

SELF-DIRECTED STUDENT SCHOLARLY PROJECTS (SDSSP)



Book of Abstracts

DECEMBER 13th 2019 | 8 am - 4 pm | Event Centre

Planning Committee

Arpita Vyas, MD

Valerie Gerriets PhD

Haleema Kaifi

Class of 2022

Self-Directed Student Scholarly Projects

[SDSSP]

Research Day Proceedings

Book of Abstracts

Planning Committee:

Arpita Vyas, MD

Valerie Gerriets, PhD

Haleema Kaifi



CALIFORNIA
NORTHSTATE
UNIVERSITY

Research Day Agenda

8:00 - 8:05 am: Introductory remarks: Drs. Gerriets and Vyas

8:05 – 8:25 am: Dean Silva: “Success in Medical Research: Avoid Entering Too Many Rabbit Holes”

8:25 – 8:45 am: Dean Yang: “A Professional Journey Engaging in Innovation”

8:45 - 10:30 am: Oral presentations

10:30 - 10:45 am: **Break**

10:45 - 12:00 pm: Oral presentations

12:00 - 1:00 pm: Lunch Break

1:00 - 3:00 pm: Poster presentations

3:00 - 4:00 pm: Awards

Oral Presentations

Selected Abstracts for Oral Presentation 2019

8:45 AM – 12:00 PM

1. 8:45AM-9:00 AM

Systematic meta-analysis of long-term patient outcomes with external beam radiotherapy ± high-dose brachytherapy for squamous cell carcinoma of the vulva.
Austin Thompson, Mollee Chu and Mariam Soni

2. 9:00AM-9:15AM

Maternal risk factors and congenital heart disease in offspring
Charlotte Ellberg and Sophia Han

3. 9:15AM-9:30AM

The Effect of Periostin in Fracture Healing as related to Aging in Transgenic Mouse Models
Jeffrey Doelling

4. 9:30AM-9:45AM

Chronic resveratrol exposure improves in glucose homeostasis and cardiac function in a rat model of polycystic ovarian syndrome
Tiffany Shao, Harmanprit Randhawa and Rogelio Molina

5. 9:45AM-10:00AM

Generating a Stable Hepatitis B Virus Cell-based Infectious System for Drug Screening
Emily Nguyen

6. 10:00AM-10:15AM

Hyperglycemia Induced Auto-inflammation of Human Microvascular Retinal Endothelial Cells
Aiza Anwar and Janet Lee

7. 10:15 AM- 10:30AM

The Relationship between Tyramine Levels and Inflammation in Metabolic Syndrome.
Ajay Patel, Austin Thompson and Lillian Abdelmalek

10:30AM- 10:45 AM: COFFEE BREAK

8. 10:45 AM-11:00AM

Feasibility of Wearable Technology to Monitor Heart Rate Variability in Healthy Individuals

Imre Redai, Pranav Sathe, Sarah Fetterolf and Tiffani Barham

9. 11:00 AM-11:15

Opioid Abuse Trends of the National Population among Different Racial Groups

Kevin Yee, Austin Thompson and Isaac Chen

10. 11:15 AM- 11:30AM

Favorable Radiographic Response after Preoperative Chemotherapy in Patients Undergoing Sarcoma Lung Metastasectomy Predicts Improved Disease Free Survival

Nivedita Kar

11. 11:30AM-11:45

Alleviating headaches and pain in Gulf War Illness with Neuronavigation-guided rTMS: a preliminary assessment

Karen Lei

12. 11:45 AM -12:00 AM

Extinguishing Burnout at its Source: Addressing Wellness Course Efficacy for Medical Students

Jason Kuan, Cindy Ma, Austin Thompson and Melanie Yoshihara

12:00PM- 1:00 PM: LUNCH

Oral Presentation Abstracts

1. A Surveillance, Epidemiology, and End Results Analysis of Long Term Patient Outcomes with External Beam Radiation Therapy ± High-Dose Brachytherapy for Squamous Cell Carcinoma of the Vulva

Mollee Chu, Mariam Soni, Austin Thompson, Jose Puglisi PhD, Tracy Yarbrough MD PhD

California Northstate University College of Medicine, Elk Grove, California

Introduction: Little is known whether combined brachytherapy (BT) with external beam radiation therapy (EBRT) has better outcomes than EBRT alone, with recent evaluation showing no significant improvement in survival. The goal of this study was to reevaluate patient outcomes for vulvar cancer and compare outcomes for individual subtypes to see if there is an improvement when BT is added to EBRT.

Methods: Data between 2000 and 2016 from the National Cancer Institute's Surveillance, Epidemiology, and End Results (SEER) database was analyzed. Patients with EBRT+BT or EBRT treatment alone were analyzed with the exclusion of patients with prior surgical resection. Overall survival (OS) and disease-specific survival (DSS) were assessed using the Kaplan-Meier method and significance denoted with the Log Rank (Mantel-Cox) method.

Result: A total of 1,188 patients were analyzed, with 1,135 receiving EBRT alone and 53 receiving EBRT+BT. A combination of EBRT+BT was significantly associated with better overall ($p = 0.014$) and disease-specific survival ($p = 0.028$) compared to EBRT alone. EBRT+BT treatment was associated with better outcomes for patients receiving treatment between 2010-2016 ($p = 0.008$) compared to EBRT alone, while there was no significant benefit for patients receiving treatment between 2000-2009. Better overall survival ($p = 0.046$) and disease-specific survival ($p = 0.032$) outcomes were seen in patients under 70 receiving combination therapy rather than EBRT alone. There was no significant association between treatment methods for certain subgroups, including race and year of diagnosis.

Conclusion: EBRT+BT is associated with improved survival compared with EBRT alone in the overall group of patients. Certain subgroups may not receive significant survival benefit from EBRT+BT, and should consider this when deciding on radiation therapy; however, this may require further analysis in the future with a greater cohort of patients.

2. Maternal risk factors and congenital heart disease in offspring

¹Sophia Han, ¹Charlotte Ellberg, ²Joseph Izzo, ¹Arpita Vyas MD

¹California Northstate University College of Medicine, Elk Grove, California. ²San Joaquin General Hospital, Stockton, California.

Congenital heart disease (CHD) is the leading cause of birth defect-associated illness and death in infants. Previous research has identified certain maternal factors associated with an increased risk for CHD that include diabetes, obesity, and hypertension. This study involved a one year retrospective analysis of the Maternal Fetal Medicine database at San Joaquin General Hospital (SJGH) to assess the incidence of CHD and maternal risk factors associated with CHD in a single hospital setting with a diverse patient population. Maternal risk factors assessed include diabetes, obesity, BMI, hypertension, polycystic ovarian syndrome (PCOS), age, and drug abuse. Chi square tests for categorical variables and Wilcoxon rank sum tests for numerical variables were conducted using SPSS and R statistical software. From March 2018-July 2019, a total of 2,577 infants were born at SJGH, and 88 (2.5%) of these infants were diagnosed with CHD. Of these 88 infants, 45 were female and 43 were male. Obesity was more prevalent than diabetes and hypertension amongst the mothers of offspring with CHD (22 had diabetes, 49 had a BMI >30 at the time of admission, 10 had hypertension). 25% of the mothers were advanced maternal age (>35 years), and 12 reported drug abuse. No maternal records documented a history of PCOS. In line with previous research, we found that maternal diabetes was associated with an increased risk for CHD ($p=0.02$) and maternal drug abuse was also associated with increased risk for CHD ($p<0.038$). Additionally, a trend was observed between advanced maternal age and CHD ($p=0.06$). No associations between CHD and obesity ($p=0.61$), BMI>30 ($p=0.35$), or maternal hypertension ($p=0.56$) were observed. Multivariate regression analysis was performed in 88 cases where data for predictors were complete. 3 factors were identified as significantly associated with risk for CHD including maternal age $p= 0.042$ (OR 1.08 CI 1.01- 1.16), substance abuse $p=0.007$ (OR 6.52 CI 1.89-30.71), diabetes mellitus $p=0.029$ (OR 3.91, CI 1.24-15.09). Further large-scale analysis spanning over several years is needed to assess identified maternal risk factors for offspring's CHD risk. These studies will allow for designing screening protocols and preventative strategies for maternal factors that associate with CHD.

3. Periostin Expression and Fracture Healing Changes with Aging

Jeffrey Doelling¹, Daniel Clark², Ralph Marcucio PhD²

¹California Northstate University College of Medicine, Elk Grove, California. ²Orthopedics Trauma Institute, University Of California San Francisco

Introduction: It is well documented that bone fractures heal more slowly as animals age, with the exact mechanisms not completely understood. Periostin is one known periosteum protein that facilitates osteoblast recruitment and migration to sites of bone damage, promoting fracture healing. RNA-sequencing data from the Marcucio Lab at UCSF previously demonstrated bone marrow stromal cells in cultured macrophages had significantly decreased Periostin expression in old macrophages compared to young macrophages. This data suggests the hypothesis that decreased Periostin expression with aging is partially responsible for slower fracture healing with aging.

Methods: Three groups of mice (N=6 each) were evaluated for fracture healing; young wild-type, old wild-type, and young POSTN Knock-Out. Tibial bone was fractured using a standardized three-point fracture apparatus under anesthesia. At day 10 post-fracture mice were sacrificed and fractured tibias were harvested, decalcified, then embedded in paraffin and sectioned on microtome. The tissue samples were stained with HBQ stain (bone red, collagen blue, muscle pink). To compare fracture healing rates between young, old, and POSTN KO mice, analyses of total callus, new trabecular bone, cartilage, and marrow volumes were performed using Stereology, a cell counting microscopy method to count cell types (Bone, Cartilage, Marrow). Statistical analysis was performed with GraphPad. One-Way ANOVA was used to compare all three groups (young vs old vs POSTN KO) in each of the seven categories (volume callus, volume bone, volume cartilage, volume marrow, %bone, %cartilage, %marrow). Unpaired Student's t-test was used for statistical analysis between two groups for each combination of animal group (young vs old, young vs POSTN KO, old vs POSTN KO) in each of the seven categories. In all analyses, p values <0.05 were considered significant.

Results: One-way ANOVA confirmed statistical significance between the three groups (p < 0.05 each), followed by Unpaired Student's t-test statistical analysis between each combination of groups for each of the seven categories. The greatest volumes of callus, bone, cartilage, and marrow were observed in the Young group. In particular, Young new bone was significantly greater than both Old new bone (p < 0.0001) and POSTN KO new bone (p = 0.0002). The lowest volumes of callus, bone, cartilage, and marrow were found in the Old and POSTN KO groups, with no significant difference between the Old and POSTN KO groups.

Conclusion: Young fracture cell volumes are significantly increased compared to both Old and POSTN KO mice, with Old and POSTN KO fracture cell volumes not statistically different to each other. We can conclude the young POSTN KO mice fracture healing is more similar to Old wild-type mice than to the age matched young wild-type mice. Periostin may be a therapeutic platform for fractures in elderly patients, requiring further investigation.

