathology report of the bleb showed nonspecific findings, described as a potential reactive inflammatory response. Chest tube was removed on January 22nd with a repeat x-ray of a stable patient showing no pneumothorax. He was able to ambulate and had well-controlled pain. Surgical team deemed him fit for medical discharge with instructions for follow-up the next week.

Discussion: This unique case study demonstrates the complications in management of a severe primary spontaneous pneumothorax, in which the lung was completely collapsed, despite adhering to current clinical guidelines.

34. Intra-sheath vs Extra-sheath Injection for DeQuervain's Tenosynovitis

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Introduction: DeQuervain's Tenosynovitis is a common condition with an estimated incidence of 0.5% in men and 1.3% in women, usually occurring in the third or fourth decade of life. The condition involves accumulation of mucopolysaccharide in the first dorsal compartment of the wrist, narrowing the passageway through which the abductor pollicis longus (APL) and extensor pollicis brevis (EPB) tendons pass¹. Patients typically present with pain over the radial styloid that is often exacerbated by grasping, thumb abduction and ulnar deviation of the wrist. Currently the most effective treatment modality for this condition is injecting corticosteroids directly into the sheath where the APL and EPB pass. However, we hypothesize that injecting corticosteroids outside the sheath will not be inferior. Our rationale for this hypothesis lies in prior studies examining a similar approach for the treatment of the related condition, trigger finger. Two separate studies compared the efficacy of intrasheath vs extrasheath steroid injections in this condition and found that extrasheath injections were as effective as intrasheath injections in the treatment of trigger finger^{2,3}. These studies lay the groundwork for this approach in DeQuervain's, however, no clinical trials comparing the efficacy and safety of intrasheath versus extrasheath steroid injections for the treatment of DeQuervain's tenosynovitis have been reported to date

Methods: All injections will be performed at the UC Davis Medical Center. Each injection will be done by 1 of 3 experienced hand surgeons, Dr. Christopher Bayne, Dr. Robert Szabo or Dr. Robert Allen. The trial will be a double blinded randomized controlled trial with half of the subjects randomized to receive intrasheath injection and the other half receiving extra sheath injection. After signing consent, the inclusion and exclusion criteria will be reviewed. Eligible subjects will be enrolled and randomized into the study. The consenting researcher will use a digital Randomizer application ("Randomizer", available on all smart phones) to assign the individual to either intrasheath injection group or extra sheath injection group. After being randomized, the study arm will be recorded at subject source document and Enrollment Log. The signed consent will be scanned into the patient's electronic medical record. The hard copy consents will be stored securely as outlined below. Participants will not be informed which arm of the trial they have been placed in until after the conclusion of their involvement with the study. To ensure blinding of the physicians, follow up assessments will not be performed by the doctors who administered the injection and will instead be performed by residents who will not be informed which group the patient has been placed in. In both groups the injection will be ultrasound-guided and the injection solution will be composed of 1ml of 1% lidocaine and 1ml (20mg) of dexamethasone. Patients randomized to the intrasheath injection group will have all fluid injected directly into the APL/EPB sheath. In this group of patients, if sub compartments are found upon ultrasound inspection half of the solution will be deposited into the APL sheath and the other half will be deposited into the EPB subsheath, as previously described⁴. In patients randomized to the extrasheath injection group, the injection will be given surrounding the sheath. In both groups, pain will be measured using the visual analog scale (VAS) and symptoms/disability will be measured using the shortened Disabilities of the Arm, Shoulder and Hand Questionnaire (quickDASH). All results, including which group the patient was randomized to, will be recorded and input into the appropriate spreadsheet. To achieve significance for the study, 13 people in each arm of the trial for a total of 26 will need to be recruited. However, to ensure we have an adequate number of patients to achieve significance for secondary study endpoint analysis and allowing for a dropout rate of 15% we plan to enroll 80 patients

Results: As of now we are awaiting final IRB approval, thus no results have been collected yet.

35. A Rare Presentation of SMA Vasculitis with Chest and Upper Back Pain

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Introduction: Mesenteric ischemia is a phenomenon that occurs when arteries supplying the gastrointestinal tract either become narrowed or obstructed, thus reducing or halting downstream perfusion. Etiologies of mesenteric ischemia include; nonatherosclerotic abdominal arterial vasculopathies (NAV), including arterial dissection, aneurysm, stenosis, or vasculitis.[1] The majority of symptoms in mesenteric vasculitis are due to intestinal ischemia.[2] In this case report, we will discuss a noteworthy unusual presentation of mesenteric ischemia due to superior mesenteric artery (SMA) vasculitis, in the hopes of preventing delays in diagnosis and care of patients who may present this way in the future.