4. Chronic resveratrol exposure improves in glucose homeostasis and cardiac function in a rat model of polycystic ovarian syndrome.

Rogelio Molina¹, Tiffany Shao¹, Harmanprit Randhawa¹, Arpita Vyas MD¹

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

Polycystic ovary syndrome (PCOS) is the commonest endocrinopathy in women of reproductive age, with a prevalence of 5–8%. Long-term complications seen in PCOS include cardiovascular disease and type 2 Diabetes Mellitus. Current therapies do not completely address the cardiometabolic perturbations seen in women with PCOS. Resveratrol (RSV), a natural polyphenol, is shown to have beneficial cardio-metabolic effects in various pathological conditions including that on insulin sensitivity and cardiovascular function. In-vitro studies suggest its' beneficial effects on ovarian function as well. Therefore, we hypothesized that chronic exposure to RSV would improve both cardiovascular and metabolic phenotypes in PCOS. To test this hypothesis we used an established rat model of PCOS that develops metabolic derangement and irregular cycles. A 7.5 mg (90-day release) dihydrotestosterone (DHT) pellet providing a daily dose of 83 mcg was implanted in 5-week-old female rats. Studies were also conducted on littermate matched controls (C) with no DHT implant. A subgroup of the control and DHT treated rats (n=6 per group) received a 0.84 g/kg dose of resveratrol (RSV) in their chow starting at age 5 weeks. At 8 weeks, animals were weighed weekly (n=6 per group). Oral glucose tolerance test (OGTT n=6 per group) and cardiac echocardiogram (C n=12, C+RSV n=6, DHT n=10, DHT+RSV n=6) were conducted at 16-weeks of age. Statistics were done using Graphpad Prism 8 software, using a way ANOVA to test difference between means and two way ANOVA to test differences between means over time. If the ANOVA showed significant difference, a multiple comparison test was performed to examine which groups were statistically different. Body weight increased significantly in DHT treated rats compared to C between 8 and 16 weeks (40 vs 22 grams, $p < 0.001$). RSV treatment did not mitigate the effects of DHT on body weight (34 vs 40 grams, $p > 0.5$). There was significantly higher glucose excursion at 30 minutes post glucose load in both DHT (148 ± 7.4 mg/dl) and DHT+RSV (139 ± 7.4 mg/dl) compared to C group (121 ± 13 mg/dl, $p < 0.001$, $p = 0.03$ respectively). However, by 60 and 90 minutes only DHT group had a significantly higher glucose excursion compared to both DHT+RSV and C groups ($131 \pm 4.1, 124 \pm 5.7, 110 \pm 5.9$ mg/dl, $p = 0.015, p = 0.21$ respectively); 90min ($118 \pm 5.8, 110 \pm 4.7, 96 \pm 4.2$ mg/dl, $p < 0.01, p = 0.09$ respectively). By 120 minutes, no significant difference in glucose levels existed between groups. Cardiac echocardiogram showed significantly lower mitral valve E/A ratio and increased MV isovolumic relaxation time (IVRT) in DHT group compared to C. RSV treatment reversed these changes. To further elucidate mechanisms underlying these changes in LV function we investigated insulin signaling pathways in the LV. Preliminary data (n=3 per group) suggested a trend towards downregulation of pAKT/AKT ratio and GLUT 4 in DHT treated LV myocardium and upregulation in RSV treatment. Further studies are needed to confirm these findings. In conclusion, RSV improved glucose homeostasis and diastolic dysfunction in the DHT induced rodent model of PCOS and may serve as a novel treatment option targeting the cardiometabolic derangement seen in PCOS. Further studies elucidating the mechanisms underlying the beneficial effects of RSV on cardio-metabolic phenotype in this PCOS rodent model is warranted.

5. Generating a Stable Hepatitis B Virus Cell-based Infectious System for Drug Screening

Emily Nguyen¹, Ahmed El-Shamy PhD²

¹California Northstate University College of Medicine, Elk Grove, California. ²California Northstate University College of Pharmacy, Elk Grove, California.

Introduction: Approximately 2 billion people have been infected by hepatitis B virus (HBV) and 250 million of whom are currently chronically infected, including at least 1.25 million in the United States. Current anti-HBV drugs are not curative, partly due to the continued presence of transcriptionally active HBV-DNA in the host nucleus that is not directly targeted by the available therapies. Therefore, prolonged and often life-long treatment is necessary for persistent suppression of viral replication and reducing the risk of cirrhosis and liver cancer. According to the 2018 HEPATOLOGY report, the development of new therapeutics that lead to a “*functional cure*” of chronic HBV infection is currently a top priority of HBV-related research. Many clinical medications are derived from medicinal plants and thus, they offer a great potential resource for developing novel antiviral agents. In order to screen various natural products, a functional cell-based HBV infectious system must be established. This project aims to establish a cell culture system that supports the complete life cycle of HBV.

Methods: This cell culture will comprise of hepatoma-derived cell lines, called Huh7. These cell lines alone are not susceptible to HBV infection as they are not able to mediate viral entry due to lack of expression of the sodium taurocholate cotransporting polypeptide (NTCP), which serves as the functional receptor for HBV. By molecular cloning approaches, a vector plasmid was prepared containing the NTCP gene and an antibiotic resistance marker gene (gentamicin). The plasmid was then purified using midi-prep technique. Subsequently, purified NTCP plasmid was transfected into Huh7 cells obtained from Rice Laboratory at Rockefeller University, New York. Twenty-four hours after the transfection, the cells were then cultured in complete media containing 500 micrograms of gentamicin / mL and fresh media was added every 2-3 days for three weeks. To prepare a stock of HBV, HepDE19 cells were used. These cells were cultured in 3% fetal bovine serum (FBS) media until they reached 100% confluency. The media was collected every 48 hours for three weeks. Then the media was concentrated via polyethylene glycol (PEG) precipitation approach.

Results: Three weeks after transfection of Huh7 cells with NTCP plasmid, only the cells expressing NTCP and containing the gentamicin resistance gene survived. The NTCP expression was confirmed via immunofluorescence (IF) assay using NTCP monoclonal antibody (mAb), which revealed that >80% of transfected cells were highly expressed NTCP. Currently, we are in process of determining the amount of HBV genome of prepared virus stock via quantitative real time PCR. Then, the NTCP-Huh7 cells will be infected with HBV stock. Infectivity will be measured via IF assay using HBV-core protein mAb.

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 Aussit University, Egypt. These natural products include Indonesian medicinal plants obtained from Java Island and the venom of black Egyptian scorpion and bee venom.

6. Hyperglycemia Induced Auto-inflammation of Human Microvascular Retinal Endothelial Cells

Aiza Anwar, Janet-Lee Coomes, Ishwarlal Jialal, MD, PhD, Hongbin Wang, PharmBS, MS, PhD

California Northstate College of Medicine, Elk Grove, CA

Introduction:

Diabetic Retinopathy (DR) is a feared complication of diabetes that occurs in about one third of diabetic patients. DR is the leading cause of vision impairment and blindness in working adults and studies have suggested that poor glycemic control accelerates the progression of DR. Inflammation appears to play a pivotal role in the pathogenesis of DR. Previously, it has been shown that hyperglycemia (HG) increases the expression and activity of toll-like receptors (TLR) 2&4 and receptors for advanced glycation end products (RAGE) in human microvascular retinal endothelial cells (HMVREC). Damage-associated molecular patterns (DAMPs) are associated with promoting pathological inflammatory responses and may act as ligands for both TLRs and RAGEs. However, the role of HG in inducing auto-inflammation by triggering DAMPs is poorly studied.

We will test the effect of HG on the HMVREC expression of high mobility group box 1 protein (HMGB1), a DAMP which acts as a ligand for TLRs and RAGE. We will assess for both time course and dose response effects and expect that higher concentrations of glucose will induce higher levels of HMGB1 expression and that the levels will increase after longer incubation periods.

Methods:

HMVRECs were grown to confluence in 12 well plates then subjected to hyperglycemia versus euglycemia (5.5mM glucose) conditions for 8 and 24 hour incubation periods. The supernatant was collected and HMGB1 levels were assayed by enzyme-linked immunosorbent assay (ELISA).

We tested four hyperglycemic conditions: 15mM, 20mM, 25mM, and 30mM glucose. Based on initial results, the experiment was optimized to 24 hour incubation period with 25mM glucose concentration which produced the most reproducible results. Results and statistical significance were analyzed by Wilcoxon matched-pairs signed rank test.

Results:

Incubation of HMVREC for 24 hours with 25mM glucose (n=8 experiments) led to an increased expression of HMGB1 compared to euglycemia (5.5mM). There was an 11% augmentation that was statistically significant ($p=0.008$).

Conclusion:

There was a significant increase in HMGB1 levels when HMVRECs were subjected to 25mM glucose, suggesting an auto-inflammatory response to hyperglycemia via induced activation of TLRs and RAGEs. HMGB1 may be a potential target for anti-inflammatory therapies in diabetic retinopathy and warrants further research.

7. The Relationship between Tyramine Levels and Inflammation in Metabolic Syndrome

¹Ajay Patel, Austin Thompson, ¹Lillian Abdelmalek, ³Beverley Adams-Huet, ^{1,2}Ishwarlal Jialal MD, PhD

¹California Northstate University, College of Medicine, Elk Grove, CA, USA, ²VA Medical Center, Mather, CA, USA, ³University of Texas, Faculty of UT, Southwestern Medical Center, Dallas, TX, USA,

Introduction: Metabolic syndrome (MetS) is an important contributor to both type 2 diabetes mellitus (T2DM) and atherosclerotic cardiovascular disease (ASCVD). Although MetS affects one third of American adults, its pathogenesis remains to be elucidated. Tyramine, a derivative of tyrosine, has been shown to act as a catecholamine releasing agent in the human body. The aim of this study is to investigate the role of tyramine as an early biomarker for nascent MetS without the confounding of T2DM, ASCVD or smoking.

Methods: This was an exploratory study of 28 patients with nascent MetS and 20 matched controls carried out in 2018. Metabolites were evaluated from patient's frozen early morning urine samples and were correlated with biomarkers of inflammation and adipokines. They were assayed by the National Institutes of Health (NIH) Western Metabolomics Center using liquid chromatography/mass spectrometry (LC/MS) and standardized to urinary creatinine. All patients had normal hepatic and renal function.

Results: Tyramine concentrations were significantly reduced in patients with MetS compared to controls, $p = 0.0009$. In addition, tyramine was significantly inversely correlated with multiple biomarkers of inflammation and cardiometabolic risk factors such as RBP4, monocyte TLR-4 abundance and P38MAPKinase activity, body mass index (BMI) and blood pressure (BP) (both systolic and diastolic).

Conclusion: In conclusion, low levels of tyramine could contribute to the proinflammatory state of MetS.

8. Feasibility of Wearable Technology to Monitor Heart Rate Variability in Healthy Individuals

¹Tiffani Barham, ¹Sarah Fetterolf, ¹Imre Redai, ¹Pranav Sathe, ¹Jose Puglisi Ph.D., ²Andrea Schneider Ph.D.

¹California Northstate University College of Medicine, Elk Grove, California. ²MIND Institute University of California, Davis, California

Introduction: Wearable technology has recently become popular for self-tracking of heart rate and monitoring physical activity. The purpose of this study is to assess whether wearable technology can be used for measuring viable clinical data for medical research and health care purposes. If wearables can be used to provide such data then they have the potential to provide great benefit to healthcare practitioners and their patients for future research and clinical care.

Hypothesis: Can wearable technologies provide viable data to measure heart rate variability in healthy adults?

Methods: 8 healthy individuals were given Samsung Gear 2.0 Pro to wear for 1 hour to measure heart rate variability (HRV). We used Tizen studio to develop a web app that extracts data from the Samsung Gear 2.0 Pro. Data was analyzed using MATLAB software. The app is able to calculate the RR intervals and report them every second to obtain HRV. The MATLAB calculated 19 parameters typical of HRV analysis.

Results:

The wearable device produced 62.5% valid data (5/8 individuals). HRV parameters calculated include:

Mean frequency = 72.8 bpm

The mean distance between the RR = 864.176566

Minimum = 610.2

Maximum = 1033.2

*Entropy = 1.03813196

(*Entropy should be close to 1 (the ratio of two consecutive RR intervals) however an entropy of exactly 1 is not good as it would indicate the inability to adapt HR. Entropy value of <1 indicates tachycardia, values >1.3 indicate bradycardia).

Conclusion: We saw that it is feasible to collect clinically valid data of HRV and analyze it using the Samsung Gear 2.0 Pro. Records show that there are some practicality issues in the wearability of the devices on an individual's wrist as well as technical issues that need to be improved in order to measure data for longer periods of time, but we are getting reasonable quality and quantity of data.

Discussion: As a final thought, this technology will open the doors for a less invasive monitoring system for children with autism spectrum disorder that have a low threshold for stressors.

9. A Surveillance, Epidemiology, and End Results Analysis of Long Term Patient Outcomes with External Beam Radiation Therapy ± High-Dose Brachytherapy for Squamous Cell Carcinoma of the Vulva

Mollee Chu, Mariam Soni, Austin Thompson, Jose Puglisi PhD, Tracy Yarbrough MD PhD

California Northstate University College of Medicine, Elk Grove, California

Introduction: Little is known whether combined brachytherapy (BT) with external beam radiation therapy (EBRT) has better outcomes than EBRT alone, with recent evaluation showing no significant improvement in survival. The goal of this study was to reevaluate patient outcomes for vulvar cancer and compare outcomes for individual subtypes to see if there is an improvement when BT is added to EBRT.

Methods: Data between 2000 and 2016 from the National Cancer

Institute's Surveillance, Epidemiology, and End Results (SEER) database was analyzed. Patients with EBRT+BT or EBRT treatment alone were analyzed with the exclusion of patients with prior surgical resection. Overall survival (OS) and disease-specific survival (DSS) were assessed using the Kaplan-Meier method and significance denoted with the Log Rank (Mantel-Cox) method.

Result: A total of 1,188 patients were analyzed, with 1,135 receiving EBRT alone and 53 receiving EBRT+BT. A combination of EBRT+BT was significantly associated with better overall ($p = 0.014$) and disease-specific survival ($p = 0.028$) compared to EBRT alone. EBRT+BT treatment was associated with better outcomes for patients receiving treatment between 2010-2016 ($p = 0.008$) compared to EBRT alone, while there was no significant benefit for patients receiving treatment between 2000-2009. Better overall survival ($p = 0.046$) and disease-specific survival ($p = 0.032$) outcomes were seen in patients under 70 receiving combination therapy rather than EBRT alone. There was no significant association between treatment methods for certain subgroups, including race and year of diagnosis.

Conclusion: EBRT+BT is associated with improved survival compared with EBRT alone in the overall group of patients. Certain subgroups may not receive significant survival benefit from EBRT+BT, and should consider this when deciding on radiation therapy; however, this may require further analysis in the future with a greater cohort of patients.

10. Opioid Abuse Trends of the National Population among Different Racial Groups

Kevin Yee, Austin Thompson, Isaac Chen, Dr. Jose Puglisi PhD

California Northstate University, College of Medicine

Introduction:

There exist various demographic differences in drug use, and our initial hypothesis was that Asian American people would show a greater amount of opioid use compared to other races.

Methods:

The data used in the investigation of opioid consumption was obtained from the National Survey on Drug Use and Health, compiled from 2002 until 2017. Survey questions regarding the types of drugs used by individuals and their social factors were analyzed from the main database and investigated using the computer program SPSS. The survey questions were re-coded in order to re-categorize the opiate drugs studied and visualize the severity of opioid usage. Racial, educational, locational, and income status of the participants in the study were cross-compared with the use of opioids to determine if there were any significant trends that amounted through the span of the obtained data. The investigation used Chi-Square and Pearson Correlation Coefficients when analyzing the values collected to determine significance between racial groups.

Results:

A total of 892,972 people were analyzed, with 279,990 of respondents having taken at least 1 opioid drug. Amongst white people, moderate opioid drug use had a statistically significant decline ($p = .006$) but also saw a rise in severe opioid drug use ($p = .027$) from 2002 - 2017. This same trend was noted for hispanics, with a p-value of .018, and a p-value of .005 respectively. For black people, there was a statistically significant rise in both moderate and severe opioid drug use, resulting in a decline in those who had not tried opioids ($p < .000$ for all 3 trends). For Asian people, no statistical significance was noted.

Conclusion:

Asians were the least likely to try opioid drugs, with an indiscernible trend in an increase or decrease in use. White, black, and Hispanics all saw a rise in severe opioid drug use. Additional social factors should be investigated to see which factors may be influencing this rise in opioid drug use.

11. Alleviating headaches and pain in Gulf War Illness with Neuronavigation-guided rTMS: a preliminary assessment

Karen Lei^{1,2}, BS; Alphonsa Kunnel³, BS; Valerie Metzger-Smith³, BS; Shahrokh Golshan¹, PhD; Jennifer Javors³, MD; Jennie Wei³, MD; Roland Lee³, MD; Michael Vaninetti³, MD; Thomas Rutledge³, MD; Albert Leung^{1,3,4}, MD

¹Veterans Medical Research Foundation, 3350 La Jolla Village Dr (151A), Building 13, San Diego, CA 92161, USA, ²California Northstate University, College of Medicine, 9700 W Taron Dr, Elk Grove, CA 95757, USA. ³Veteran Affairs San Diego Healthcare System, 3350 La Jolla Village Dr, San Diego, CA 92161, USA. ⁴University of California, San Diego, School of Medicine, Department of Anesthesiology, 9500 Gilman Dr, La Jolla, CA, USA

Introduction

More than 25% of the 700,000 veterans who deployed to the Persian Gulf between 1990-1991 report a myriad of unexplained symptoms termed Gulf War Illness. Migraine-like headaches and chronic widespread pain were detected in 64% of veterans with Gulf War Illness (GWI-HAP) in addition to neuropsychological dysfunction in mood, attention, and memory. Unfortunately, conventional pharmacological treatments for GWI-HAP are not shown to be effective and drugs such as narcotics contain many side effects. This sham-controlled randomized clinical trial aims to validate active repetitive transcranial magnetic stimulation (rTMS) in alleviating headache and other associated symptoms among GWI-HAP patients compared to sham rTMS at the left motor cortex (LMC).

Methods and materials

27 veterans with GWI-HAP were randomized to receive either four sessions (>24 and <72 hours) of active rTMS (10 Hz with 2000 pulses per session at 80% of resting motor threshold) and one one-month maintenance session or sham rTMS at the LMC. Headache logs and neuropsychological assessments were completed by the subjects at pretreatment, posttreatment one-week, one-month, and two-month time points. Data was analyzed with Chi-Square or mixed model ANOVA using the baseline as a covariate.

Results

A significantly higher number of subjects within the Active group reported at least a 50% reduction in headache frequency one-month posttreatment compared to baseline than the Sham group ($p = 0.037$). Joint pain intensity was significantly reduced in the Active group compared to Sham when subjects completed the Short-Form McGill Pain Questionnaire ($p = 0.042$) and the Revised New Clinical Fibromyalgia assessment using a mechanical visual analogue scale ($p = 0.031$). Additionally, the Active group reported improved mood and affect via the Neurobehavioral Symptom Inventory ($p = 0.005$), improved attention via the Conner's Continuous Performance Test II Preservations category ($p = 0.041$), and decreased insomnia via the Insomnia Severity Index assessment ($p = 0.015$) compared to Sham.

Conclusion

Preliminary data analysis suggests repetitive TMS may be effective in reducing headache frequency, joint pain, and insomnia, while improving mood and attention in patients with GWI-HAP.

12. Extinguishing Burnout at its Source: Addressing Wellness Course Efficacy for Medical Students

Jason Kuan, Cindy Ma, Melanie Yoshihara, Austin Thompson, Jose Puglisi PhD, Valerie Gerriets PhD

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

Our research assesses medical student wellbeing, and evaluates whether taking a compassion or mindfulness-based elective course alleviates or minimizes the psychological stress of attending medical school. Our project examines the effects of two CNUCOM student wellness courses, Mindfulness-Based Stress Reduction (MBSR) and Healer's Art, and whether student participation in either course will confer decreased levels of burnout compared to students who do not enroll in either.

Attending medical school is considered highly stressful and many studies suggest medical students may be at increased risk of psychological issues, anxiety, burnout, and decreased life satisfaction. Importantly, stress experienced during medical school predicts postgraduate mental health issues and studies have shown up to one-third of physicians have experienced burnout. To combat this trend, wellness courses are being implemented for medical professionals at many institutions. While MBSR and other wellness courses have been studied for physicians, their efficacy for medical students remains unknown.

We invited CNUCOM medical students to complete an optional online survey based on the Oldenburg Burnout Scale (OLBI) once per semester. We compared the mean OLBI scores of students who took a wellness elective course over the past six months to students who have not taken either course. We analyzed the results using independent samples *t*-test through the SPSS program.

Our results show that taking a wellness course may alter burnout scores for subsets of students. Importantly, after completing a wellness elective, students identifying as male showed significantly reduced burnout scores compared to those who did not ($p=0.023$).

Given that the MBSR and Healer's Art courses appear to reduce burnout in CNUCOM male medical students, ongoing studies will continue exploring gender disparities. Furthermore, analyzing pre-/post-course longitudinal data will improve understanding of medical student needs and identify programs that alleviate distress, to ultimately reduce burnout among physicians.