Case description: This case study will explore a case of mesenteric ischemia caused by SMA vasculitis, a nonatherosclerotic abdominal arterial vasculopathy (NAV), in which a 57 y/o woman with history of hyperlipidemia and GERD presented to the ER with chest and upper back pain. Initial work up for MI and PE were inconclusive and the patient was discharged. Patient then returned the next day complaining of chest and additional abdominal pain radiating to her back. An abdominal CTA, venous ultrasound, and MRI revealed findings highly suggestive of ischemia caused by vasculitis of the superior mesenteric artery, for which the patient was treated with tapering prednisone.

Discussion: Evaluation for mesenteric ischemia in patients presenting with nonspecific trunk pain will allow physicians to provide more prompt and catered care. Additionally, with the ubiquity of COVID-19 and its role in downstream inflammatory processes, atypical causes of mesenteric ischemia may be an increasingly important differential to consider.

36. Efficacy of LGBTQ Cultural Competency Training Modules

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Introduction: As a formally recognized health disparity population, the LGBTQ community receives inadequate health care services at least in part due to the lack of cultural competency of healthcare providers. The efficacy of current training has been criticized for long hours, statistics and jargon-filled content, and disregard for current advances in educational methodology. We hypothesize that while attending a standard training module will increase participants' competency, measured by self-assessed confidence, we further hypothesize that our training module containing testimonials from the LGBTQ community will show a larger increase in participants' self-assessed confidence. We will be comparing our narrative-based training module to a comparable part of the three part GLMA Cultural Competency Webinar series.

Methods: All participants were from California Northstate University College of Medicine (CNUCOM) or College of Health Sciences (CHS) and took a pre-training evaluation to establish their baseline self-assessed cultural competence with the LGBTQ community and culture. We measured self-assessed confidence, motivation and engagement in the Likert scale survey. Participants were then randomly assigned to either our own testimonial-based training model or the second part of the three part GLMA Cultural Competency Webinar series. Comparisons were analyzed with the Mann-Whitney-Wilcoxon test.

Results: Results will be available shortly.

Conclusion: Depending on results but assuming results are as expected, we conclude that participants' increased self-assessed confidence demonstrates the improved efficacy of narrative-based content for learning programs. Increased motivation and engagement are particularly important metrics for physician-led care, as they can directly lead to improved health outcomes for patients.

37. Global health conundrum: Gastrointestinal cancer and meat consumption during the last six decades

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This past century has seen the most advancement in medicine, leading to an almost thirty year increase in the average life expectancy. This increase in life expectancy has also increased cancer incidence in the global population. Cancer is a multifactorial disease, and thus its origin cannot be directly correlated with just one cause. To the best of our knowledge, this is the first study investigating how global meat consumption has influenced various cancers' incidence rates across the world. Although the correlation between meat consumption and cancer risk has been investigated, a global temporal study investigating the national mortality rates of gastrointestinal cancers relating to meat production remains unexplored. We researched causes for the trends between meat production and GI cancer mortality in affluent nations of both the Eastern and the Western hemisphere including: the USA, Canada, Japan, France, and Singapore. Data was collected from the Food and Agricultural Organization of the United Nations and the World Health Organization Cancer Mortality Database. Meat consumption data was unavailable between the 1960s-2010, so meat production data was used instead. Interestingly, the pancreatic cancer mortality rate increased in each country except Canada.²⁶ The spike is due to increased meat consumption, obesity, lack of screening modalities, poor prognosis, and late diagnosis of the disease.^{2,5,9} Canada's 1% drop in mortality rate can be attributed to a decreased smoking rate amongst men (62% to 16% from 1965-2017) as well as an overall decline in meat consumption.^{9,11,26} The mortality rates of gastric and colorectal cancer (CRC) have decreased despite a meat production increase. Decreased H. pylori prevalence (Europe: 48.8% to 39.8%, North America: 42.4% to 26.6%, and Western Asia: 53.6% to 54.3%), better food preservation, and improvement in environmental conditions have lowered gastric cancer incidence.¹⁰ The CRC mortality rate in the USA, Canada, Japan, and France decreased mostly due to colonoscopy screening measures, better treatment, and decreased red meat consumption.^{16,28} In Singapore, increased obesity and a poor, high caloric diet accounts for an increased CRC mortality rate despite decreased meat production.^{17,13} This rate is exacerbated by lower screening rates due to decreased CRC risk awareness.^{12,28} Gastric and CRC mortality rates decreased despite increases in meat production, while pancreatic cancer incidence rates have increased.²¹ These trends are further investigated and necessary to understand in order to lower the mortality rates of GI cancers on a global scale