Poster Presentations

Poster Number and Title	Students	Mentor
1. Juvenile Subcorneal Pustular Dermatitis	Adrienne Pan, Preethi Balagani	Raj Sivamani
2. Best Medical Therapy Superior to Carotid Endarterectomy in Secondary Stroke Prevention in Symptomatic Extracranial Internal Carotid Artery Stenosis of 50-69%	Christopher Blaine, Ana Acosta, Mollee Chu, Aaron Downs, Mina Elsabee, Aasim Naqvi	Dr. ForShing Lui
3. Examining the Evidence For and Against the Dual-Hit Theory of Sporadic Parkinson's Disease	Zeeraq Rana	Dr. Rochelle Frank
4. A rare case of perianal Langerhans Cell Histiocytosis and concurrent Juvenile Xanthogranuloma	Matthew Golden, Nathan Baumgarten, Nivaz Brar	Dr. Nazila Hejazi
5. Dysbiosis and Liver Disease Development	Ranjana Ravikumar	Dr. Yvonne Wan Yu-Jui (UCDAVIS)
6. Ergotamine/Caffeine	Ryan Foley	Dr. Valerie Gerriets
7. A Literature Review on the Embryology and Teratology of TORCH Infections	Brianna Belanger	Dr. Forshing Lui
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9. Modulation of in vivo Hypothalamic AgRP Neuronal Activity Following Vertical Sleeve Gastrectomy	Seonghyun (Jamie) Ahn	Dr. Zachary A. Knight (UCSF)
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15. Liddle Syndrome due to a Novel C.1713 Deletion in the Epithelial Sodium Channel β - Subunit Affecting 3 Generations of a Family	Raven Brower, Venus Shabgahi, Ida Ghlichloo	Dr. Arpita Vyas
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18. Review: Leuprolide	Dallas Swayzer	Dr. Gerriets
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25. The Role of Tryptophan Metabolites as Anti-inflammatory Molecules	Peter Alexieff, Eric Jones, Aiza Anwar, Nicholas Harre	Dr. Ishwarlal Jialal & Dr. Hongbin Wang
26. Gastric Volvulus in an Elderly Female	Aaron Downs, Annaliese Elam, Matthew Burgess, Robert Dang	Dr. Leonard Ranasinghe
27. Homelessness and Healthcare: Identifying Challenges and Solutions in Providing Healthcare to Homeless Populations	Julia Du, Mina Elsabee, Ijeoma Kalu, Jason Soong	Dr. Arpita Vyas

28. Hemorrhagic Cough due to Muscle Tear While on Warfarin: A Case Report	Aasim Naqvi, Andrew Escobar	Dr. Leonard Ranasinghe
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33. Wake up! Wake up! Engaging Verbal and Nonverbal Autism Spectrum Elementary School Students in the Anatomy Academy Service- Learning Environment	Jared Duval	Dr. Jonathan J. Wisco (Boston University)
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36. Medical School lecture attendance and its effects on course grades, step 1 scores, and student wellness.	Jamie Ahn, Nawal AbouZahr, Sonia Bhattacharya, Kevin Walker	Dr. Dhillon
37. Physiology and Clinical Significance of Ghrelin	Emily Young	Dr. Jialal
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Poster Presentation Abstracts

1. Juvenile Subcorneal Pustular Dermatitis

Adrienne Pan¹, Preethi Balagani¹, ²Raja Sivamani

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Introduction:

Subcorneal pustular dermatosis (SPD), also known as Sneddon-Wilkinson disease, is a type of neutrophilic dermatosis that presents with hypopyon pustules on the trunk, flexor surfaces, and intertriginous areas of the body. These sterile pustules are described as half-pustular, half-clear flaccid blisters that rupture easily and cause crusting and hyperpigmentation. This chronic, relapsing rash forms an annular or serpiginous pattern. Histology reports characterize SPD with neutrophilic infiltrates, subcorneal pustules, and negative immunofluorescence. Dapsone is the first-line treatment for SPD, though there have been cases of successful treatment with etretinate, acitretin, PUVA, narrow-band (TL-1) UVB phototherapy, and colchicine

Case Presentation: A previously healthy 10 year old Caucasian male presented with itchy and stinging rashes on his extremities, buttocks, and trunk, which had been present for 6 months. Biopsies were done on the left buttock, right knee, and left thigh. Direct immunofluorescence was negative, ruling out autoimmune blistering disorders such as pemphigus herpetiformis.

Many medications, such as clobetasol ointment, atarax, ivermectin, ketoconazole cream, permethrin cream, triamcinolone ointment, keflex were taken, all without improvement. He was prescribed prednisone as well as increased dosages of dapsone through 6 months, with improvement of the rash.

Though the histopathological results may not have corroborated the primary differential, clinical evidence shows SPD as there was such a positive response to dapsone treatment. However, the patient after 4 months of treatment, started to complain of severe joint pain.

Discussion: Subcorneal pustular dermatosis (SPD), also known as Sneddon-Wilkinson disease, typically presents in middle-aged women, though there have been few cases reported in children under 18 years of age. Our patient is an unusual case of SPD, because he is a 10-year-old male whose histology findings did not align with the typical SPD histopathology.

Clinically, the patient presented with layered hypopyon pustules and multiple annular patches of hyperpigmentation and crusted erosions scattered across his trunk and extremities, which is classically seen in SPD. The characteristic histopathologic finding in SPD is subcorneal pustules, perivascular neutrophilic infiltrates with occasional eosinophils in the epidermis, a normal dermis, spongiotic changes, and negative direct immunofluorescence. Biopsies of the lesions revealed a subcorneal pustule and negative direct immunofluorescence. However, the biopsies showed perivascular infiltrates of eosinophils and lymphocytes but not neutrophils. The lack of neutrophilic infiltrates conflicts with the diagnosis of SPD, which is why this case is unusual

2. Best Medical Therapy Superior to Carotid Endarterectomy in Secondary Stroke Prevention in Symptomatic Extracranial Internal Carotid Artery Stenosis of 50-69%

Christopher Blaine, Mollee Chu, Mina Elsabee, Aaron Downs, Aasim Naqvi, Ana Acosta

Introduction: Internal carotid stenosis presents a large risk to the recurrence of cerebrovascular ischemic events. Previous studies confirmed the efficacy of surgical versus medical intervention with high grade stenosis (70-99%) of the extracranial internal carotid artery. Carotid endarterectomy was also confirmed not to be as good as medical therapy for stenosis less than 50%. There is limited information on the preferred treatment in stenosis of 50-69% of the extracranial internal carotid artery.

Methods: We reviewed the literature and analyzed surgical versus best medical therapy in patients with symptomatic extracranial stenosis of 50-69%.

Results: Early surgical trials showed patients with symptomatic stenosis 50-69% of the extracranial internal carotid artery had better outcomes in the 5-year rate of ipsilateral stroke with surgical therapy than medical therapy (16% relative risk reduction). This trend does not hold true in women or in surgery beyond 12 weeks of the initial ischemic event. Later studies, though, with more comprehensive medical therapies show significantly lower rates of recurrent strokes.

Medical therapies have become more comprehensive, more aggressive, and more effective with improved outcomes in preventing recurrent ischemic events over standard surgical procedures. Rates of recurrence of cerebrovascular events in symptomatic surgical patients were 12% at 5 years. Aggressive comprehensive medical therapy achieves a recurrence rate of 2.8% at 5 years.

Conclusion: We conclude that symptomatic extracranial internal carotid artery stenosis of 50-69% should be managed with best medical therapy.

3. Examining the Evidence For and Against the Dual-Hit Theory of Sporadic Parkinson's Disease

Zeeraq Rana

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Introduction: The dual-hit theory (or Braak's hypothesis) states that sporadic Parkinson's disease (PD) is initiated by an unknown pathogen in the nasal cavity or the gut that triggers a spreading Lewy pathology (LP) towards the CNS. Here, we review the literature in support of and against the dual-hit theory focusing on the enteric and olfactory neuroanatomy, mechanisms of spreading LP, wild-type (WT) α Synuclein (α Syn) toxicity, and digestive problems in clinical presentations.

Methods: Research methods consist of extensive searching for peer-reviewed literature on PubMed, Ovid, and EBSCO with the following terms: "Braak's hypothesis", "dual hit theory", " α -synuclein transcript usage", "Parkinson's hibernating spore", " α -synuclein transmission Parkinson's", " α -synuclein caspase-1 Parkinson's", "late-onset Parkinson's", "VPS35 Parkinson's", "Parkinson's epidemiology", "familial Parkinson's", " α -synuclein locus multiplication", "rotenone Parkinson's", "paraquat Parkinson's", "toxin's sporadic Parkinson's", "enteric nervous system Parkinson's", " α -synuclein prion Parkinson's", "Parkinson's inflammation enteric", "Parkinson's oxidative stress enteric", "Parkinson's astrocytes", "Parkinson's α -synuclein distribution", "Parkinson's neuroinflammation", "Parkinson's olfactory inflammation", "Parkinson's dorsal motor nucleus", and "Parkinson's medulla oblongata"

Conclusions: Currently, Parkinson's is most commonly diagnosed by the presence of motor symptoms. Unfortunately, these symptoms indicate that irreversible damage has already occurred in the basal ganglia. If the dual-hit hypothesis is proven to be true, methods of screening and treatment may be developed to potentially prevent and/or recognize the initiation of LP and stop its progression before reaching the CNS.

We conclude that the evidence overwhelmingly supports the dual-hit theory *in vivo*, *in vitro*, and clinically. However, this appears to only hold true in a subset of sporadic PD cases with early onset.

4. A rare case of perianal Langerhans Cell Histiocytosis and concurrent Juvenile Xanthogranuloma

Matthew Golden, Nathan Baumgarten, Nivaz Brar , Nazila Hejazi, M.D.

California Northstate University College of Medicine

Introduction : Langerhans Cell Histiocytosis (LCH), commonly referred to as Histiocytosis X, is a rare disorder characterized by proliferation of Langerin/CD1a/S100+ cells. LCH derives its name because of its resemblance to Langerhans cells from a microscopic and immunochemistry standpoint, despite being derived from myeloid progenitor cells. LCH can infiltrate most organs, classically producing osteolytic bone lesions (77%), an erythematous papular rash (39%), and/or oral lesions 1. LCH is most common in children 2 (4-5 million per year versus 1-2 million per year in adults 5) and is not associated with a significant family history of the disease. The pathophysiology of LCH is not well understood. LCH may spontaneously regress, suggesting a reactive nature, however monoclonal populations point towards a neoplastic condition. Biopsy of LCH reveals mixed cellularity with Langerhans cells, eosinophils, neutrophils, and lymphocytes. In addition to staining positive for CD1a/S100/Langerin, 57% of LCH are positive for *BRAF* V600E mutations and is associated with higher risk of disease 3,4 . Langerhans cells contain Birbeck granules (Figure A), rod-shaped organelles commonly described as “tennis rackets”. LCH may be difficult to diagnose without immunohistochemistry as it can involve many organs and present similarly to diseases such as Erdheim-Chester disease, Juvenile Xanthogranuloma, and multiple myeloma. Diagnosis is confirmed with positive CD1a, S100 and Langerin staining and the presence of Birbeck granules. Treatment for LCH depends on the number of lesions and what organs are affected. Combined histiocytoses can occur and may present as simultaneous lesions or present years apart.

Case Presentation: We report of a 59-year-old man with a rare case of perianal LCH who later presented with Juvenile Xanthogranuloma of the right abdomen. The patient initially presented with an infected, ulcerated perianal mass that was treated with antibiotics and subsequently biopsied. Hematoxylin and eosin stained slides showed sheaths of histiocytic-like cells with nuclear folding, intra-nuclear grooves and abundant background eosinophils. Mitotic figures were present with approximately 10 mitoses per 10 HPF. CD1a, S100, Langerin, and *BRAF* stains were all positive leading to the diagnosis of LCH. Two months later the same patient presented with a right abdominal cutaneous lesion. Biopsy revealed many dendritic and histiocytic appearing cells that were negative for CD1a and Langerin, but positive for factor XIIIa. These immunohistological findings supported the diagnosis of Xanthogranuloma.

Discussion: The occurrence of perianal LCH and abdominal Juvenile Xanthogranuloma in this patient is unusual. LCH is much more common in children, and only 16 cases of perianal LCH have been reported from 1984-2016 6 . Also, only 10% of Juvenile Xanthogranulomas occur in adulthood 7 . The most common Adult involvement in LCH in order of likelihood include lesions of the lung, followed by lesions of the bone and the skin 6 . Pituitary gland involvement resulting in diabetes insipidus may also be present 2 . Of the 16 other reported cases of perianal LCH, only 2 cases were reported as solitary lesions. Zero reported cases showed concurren

5. Dysbiosis and Liver Disease Development

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Introduction: Gut microbiome dysbiosis leads to liver pathologies due to changes in immunomodulation, inflammation cascade, and metabolism regulation. The health benefits of probiotics such as *Bifidobacterium infantis* (BI) and *Cordyceps militaris* (CM) have been extensively described. The aim of this project was to study the effects of BI, CM, and BI+CM (BICM) on steatosis induced by a Western diet enriched in both fat and sugar.

Methods: A control healthy diet (CD) of N=5 mice or a fructose palmate cholesterol (FPC)-enriched Western diet of N=2 mice was given to wild-type C57BL/6 mice after weaning (3-weeks old) for 6 months. Then, FPC-fed mice were randomly assigned to receive supplementation of BI (N=4 mice), CM (N=5 mice), or BICM (N=4 mice) by oral gavage, daily, for 4 weeks. Mice were euthanized when they were 7-months old followed by analysis of liver morphology, serum ALP and ALP, and cecum microbiota.

Results: The liver/body-weight ratio was increased in FPC compared to CD, with a notable reduction in the BI. However, the CM group did not change the liver/body weight ratio. Liver histology sections of the CD revealed the presence of lymphocytes in 1 of the 5 mice, while there were lipogranulomas all of the FPC mice. Granulomas were present in 2 of the 4 BI mice and in 1 of the 4 BICM mice. CM mice showed active mitosis in 4 of the 5 sections and tumor growth in 1 of the 5 sections. CD mice and BI mice showed a relative decrease in the abundance of proteobacteria compared to FPC mice. There was no significant variation in the microbiota phylum between BI, CM, and BICM mice groups. Alkaline phosphatase (ALP) and alanine aminotransferase (ALP) both showed a significant increase in FPC mice compared to CD mice, but were reduced in BI mice compared to FPC mice. The overall protective effect of BI was observed while CM induced mitosis and tumorigenesis.

6. Ergotamine/Caffeine

Authors: Ryan Foley and Valerie Gerriets, Ph.D.

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Introduction: Ergotamine was first used to treat migraine almost 100 years ago. It was derived from the fungus *Claviceps purpurea*. It is an agonist of 5-HT_{1A}, 5-HT_{1B}, 5-HT_{1D}, 5-HT_{1F}, and 5-HT₂ receptors. Ergotamine has worse effectiveness and side effects than triptans.

Methods: I performed an exhaustive PubMed search of reviews of full articles about ergotamine. I searched CNU Full Text Journals on Ovid for “ergotamine.” I searched PubMed for “ergotamine and caffeine.”

Conclusions: Ergotamine is prescribed for acute treatment of migraine. Avoid combining ergotamine with CYP3A4 inhibitors, analgesics, and opioids. Ergotamine constricts the carotid arteries and branches by activating 5-HT_{1B} and blocks the trigeminal nerve by activating 5-HT_{1D}. A 2mg dose is recommended with a cumulative maximum of 10mg per week. Its routes include 9 parenteral, nasal, oral, and rectal. The most common side effect from excessive dosage is extremity ischemia. Normal side effects include malaise, diffuse ischemic pains, and nausea. Combining ergotamine with caffeine reduces nausea. Contraindications include pediatric patients, renal or hepatic failure, cardiovascular disease, pregnancy, sepsis, and thyrotoxicosis. Dihydroergotamine is more effective than ergotamine, but both are worse than triptans, which may also be combined with caffeine.

7. A Literature Review on the Embryology and Teratology of TORCH Infections

Briana Belanger, Forshing Lui MD

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Introduction: Infectious teratogens are collectively known as TORCH infections and if acquired can cause physical, behavioral and intellectual deficits as well as death. This paper was written with the intention of compiling information obtained from many sources to develop a comprehensive look at the subject of TORCH infections as a whole for the Stat Pearl collection of articles.

Methods: My methods for obtaining a comprehensive look at TORCH Infections included Pubmed searches for the following terms: “TORCH Infections”; “congenital infections”; “Teratology”; “Toxoplasmosis; teratology”; “*Varicella*; teratology”; “Syphilis; teratology”; “Parvovirus B19; teratology”; “Rubella”; “*Cytomegalovirus*”; “Herpes Simplex Virus”; “*Treponema pallidum*; teratology”; “Hepatitis viruses; teratology” and “Human immunodeficiency virus; teratology”. Once all of the information was obtained it was then compiled into an article and submitted to Stat Pearl for review. After the review process it was accepted as a PubMed publication.

Conclusion: Infections, physical agents and metabolic conditions that a woman is exposed to prenatally, perinatally or peripartum can cause congenital abnormalities and other difficulties in her newborn baby. The infections that cause these deformities are collectively known as TORCH infections and include Toxoplasmosis, “Other Infections” (*Varicella*, syphilis and Parvovirus B19 etc), Rubella, *Cytomegalovirus* and Herpes Simplex Vi

8. Aluminum Hydroxide

Nathaniel Shon, Tracy Yarbrough MD

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Introduction: Aluminum hydroxide is a chemical found in many consumer products, both medical and non-medical. This article is intended to delineate its various clinical uses, side effects, and physiological activities. Many of these topics are already well-described throughout numerous other sources. For example, aluminum hydroxide was once utilized as a phosphate binder in patients with renal insufficiency. However, it was discovered that decreased renal functioning inhibited the clearance of aluminum, which is not excreted otherwise. So as renal function failed, toxic aluminum side effects such as osteomalacia became more prominent. Thankfully, as intestinal absorption of aluminum is minimal and renal clearance usually sufficient, it is a safe and widely used antacid. In this application, side effects are much less likely and contraindications are usually left to those who cannot excrete aluminum or take other drugs which require an acidic environment for absorption. This paper aims to take all of this knowledge, which is already published over numerous studies, and synthesize it into a single source.

Methods: Information regarding various uses, side effects, contraindications, and method of action were gathered via searching the term “aluminum hydroxide” on uptodate.

Summary/Conclusions: Aluminum hydroxide is a ubiquitous and largely safe product. Its main use as an antacid is only likely to be an issue when combined with other drugs which rely upon an acidic environment for uptake or activation. Additionally, due to its renal secretion, it should not be administered to those with renal failure due to the increased likelihood of toxic aluminum effects.

9. Modulation of *in vivo* Hypothalamic AgRP Neuronal Activity Following Vertical Sleeve Gastrectomy

¹Jamie S. Ahn, ²Christopher A. Zimmerman, ²Lisa R. Beutler, ²Zachary A. Knight,

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Bariatric surgery is the most effective and long-lasting treatment for obesity and other associated metabolic co-morbidities. Among various surgical operations available, Vertical Sleeve Gastrectomy (VSG) has become the most frequently used bariatric procedure in the United States. While mechanical restriction of gastric volume and mal-absorption of nutrients remain the dominant mechanistic explanation for surgically-induced weight loss, a growing body of evidence suggests otherwise. If mechanical alteration were solely responsible for inducing weight loss, patients would become hungry as a result of such weight loss. However, bariatric patients report being less hungry at baseline, and feel more satiated by a given meal size than their control counterparts. In addition, rodent studies have shown that animals start eating the same number of calories within 2 months of surgery as their controls, while defending their weight at a lower baseline. In the present study, we examined the *in vivo* activity of hunger-promoting AgRP neurons in the hypothalamus both pre- and post-VSG. Mice were equipped with a fiber photometry implant for recording the signal of GCaMP-expressing AgRP neurons. In a separate set of experiments, food intake induced by optogenetic stimulation of AgRP neurons was monitored both pre- and post-VSG in order to study whether this population of neurons was responsible for regulating food intake in bariatric animals. Our fiber photometry experiments revealed a marked hyperexcitability of AgRP neurons in the weeks immediately following VSG and subsequent weight loss. While this increase in AgRP neural activity would be expected to drive increased food intake, our optogenetic studies surprisingly revealed decreased AgRP-induced food intake in VSG animals as compared to the sham group. Together, these experiments suggest that the diminished food intake in bariatric animals may be regulated by a factor other than the activity level of AgRP neurons. The results of this work are important as they aim to better outline the physiologic mechanisms underlying surgical weight reduction. An accurate delineation of this process could potentially be used for the development of a less invasive, pharmacological alternative for the treatment of obesity.

10. Density of First Responders is Highly Associated with Motor Vehicle Accidents

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Background

Surgery and trauma care have always been at the intersection of medical care and public health. Various studies have shown the impact that surgeon density has on mortality outcomes for individuals involved in motor vehicle accidents (MVA) who need trauma care. This study aims to identify other factors influencing outcomes for MVAs in California.

Study Design

A regression analysis was performed to identify correlations between fatalities in MVAs and numerous variables. Our primary outcome variable (MVA fatalities) was sourced from the California Highway Patrol's Statewide Integrated Traffic Records System (SWITRS) accessed through the UC Berkeley's Transportation Injury Mapping System. Employment statistics for first responders per Metropolitan or Non-Metropolitan area inside California were analyzed from the U.S. Bureau of Labor Statistics. Surgeon density was accessed through the Area Health Resource File as provided by the Health Resource and Services Administration. Other variables such as populations and densities were all taken from the last major U.S. Census (2010). A regression analysis was performed on these independent variables to determine if any correlations existed between these features and MVA fatalities.

Results

A preliminary ordinary least squares (OLS) regression was performed. Further analysis will reveal if OLS is the best fit. Of all features tested, the number of first responders per capita was one of the variables most strongly associated with MVA mortality (Adj r squared = 0.628). This association was stronger than that of first responders per square mile of land (Adj r squared = 0.008).