38. Supraorbital Keyhole Craniotomy Via An Eyebrow Incision: A Systematic Review and Meta-Analysis

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Introduction: Supraorbital keyhole craniotomy via an eyebrow incision is a minimally invasive alternative to frontotemporal craniotomy for tumor resection and aneurysm clipping. Due to its increasing use, the purpose of this study was to provide a systematic review and meta-analysis on the outcomes related to this approach.

Methods: PubMed, Embase, and Scopus databases were systematically searched on August 11th, 2020 for the following terms: “supraorbital keyhole”, “supraorbital eyebrow”, “supraorbital craniotomy”, “supraorbital approach”, “keyhole eyebrow”, “transciliary”, or “superciliary”. The results were reported according to PRISMA guidelines. Original retrospective and prospective studies published in English language were included in the meta-analysis. The t test was used to compare the different groups and p value of < 0.05 was considered statistically significant.

Results: A total of 2,629 records were identified. Of those, 126 studies (8,241 surgical cases) met inclusion criteria. The mean age was 46.72 ± 15.53 years old. Aneurysms made up the majority of the pathology. Mean total complication rate was $26.71 \pm 25.72\%$. Mean treatment-related mortality rate was $1.26 \pm 2.78\%$. Technical success, defined as total resection, complete clipping, or otherwise satisfying the authors’ surgical aims, was achieved in $83.63 \pm 21.5\%$ of the cases. When the endoscopic-assisted supraorbital approach and the non-endoscopic-assisted supraorbital approach were compared, no significant difference was observed in technical success, total complications, mortality, length of hospital stay, or operative time ($p > 0.05$ for all). Furthermore, we found that vascular pathology was associated with higher technical success rate, lower complications, shorter operative time, but longer hospital stay compared to tumor pathology ($p < 0.05$ for all).

Conclusion: Our results demonstrate that the supraorbital craniotomy via an eyebrow incision is a feasible minimally invasive approach with high technical success rates for various pathologies, especially for aneurysm clipping. The addition of endoscope, however, is not associated with better outcomes.

39. Catheter-Directed Thrombolysis and Aspiration Thrombectomy of a Complex Stenotic Saphenous Vein Graft

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Introduction: Saphenous vein grafts (SVGs) are frequently used during coronary artery bypass graft (CABG) surgery for redirection of blood flow around a blockage. SVGs are prone to occlusion and deterioration. Percutaneous coronary intervention (PCI) to open blocked blood vessels in patients presenting with myocardial infarctions after CABG surgery with a SVG carries an increased risk of 15 to 20% for incidence of major adverse cardiac events within 30 days, necessitating research into possible adjuncts to PCI to improve outcomes.¹ Since the 1980s, several reports have been published with descriptions of successful vein graft recanalization achieved with local infusion of thrombolytic agents, many varying in technique. The optimal approach for SVG interventions has remained an elusive entity as no standardized protocol exists on the ideal pharmacotherapy in these cases.

Case Presentation: We present a case of a 52-year-old male with a past medical history of hypertension, hyperlipidemia, diabetes mellitus, and coronary artery disease with CABG performed seven years prior to his presentation, who was transferred with a non-ST segment elevation myocardial infarction. His angiogram revealed a severely thrombotic 90% stenotic lesion in the SVG to the obtuse marginal artery with organized clot and TIMI-2 flow. The decision was made to avoid aspiration thrombectomy outright, and allow for a pharmacological approach with delayed PCI. In the method used, the patient was given 15mg of alteplase as a slow infusion over 15 minutes via an AL1 guide, followed by a 12-hour infusion of alteplase at 0.5 mg/hour intra-lesion via microcatheter and heparin at a rate of 300 units/hour. After, a filterwire was utilized for distal protection before aspiration thrombectomy and subsequent PCI were performed. The patient was uneventfully monitored overnight and discharged home the next day.

Discussion: Just as in native coronary arteries, PCI intervention remains the preferred strategy for SVGs in the setting of myocardial infarction; however, SVG intervention is further complicated by a substantially higher risk of major adverse cardiac events. There are no standardized administration guidelines or large trials dedicated to studying intragraft thrombolytic infusions with PCI which offer the advantage of localizing therapy and minimizing nontarget side bleeding. It is imperative to continue research on optimal adjuncts to SVG PCI to reduce risk and improve clinical outcomes. The approach used in this case yields an alternative strategy to minimize distal embolization of a thrombus and limit the area of intervention.