Conclusions

Preliminary conclusions are that the density of first responders (per capita) are highly associated with MVA outcomes. However, further analysis will be performed to determine if OLS is the best fit analysis for our data set.

11. Amoxicillin-clavulanic acid induced Toxic Epidermal Necrolysis: a case report

Peter Lee, M.S., Derek Yip, B.S., Jinhua Shen, B.S., Leonard Ranasinghe MD PhD

California Northstate University College of Medicine

Introduction:

Epidermal necrolysis is characterized by severe blistering and peeling of the skin, often the result of a medication's adverse effects. Drugs that have been reported to cause SJS or TEN include, but are not limited to, are phenytoins, sulfonamides, anticonvulsants, oxicam NSAIDs, allopurinol, corticosteroids, and aminopenicillins. It can lead to sepsis, pneumonia, dehydration, and multiple organ failure. This phenomenon is further sub categorized depending on the coverage of the skin. When under 10% of the body surface area is affected, a diagnosis of Steven Johnson Syndrome is made. When over 30% of the body surface area is affected, toxic epidermal necrolysis (TEN) can be diagnosed. Most reactions will occur within 2 months of drug administration, with an average of 31.1 days after starting the medication if the patient has had no prior exposure. Reactions to the drug occur on average 4.1 days after initiation of the therapy if there was previous exposure to the drug. Respectively, the annual incidence of SJS and TEN are 1-6 and .4-1.2 per million people. Although rare, there is a high mortality rate of 5.7% and 15.1%, respectively. Currently the pathogenesis of SJS/TEN is still under investigation, but it is widely believed to be immune-mediated. Literature shows the involvement of cytotoxic T lymphocytes in the initiation of the hypersensitivity reaction (4).

Case Presentation:

Our patient is a 25 year-old male with no reported allergies presented to the emergency department in a wheelchair with rash and blisters spreading from his trunk to his proximal extremities, covering up to 80% of his body surface area. His history consisted of taking Augmentin and naproxen 3 days prior for tooth pain, after which the skin rash began to develop. He was then transferred to the burn unit at UCDCM for supportive care. The frozen section biopsy results were consistent with TEN with negative direct immunofluorescence results. As for treatment he underwent xenograft surgery and was intubated for respiratory infection and distress.

Discussion:

This case highlights the importance of weighing the benefits and possible adverse effects of drugs prior to prescription. Drugs that have been reported to cause SJS or TEN include, but are not limited to, are phenytoins, sulfonamides, anticonvulsants, oxicam NSAIDs, allopurinol, corticosteroids, and aminopenicillins (5). Amoxicillin, an aminopenicillin, is a common antibiotic prescribed for respiratory and dental diseases due to its oral tolerability. The combination of amoxicillin and clavulanic acid (Augmentin) is becoming more commonly used due to its extended coverage of Beta lactam resistant microbes. Studies have shown that while the percentage of skin reactions was significantly higher for amoxicillin usage alone, the percentage of serious skin reaction, as defined as fatal, life threatening, or disability causing, is significantly higher for amoxicillin+clavulanic acid usage. The mechanism of this hypersensitivity reaction is still poorly understood. A hypothesis has been made that it is mainly due to an 'immunologic idiosyncrasy' involving HLA-class-II antigens.

12. The Effects of Living Situation on Anxiety among Medical Students at CNUCOM

Melanie Hew, Connor Gehris, Hunter Smothers, Valerie Gerriets PhD

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Introduction: Due to the demanding nature of medical education, mental health conditions such as stress, anxiety, and depression among medical students have been the focus of many studies. To fill a gap that the majority of these studies did not fill, we sought to determine if living situation plays a significant role in determining anxiety level among medical students based on the hypothesis that medical students currently living with their family/spouse or alone experience lower levels of anxiety than those living with other medical students.

Methods: Over the course of approximately four months, we administered the Student Wellbeing Survey created by Dr. Valerie Gerriets to all students at CNU COM who gave consent to participate. The data collected was used to determine whether there was a correlation between living situation (Item #6 on the survey) and levels of anxiety using the Generalized Anxiety Disorder 7-Item scale (GAD-7). Comparisons were made using Analysis of Variance with a Bonferroni post-hoc test.

Results: 167 medical students (118 females, 49 males) completed the survey. Of the 167 participants, 22 live alone, 73 live with medical students, 15 live with non-medical students, 38 live with a spouse, and 19 live with family. The mean GAD score across all participants was 4.43. When broken down into groups, mean GAD scores were: 3.59 for those living alone, 4.25 for those living with other medical students, 3.67 for those living with non-medical students, 5.18 for those living with their spouse, and 5.16 for those living with family. There was no significant difference between any of the groups ($p=0.341$). The largest difference was between those living alone and those living with their spouse ($p=0.989$).

Conclusion: We found no significant effect of living situation on anxiety levels in medical students. However, we were able to observe trends based on living situation. Students living alone had the lowest levels of anxiety, followed by those living with non-medical students. Those living with their spouse had the highest.

13. Cardiac Arrest Secondary to Improper Treatment of Anaphylactic Shock with Epinephrine

Ana Acosta, Indraneel Brahme, Dr. Leonard Ranasinghe, Ph.D., MD, DABEM

California Northstate University College of Medicine (CNUCOM)

Introduction: Systemic anaphylactic shock is due to an overwhelming hypersensitivity response to the release of chemical substances in response to a generally harmless antigen. The stimulus may be an exposure to food, drugs, insect venom, or pollens.¹ Epinephrine is considered the first line drug for treatment of anaphylactic shock. The acceptable range for an intramuscular (IM) dose is 0.3 to 0.5 mg (1:1000), the preferred intravenous (IV) dose for anaphylactic shock is 0.1 mg (1:10,000) given over several minutes.² The benefits of epinephrine when used for anaphylactic shock outweigh the potential risks for cardiovascular complications when given through the appropriate route and in the correct dosage.³ Overdose of epinephrine has been shown to induce coronary artery spasm in several cases. Adverse cardiovascular events following epinephrine treatment for shock occur primarily when patients receive IV administration compared to IM epinephrine treatment or an error in IV dosing is made.⁶ This case study aims to discuss the risks associated with doses of epinephrine that exceed the current recommendations for therapy with IV epinephrine.

Case Presentation: In this case, a 36-year old female suffering from anaphylactic shock from hair dye was given an incorrect dose of epinephrine (1:1,000 IV) by paramedics. The patient was unresponsive at the time, and following epinephrine administration, she became pulseless. CPR was administered, and a dose of epinephrine (1:10,000 IV) was given in the ED. The patient was also given IV normal saline, solumedrol (125mg IV), and Benadryl (50mg IV). Her EKG revealed ST elevations in anterior leads. She was transported to a second hospital where she became responsive. Cardiology consultation and cardiac catheterization revealed no coronary artery disease. The patient suffered no lasting complications, however, incorrect dosage and administration of IV epinephrine by paramedics was a life threatening intervention that could have caused mortality in this patient.

Discussion: When patients with anaphylactic shock are treated with IV bolus epinephrine, there is a greater risk of adverse cardiovascular events compared to IM epinephrine administration.⁹ This patient recovered with no apparent complications; however, the purpose of this case study is to encourage better education for IV bolus administration of epinephrine.

14. Preventing Loss of Independence through Exercise (PLIÉ): Evaluation of Implementation at a VA Community Living Center

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Background: Preventing Loss of Independence through Exercise (PLIÉ) is an integrative group movement program developed to improve quality of life and daily function in people with mild-to-moderate dementia. We implemented PLIÉ at a VA Community Living Center (CLC) and performed a formative evaluation of reach and experience.

Methods: We provided 12 weeks of experiential training to two local clinical champions. Approximately 9 months later, we evaluated the following implementation outcomes: 1) reach (number of post-training classes offered and attendance rates and 2) resident, family, and staff experience (assessed by anonymous surveys administered to individuals who had attended one or more classes). Surveys included satisfaction ratings (5-point Likert scale) and open-ended questions (changes in themselves and others due to PLIÉ, what they liked most and least, and other comments). In addition, progress notes were reviewed. Two independent coders performed a qualitative content analysis to identify key domains of change associated with PLIE participation.

Results: A total of 45 1-hour PLIÉ classes were offered over 9 months. Residents attended an average of 13 +/- 12 classes with an average of 14 veterans, 4 staff members and 2 family members per session. Anonymous survey respondents (15 residents, 14 staff, and 8 family members) were highly satisfied with the PLIÉ program (mean: 4.8, 4.4, and 4.9 on 5-point Likert scale, respectively). Qualitative analyses identified improvements in the domains of physical function, cognitive ability, well-being, and social connection in residents and other class participants that were consistent with clinical progress notes (Table).

Conclusion: PLIÉ was successfully implemented in a VA nursing home with high satisfaction among residents, staff and family members. Residents exhibited clinically meaningful physical, cognitive, and psychosocial benefits. Larger scale studies of implementation in other CLCs and nursing homes are warranted.

15. Liddle syndrome in pediatric patient presenting with normotension and novel c.1713 deletion in the epithelial sodium channel β -subunit

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Introduction: Liddle syndrome is a rare genetic disorder with an autosomal dominant inheritance pattern presenting with resistant hypertension in early childhood due to a gain-of-function mutation affecting the epithelial sodium channel (ENaC) in the distal nephron. This renders the channels resistant to degradation and results in sodium retention and subsequent volume retention. 1 To date, 31 different mutations have been discovered that may result in Liddle syndrome.²

Case Presentation: We report a case of a 16-year-old girl presenting with hypokalemia with a strong family history of hypokalemia and hypertension. The patient herself did not have a history of hypertension; however, she was at the time of the consultation taking propranolol (Inderal LA) 80 mg daily, for migraine prophylaxis which could be masking hypertension. She subsequently gets diagnosed with Liddle syndrome after genetic testing revealed the presence of a novel deletion (c.1713delC) causing the premature termination of the SCNN1B protein product, a component of ENaC.

Discussion: We have described a novel deletion (c.1713delC) causing the premature termination of the SCNN1B protein product. Additionally the proband also presented normotensive and hypokalemic. This is not the classical clinical picture that Liddle's syndrome is associated with. However the proband's family history was significant for a mother with hypertension and three generations of hypokalemia. Therefore it serves to show the importance of eliciting a complete history.

16. An analysis of MCAT, GPA, and other academic indicators and their predictive abilities regarding USMLE Step 1 scores at a single institution

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California Northstate University College of Medicine (CNUCOM)

Introduction: As the United States Medical Licensing Examination (USMLE) Step 1 is one of the most important determinants in residency applications, the authors will explore various metrics of student performance, including undergraduate GPA, Medical College Admission Test (MCAT) scores, National Board of Medical Examiners (NBME) end-of-course exam scores, and Comprehensive Basic Science Examination (CBSE) scores and look for correlation with the students' USMLE Step 1 scores. Using the scores of CNUCOM's classes of 2019 and 2020, the authors will attempt to answer the question of which factor from previous performance can best predict USMLE Step 1 performance.