40. Massive Bupropion and Oxcarbazepine Overdose

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This report describes a case of massive bupropion overdose leading to cardiac toxicity and seizures in an adolescent suicide. A 19-year-old female presented to the Emergency Department (ED) with an estimated bupropion overdose of 28.2 grams with possible oxcarbazepine consumption based on the patient report. The patient was unresponsive and was treated for intermittent seizures and cardiogenic shock but could not be resuscitated and died within 48 hours. Several existing reports regarding bupropion overdose describe sinus tachycardia and seizures corrected by symptomatic treatment. To our knowledge, this case could potentially document the highest ingestion of bupropion recorded thus far in literature highlighting the rapid onset of cardiac dysfunction with reduced ejection fraction. In the context of this case, we discuss the clinical manifestations of bupropion overdose, and their prevalence among Emergency Departments. We also examine the biological mechanisms behind the epileptic activity and cardiotoxicity after large ingestions of bupropion and oxcarbazepine, and the possible treatment strategies in an emergent setting. Finally, we consider the public health consequences of these frequently prescribed medications.

41. Somatic Mutations within Myocilin are the Driving Components of Glaucoma Onset and are Linked to a Variety of Cancers

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Introduction: Glaucoma is a chronic optic neuropathy that leads to irreversible vision loss. Considerable progress in research has led to the discovery of 24 genomic regions associated with its pathophysiology. One of the most studied genes involved with the onset of open angle glaucoma is myocilin (MYOC). To date, 105 germline mutations within MYOC are known to be glaucomacausing and result in endoplasmic reticulum (ER) stress that leads to trabecular meshwork (TM) cell death and subsequent intraocular pressure (IOP) elevation. An analysis of MYOC somatic cancer-associated mutations revealed a notable overlap with pathogenic glaucoma variants. TM cells have the potential to accumulate somatic mutations at a rapid rate due to ultraviolet (UV) light exposure, thus we propose that an accumulation of somatic mutations within MYOC is an important contributor to the onset of glaucoma. Furthermore, Rosetta energy calculations revealed a large ratio of MYOC somatic to germline thermodynamically stabilizing variants.

Methods: We've utilized the mutation diagram generated through the cBioPortal for Cancer Genomics MutationMapper and modified it using the Hypertext Markup Language (HTML). We obtained the MYOC structure and modified it using the PyMOL computer software for molecular visualization. For our energy-based analysis, we utilized the most recent Rosetta score function and calculated energy approximations to a degree that allows for change in free energy ($\Delta\Delta G$) prediction in kilocalories per mole (kcal/mol). Python programming language and PyRosetta were used for energy calculations.

Results: Of the 278 known MYOC germline mutations, 105 manifest a glaucoma phenotype, while 173 are identified as neutral polymorphisms or mutations with unknown pathogenicity. To graphically demonstrate our findings, we generated the full collection of MYOC variants and mapped them on a mutation diagram based on their reported phenotypes. 11 MYOC somatic mutations precisely overlap with glaucoma-inducing germline mutations; R91STOP, G246R, L255P, T285M, R296C, A363T, G367R, T377M, D384N, A427T, and R470C. Our analysis of the thermodynamic parameters of MYOC revealed that stabilizing mutations were predominantly located on the exterior of the MYOC OLF domain. We found that the ratio of cancer to glaucoma stabilizing variants was quite large; 31 cancer-associated and 4 glaucoma-inducing mutations exhibited negative $\Delta\Delta G$ values. Five of the thermodynamically stabilizing cancer-associated mutations within the OLF domain overlapped with the germline neutral polymorphisms (T293K, T325M, E414K, A447V, and R470H). The E253Q and A447V cancer-associated variants were the 2 most stabilizing out of all mutations tested, with Rosetta $\Delta\Delta G$ values of -6.93 and -6.12 kcal/mol, respectively.

Conclusion: We present a large collection of known somatic and germline MYOC variants and demonstrate that a significant level of overlap exists between the two types of mutations. We are the first to propose that an accumulation of pathogenic MYOC somatic mutations within the TM of the eye by means of UV radiation can lead to protein aggregation, induced ER stress, TM cell death, and subsequent IOP elevation, which are attributes of the glaucoma phenotype induced by the known germline MYOC glaucoma-causing variants. Through the implementation of thorough Rosetta energy calculations, we have established that mutations within MYOC can have stabilizing properties, potentially resulting in its overexpression. In summary, our theory that somatic mutation accumulation within MYOC contribute to glaucoma pathogenesis lays the groundwork for future studies to uncover the frequency of the pathogenic variants occurrence within TM cells using singlecell whole genome sequencing and other viable techniques.