Methods: Using records of various metrics of student performance compiled with the help of the university's academic office, the students' performance from undergraduate studies through the first two years of medical school were correlated with the students' performance on the USMLE Step 1 through Pearson correlation.

Results: The study consisted of 59 students in the class of 2019 and 86 students in the class of 2020. For both classes, the strongest correlations with USMLE Step 1 scores were scores of the CBSE1 (Class of 2019 $R^2 = 0.611$, Class of 2020 $R^2 = 0.689$) and mean scores of NBME end-of-course exams of the first two years (Class of 2019 $R^2 = 0.651$, Class of 2020 $R^2 = 0.718$), while their MCAT (Class of 2019 $R^2 = 0.005$, Class of 2020 $R^2 = 0.08$) and GPA (Class of 2019 $R^2 = 0.025$, Class of 2020 $R^2 = 0.082$) only had weak correlations.

Conclusion: The authors' findings confirmed their hypothesis that among the various metrics of student performance, NBME end-of-course exam scores and CBSE1 scores had the strongest correlation with USMLE Step 1 scores.

17. An unusual case of vaginal abscess

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California Northstate University, College of Medicine

Introduction: Shortness of breath, or dyspnea, poses a complex differential for the emergency room physician, with etiologies including pulmonary, cardiac, metabolic, hematologic, neuromuscular, gastrointestinal, and psychiatric causes. Rapid recognition of the underlying cause of dyspnea is key to minimizing patient morbidity and mortality; however, the causes are sometimes subtle and challenging to identify. This emphasizes the importance of taking a thorough history and performing a complete and honest physical exam. In this report we describe the case of a pregnant woman with a vaginal abscess leading to secondary sepsis and tertiary shortness of breath which was discovered during a consultation with an astute OB/GYN.

Case Presentation: We present a case of a 29-year-old pregnant female (30 weeks) who was evaluated and discharged from the emergency department multiple times over a period of two weeks with the chief complaint of dyspnea.

On primary survey the patient noted lightheadedness, dizziness, chest pain, decreased fetal movement, and a vaginal “pimple” that she tried to pop. Her vital signs were: BP: 124/78, P:116, RR: 20, Temp: 36.6C, and O₂ Sat: 97% on room air. An EKG showed incomplete right bundle branch block and normal sinus rhythm revealing no ischemic changes, a chest X-ray was normal showing no intrathoracic process, and an ultrasound of the fetus was unremarkable. A few hours later she stated she was feeling better and was discharged home.

A week later she presented with the same chief complaint and associated symptoms. New labs were significant for metabolic acidosis, slight hyponatremia, hyperchloremia, low CO₂, critically low BUN, and a normal creatinine. BNP levels were normal. CBC showed elevated WBC with a slight decrease in RBC and hemoglobin. PT and PTT were mildly prolonged. D-Dimer levels were high at 1,628 ng/mL DDU and results from a lung V/Q scan were unremarkable. Sepsis was suspected and antibiotics were started.

Suspected sepsis necessitated an OB/GYN consult to evaluate the fetus. On physical exam, the OB/GYN physician discovered a 2.5cm vulvar abscess that she incised, drained, and sent for cultures that later grew methicillin-sensitive *Staphylococcus aureus*. The patient was eventually discharged home with cephalexin and azithromycin and instructions to follow up with her PCP and OB.

Discussion: This case illustrates the necessity of taking a thorough history and performing a complete physical exam in the context of a chief complaint of dyspnea. It additionally yields teaching points about the management of frequent visitors to the ED, handling of patient handoffs at the end of shifts, using a pelvic exam when it may not be obvious to the patient why one is needed, and carefully reviewing and retaking histories (when stumped) instead of relying on previous EMR notes only.

18. Leuprolide

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Introduction:

Leuprolide is an FDA-approved gonadotropin-releasing hormone agonist that is used for the management of endometriosis, uterine leiomyomata (uterine fibroids), treatment of central precocious puberty in children, and advanced prostate cancer. Because of its many clinical applications, it is important for interprofessional healthcare teams to be aware of the indications, adverse reactions, and contraindications of leuprolide.

Methods:

My method consisted of extensive searching for publications on PubMed with the following terms: “Leuprolide”; “Endometriosis Leuprolide”; “Leuprolide Prostate” “Leuprolide Prostate Cancer”; “Leuprolide Acetate”; “Leuprolide Central Precocious Puberty”; “Leuprolide Contraindications”; “Adverse effects of Leuprolide”; “Leuprolide Paraphilia”; “Leuprolide Breast Cancer”; “Leuprolide Transgender Therapy”; “Leuprolide IVF” “Lupron”; “Leuprorelin”; “Central Precocious Puberty”; “Uterine Fibroids”

Summary:

Leuprolide was first approved in 1989 for the palliative treatment of metastatic prostate cancer. Since then it has been FDA approved for use in treating endometriosis, uterine leiomyomata, and central precocious puberty. Off-label uses include management of breast cancer, hormone therapy for male to female transgender patients, premenopausal ovarian suppression and management of paraphilia and hypersexuality. As a GnRH analog, leuprolide lowers FSH and LH levels which in turn lower the levels of testosterone and estrogen in males and females respectively. To reach the desired effect leuprolide has to be given continuously and in therapeutic doses. It can be administered with either subcutaneous or intramuscular injections over various timespans and increments depending on the treatment plan. With its role as an inhibitor to gonadotropin secretion, leuprolide can be used in many different clinical applications with respect to sex hormone-related disorders. It is generally well-tolerated in children and in adults, major side effects include headaches, flushing and injection site pain. Research is ongoing for more disorders that could possibly be alleviated with leuprolide therapy.

19. Clavulanic Acid

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Introduction: Clavulanic acid, also known by its potassium salt form clavulanate, is FDA approved for clinical use in conjunction with amoxicillin to treat certain bacterial infections. The antibacterial activity of amoxicillin is not improved by clavulanic acid when used against bacteria that do not produce beta-lactamase. Therefore, indications for this drug combination only include patients suspected of infection with beta-lactamase-producing bacteria.

Methods: My method consisted of extensive searching for publications on PubMed with the following terms: “Clavulanic Acid”; “Clavulanate”; “Amoxicillin”; “Penicillin”; “Amoxicillin-clavulanate”; “Amoxicillin clavulanic acid”; “Amoxicillin indications”; “Amoxicillin side effects”; “Clavulanic Acid indications”; “Clavulanic Acid side effects”; “Clavulanate side effects”; “Clavulanate indications”.

Conclusion: Clavulanic acid in combination with amoxicillin has demonstrated efficacy in the treatment of infections such as complicated and uncomplicated urinary tract infections, lower respiratory infections, sinusitis, otitis media, and some skin and soft tissue infections caused by organisms such as *H. influenzae*, *M. catarrhalis*, and *S. aureus*. Clavulanic acid alone has no known antibacterial effect and is always used in combination with amoxicillin. Clavulanic acid, when administered with amoxicillin, can cause some mild gastrointestinal adverse effects. These include vomiting, nausea, loose stools, and discomfort. All contraindications for clavulanic acid are considered in conjunction with amoxicillin since clavulanic acid is not administered by itself. The drug combination is primarily excreted renally, so caution is necessary when a patient has renal impairment or is on hemodialysis. Beta-lactamase inhibitors, such as clavulanic acid, are an essential tool for treating bacterial infections that are beta-lactamase producing. To prevent an increase in antibiotic resistance, it is critical to administer this drug only to patients infected with beta-lactamase-producing bacteria.

20. Surgery resident endoscopy training efficacious with underwater colonoscopy technique

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Introduction: With the prevalence of colorectal mortalities in the United States, colonoscopy screenings are the most valuable tool in detecting and preventing colorectal mortalities. The traditional procedure is an air-insufflation colonoscopy, which has its issues regarding patient comfort and ease of approach. Water-infusion colonoscopies are an alternative technique which may be easier to teach while also decreasing patient discomfort and potentially being more effective at detection of adenomas. The purpose of this study was to determine if training residents in underwater colonoscopies is more efficacious than training them in traditional air-insufflation colonoscopies.

Methods: This study was a retrospective, single-institution study that compared the socio-demographic variables and clinical characteristics of the patients of three cohorts of physicians. The three cohorts were gastroenterologist performing an air colonoscopy (GE [air]), gastroenterologist with resident performing an air colonoscopy (GE + R [air]), and gastroenterologist with resident performing an underwater colonoscopy (GE + R [water]). The objective of this study was twofold: (1) to determine if there was a difference in patient preparation and outcome between the groups, and (2) if there was a difference in the procedure time between the groups.

Results: The three groups had similar mean ages and comorbidities. Among the three cohorts, the GE + R (water) group had the best bowel preparation with 70% of the patients ($n = 58$) having “good” prep, compared to only 52% in the GE (air) group and 61% in the GE + R (air) group ($p=0.035$). The underwater group had a greater proportion of females (47%, $n = 39$) compared 30% for GE (air) and 24% for GE + R (air), yet still had similar polyp detection rates ($p=.851$) and cecal intubation rates ($p=.380$). Lastly, the mean total procedure time of the GE + R (water) colonoscopy was comparable to the time of the GE + R (air) colonoscopies, at averages of 35.7 minutes vs 37.4 minutes respectively.

Conclusions:

The difference in bowel preparation can be attributed to the ability of the GE + R (water) group to use water to clean the bowel, thus aiding in adenoma detection. The female colon is more tortuous, meaning that females are usually more difficult to scope. However, despite having a higher proportion of female patients, the success rate and procedure time of the GE +R (water) group were comparable to the GE + R (air) group. These findings suggest that training residents in underwater colonoscopies may aid in increasing patient comfort and decreasing procedural complications without sacrificing success rate or total procedural time.

21. Naloxone availability in California

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Introduction: The increase in awareness of the opioid epidemic has led to many legislative efforts attempting to combat this crisis. One such effort has given pharmacists the ability to furnish naloxone without a physician's prescription, which is a practice that many pharmacies in the northern California region have adopted. This increase in naloxone availability suggests the hypothesis that there will be a decrease in opioid deaths as naloxone availability increases.

Methods: A short telephone survey was developed to assess geographic naloxone availability and adherence to current guidelines at pharmacies in 3 California counties: Sacramento, El Dorado, and San Joaquin counties. A list of 66,235 US pharmacies was obtained from the Department of Homeland Security (<https://catalog.data.gov/dataset/pharmacies?fbclid=IwAR3xnVKWR8GdLdjb55A91zp-VcrGZQ2kCXlu3rUVQhoGdCCxoUBSdCTe7Qs>). This list was pared down to only include pharmacies located in zip codes within Sacramento, El Dorado, or San Joaquin counties for a total of 350 local pharmacies. A maximum of five attempts was made to contact pharmacies.