42. Unique Challenges in Treating Women with Cystic Fibrosis-Related Diabetes in Pregnancy

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Cystic Fibrosis (CF) is an autosomal recessive condition that predominantly affects lung function, but often has other multi-organ manifestations. Advancements in understanding of the pathophysiology, multi-disciplinary approach to care, and therapies specifically targeting the Cystic Fibrosis Transmembrane Regulator (CFTR) Channel have led to a significant increase in life expectancy. Consequently, complications of CF, such as Cystic Fibrosis-Related Diabetes (CFRD), are becoming more prevalent. CFRD is a unique type of diabetes, the management of which is complex, as insulin requirements are affected by pulmonary exacerbations, steroids, tube feeds, exercise and pulmonary rehabilitation, and high carbohydrate diets with frequent snacks. Treatment of CFRD in pregnancy is even more nuanced as insulin resistance is heightened by the gravid state and oral intake becomes even more variable. In this case series, we explore the challenges of treating diabetes in pregnancy, which is likely to become more common with improved therapeutics, namely the Elexacaftor-Tezacaftor-Ivacaftor (Trikafta) CFTR targeted triple therapy indicated in CF patients with at least one F508del mutation. Our report combines case descriptions of six women with CF who developed diabetes prior to or during pregnancy, with literature review of the current state of CFRD and gestational diabetes (GDM) management. Across cases, one common finding was that patients with CFRD, unlike patients with other types of insulin-dependent diabetes, had minimal, if any, basal insulin requirements, but did require intensive therapy with bolus insulin to cover carbohydrates consumed. Thus, the use of traditional, basal-predominant insulin regimens led to development of nocturnal or fasting hypoglycemia and life-threatening hypoglycemia unawareness, while patients also exhibited post-prandial hyperglycemia. These patients achieved better glycemic control with prandial insulin coverage per carb ratio, as opposed to standard fixed insulin doses. Overall, therapeutic responses in patients with CFRD were quite heterogeneous, likely affected by varying insulin resistance, nutritional status, inflammation, need for tube feeds, and degree of malabsorption. Glycemic control, rate of hypoglycemia, and time in range were greatly improved by insulin pumps and continuous glucose monitors (CGMs). It can be concluded from this series that diabetes in pregnancy in patients with CF presents a unique challenge for glycemic management, and that the combination of diet and lifestyle modifications, with use of appropriate insulin regimen and technologies, paves an encouraging road for achieving good glycemic control and positive pregnancy outcomes while also improving patient satisfaction and adherence. More studies are needed to determine the optimal glycemic targets for diabetes in pregnant patients with CF, and which treatment modalities are most efficacious, increase adherence, improve quality of life, and pose the least risk to mother and fetus.

43. Blockchain in Surgery

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Introduction: Many of the recommendations for blockchain revolve around the electronic health record and while a valuable application, it is a large undertaking. The goal of this study is to take a narrower scope and evaluate whether blockchain has a place in surgery and make suggestions on where blockchain may be valuable.

Methods: To determine the possible applications of blockchain technology an online search for peer-reviewed articles through PubMed and OVID in addition to a broad internet search was conducted. The searches included “Blockchain [AND] Surgery”; “blockchain [AND] operating room.” To exclude articles that predate blockchain technology, filters were set to only include articles from 2009 onwards. PubMed yielded 80 peer-reviewed articles to consider. Because blockchain is a relatively recent technology, additional articles from the general internet search are important to include. For example, the American College of Surgeons and Institute of Electronics and Electronics Engineers have valuable ideas to consider and would otherwise be missed without a general search (Peters, 2017; Nguyen, 2018).

Conclusions: Blockchain remains a newer technology and its immediate applications to surgery are not readily apparent. The hesitancy to put patient data especially electronic health record data into blockchain backed system is understandable. However, the access and security advantages to blockchain will drive future data exchange and research. More trust in the technology needs to be developed by incorporating blockchain into other areas of healthcare such as registries, supply chain, research, and credentialing. With more usage, there will be increased experience and expertise in blockchain opening doors to future application, perhaps widespread adoption in electronic health records.