Results: Of the 350 total local pharmacies, 101 agreed to participate in the survey, 108 declined to participate, 92 pharmacies were not called due to time constraints, and at least 49 of the pharmacies were closed or had disconnected numbers listed. Since this survey was last completed in 2017, we have seen an increase in the number of pharmacies that a) stock naloxone and b) allow pharmacists to prescribe naloxone without a physicians' prescription. In 2017, only 50/130 responding pharmacies said that they currently had naloxone in stock. Of those 50 only 46.2% followed furnishing guidelines of allowing pharmacists to prescribe naloxone without a physicians' prescription. However, of the 101 pharmacies we surveyed, all but 1 reported stocking naloxone and 78 reported following furnishing guidelines.

Conclusion: These results are in line with the number of opioid deaths/100,000 people in the 3 surveyed counties. The age-adjusted death related to opioid overdose in Sacramento, El Dorado, and San Joaquin counties respectively was: 3.8/100,000; 4.4/100,000; and 3.4/100,000. All 3 of these counties were under the, already low, California average of 5.84 deaths/100,000 people despite each county having around 600 opioid prescriptions/100,000 people (2018 national average: 587/100,000 people). This supports our hypothesis that as the availability of an overdose reversal drug, like naloxone, increases; the number of opioid related deaths should decrease.

22. Methamphetamine-Associated Cardiomyopathy: A Looming Epidemic for a New Generation

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California Northstate University, College of Medicine

Introduction: Methamphetamine is a widely used drug of abuse associated with cardiovascular-related events and mortality as discussed in other case studies. There is limited scientific evidence describing the prevalence and presentation of cardiomyopathy due to the use of methamphetamine. Case studies describe the link between abuse and cardiomyopathy, also known as methamphetamine-associated cardiomyopathy (MAC) 1 . Retrospective data from 2009 to 2014 collected in a large urban community health system in southern California showed an increased prevalence of MAC in congestive heart failure patients 2 . Cardiomyopathy and heart failure appear to manifest in younger age groups, particularly those who abuse methamphetamine, compared to their non-methamphetamine using counterparts, with a mean age of 50 compared to 67 years 3 . Despite advances in the understanding of MAC, evidence regarding prevalence, presentation, and management of MAC is lacking. 4. Although methamphetamine addiction is not as large an epidemic, it is just as deadly and on the rise in many communities throughout the West Coast. Of note, consequences of chronic methamphetamine use are insidious and manifest gradually, whereas opioid overdose is rapid.

Case Presentation: We present a unique case of a 54-year-old female arriving to the emergency department (ED) with a history of hypertension, obesity, asthma, and congestive heart failure. The patient admitted to frequent use of crystal methamphetamine. The patient complained of dizziness, headache, nausea, and vomiting. She also reported abdominal and shoulder pain exacerbated by excessive coughing. Physical exam was significant for decreased aeration to bilateral bases with faint expiratory wheeze. The patient was subsequently admitted to the hospital due to presentation of hypoxia and dyspnea. Chest x-ray demonstrated a right infrahilar opacity in addition to moderate cardiomegaly. The diagnosis of dilated cardiomyopathy was made by echocardiogram with additional imaging in consultation with cardiology. EKG results indicated anterolateral T-wave inversion and sinus rhythm on telemetry indicated a ventricular rate of 69. Transthoracic echocardiography revealed an estimated LVEF of 25%. Urine toxicology was positive for methamphetamine. Hemoglobin A1C of 8.6% indicates uncontrolled diabetes mellitus. Patient underwent the following procedures: myocardial perfusion stress test (Adenosine/Lexiscan Stress test), CT angiography pulmonary, CT scan, CXR, ECHO, blood culture, and culture MRSA screen. Along with her congestive heart failure exacerbation, her cardiomyopathy was treated aggressively with ACE inhibitors, furosemide, spironolactone, albuterol, prednisone, and broad spectrum antibiotics due to concerns of pneumonia. Following her recovery and discharge, patient was lost to follow-up.

Discussion: This case illustrates the challenges to ensuring positive outcomes in patients with MAC after acute admission to the ED, including multiple co-morbidities and barriers to compliance and continuous care. It also highlights the need for increased awareness, research, and effective strategies to achieving and maintaining methamphetamine cessation in relatively young individuals, so as to mitigate irreversible cardiac damage from prolonged methamphetamine abuse.

23. Predictors of USMLE Step 1 Performance at a U.S. M.D. School Utilizing NBME® Examinations to Assess Preclinical Performance and to Serve as Early Warnings for At-Risk Students

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California Northstate University, College of Medicine

Introduction: The United States Medical Licensing Examination® (USMLE®) Step 1 has long played a critical role in determining residency match success. With prior literature suggesting the use of National Board of Medical Examiners® (NBME®) exams as a predictor for USMLE® Step 1 performance, this research evaluates the curriculum model of California Northstate University College of Medicine (CNUCOM) which almost exclusively relies on custom NBME® exams for student assessment.

Methods: Data from the model was collected from two classes with and without performance warning notifications after the first year of study to identify lower-performing students.

Results: The data indicates a strong relationship between NBME® and USMLE® Step 1 success, a convergence in the NBME® score gap between initial higher and lower performers throughout the preclinical curriculum, and a correlation between an early performance warning notification and subsequent NBME® success.

Conclusion: Our findings are presented to assist medical schools interested in developing or adapting their preclinical curricula to maximize USMLE® Step 1 performance. The authors recommend implementing performance warning notifications in the first year of medical school and deemphasizing traditional admissions metrics thought to predict success in medical school like undergraduate GPA and Medical College Admissions Test® (MCAT®) score.

24. Psychedelics in Medicine: A Review of Current Literature

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Introduction: Psychedelics, a term that translates as “mind revealing”, are a broad class of compounds known for their effects on mood, perception, and various cognitive processes. The nature of these psychoactive substances would appear to make them promising pharmacologic candidates in the treatment of psychiatric disorders – particularly when used as an adjunct to therapy. Early research with psychedelic compounds in the 1960’s and 1970’s supports this notion: a meta-analysis of nineteen studies published during the 1960’s and 1970’s found that administration psychedelic compounds showed ‘clinically judged improvement’ in 79% of subjects with a mood disorders. Despite the optimistic results of the time, clinical study of psychedelics fell out of favor in the 1970’s because of their widespread recreational outside of the medical research domain and their association with the counter culture of the time. As this cultural backlash has faded over the last few decades, there has been a resurgence of interest in psychedelic’s therapeutic potential. Dozens of academic research laboratories are investigating their clinical applications, and some institutions (such as John Hopkins and Imperial College) have full departments directly to studying the use of psychedelics in mental health care. Beyond academia, numerous million-dollar non-profit organizations dedicated to supporting psychedelic research have sprung up. This project summarizes and critiques the most up to date literature that this upcoming field is producing about the clinical applications of psychedelic compounds in the treatment of psychiatric disorders.

Methods: Below is a non-exhaustive list of the search terms used in PubMed while conducting the literature review: *“Psilocybin”*; *“Psilocybin Treatment Resistant Depression”*; *“Psychedelic assisted therapy”*; *“Psilocybin assisted therapy”*; *“Psychedelics”*; *“Medication assisted therapy”*; *“Psychedelic set and setting”*; *“Psychedelic Medicine”*; *“STAR*D”*

Conclusion/Summary: The data coming out of about the potential uses of psychedelics as therapeutic agents is promising. The application of MDMA in the treatment of PTSD of currently in phase 3 clinical trials, and psilocybin has multiple phase 2 trials underway for treatment resistant depression and addiction recovery. All proposed clinical applications of psychedelics utilize the compound as an adjunct to therapy, and this tight connection between therapy and the medication is core throughout the research. There is still a lot to be understood about the mechanism of action on a both a biochemical and connectome level. A study recently found that only 8% of American psychiatrists (whom of all healthcare providers would seem to be the most aware of the research and its need) believed the use of psychedelics in a medical context did not deserve further research. Ultimately, we conclude that, while skepticism is well warranted, the use of psychedelics in medicine deserve serious consideration.

25. The Role of Tryptophan Metabolites as Anti-inflammatory Molecules

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Introduction: Metabolic Syndrome affects an estimated 35% of Americans and significantly increases the risk for developing type 2 diabetes and atherosclerotic cardiovascular disease. The syndrome is multifactorial, but inflammation has been shown to play a pivotal role in its pathogenesis. Tryptophan is an essential amino acid that is obtained from the diet and metabolized by gut microbiota into various metabolites including N-acetyl tryptophan (NAT) and indole-3-acetate (IAA). We recently showed that NAT is significantly reduced in Metabolic Syndrome patients and correlates inversely with biomarkers of inflammation. Hence, in this in vitro study, we tested the effect of NAT and IAA on endothelial cell inflammation.

Methods: Human aortic endothelial cells (HAECs) were grown to confluence in 12 well plates and experiments were performed in serum free medium. Lipopolysaccharide (LPS) was used as an agonist at a concentration of 100ng/ml. Confluent HAECs were washed and preincubated with NAT (50 and 100 uM) and IAA (300 and 600uM) for 30 minutes prior to the addition of LPS. The cells were incubated for 24 hours and the supernatant was collected. Supernatant was analyzed for inflammatory markers using ELISA.

Results: Our initial studies showed that IL-8, MCP-1, and ICAM-1 increased significantly with LPS as compared to media alone. IL-8 was chosen as the inflammatory marker readout to use for most experiments due to the most significant fold increase between LPS and media alone. Whilst LPS resulted in an 18-fold increase in IL-8 (n=4 experiments), neither NAT or IAA inhibited LPS induced IL-8 secretion (n=4 experiments for each metabolite).

Conclusion: HAECs stimulated with 100ng/ml LPS produced an inflammatory response with increased secretion of IL-8, MCP-1, and ICAM-1. HAECs preincubated with NAT (50 and 100uM) and IAA (300 and 600uM) did not decrease LPS induced IL-8 secretion.

26. Gastric Volvulus in an Elderly Female

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Introduction: Gastric volvulus (GV) is a rare condition characterized by rotation of the stomach 180° around its axis [1]. GV can be either acute or chronic and can lead to various complications including GI obstruction and strangulation. Approximately one third of patients present with acute symptoms [2]. Acute GV is considered a surgical emergency and, if left untreated, has a high rate of mortality. Acute GV is classically characterized by Borchart's Triad which consists of unproductive retching, epigastric pain, and inability to pass a nasogastric (NG) tube [3]. Postprandial vomiting can also be seen. Diagnoses are most commonly made with imaging (plain radiograph or CT). In adults, GV is commonly due to diaphragmatic defects. We present a patient with a case of acute gastric volvulus in a 74 year old female with history of hiatal hernia. The patient was diagnosed via imaging and subsequently underwent surgical reduction of the volvulus and hernia repair.

Case Presentation: The patient is a 74 year old female with a significant past medical history. Her surgical history includes an appendectomy, 3 C-sections, and a total hysterectomy. She reported that the hiatal hernia has been present for approximately 5 years. She presented to the ED with a chief complaint of left upper quadrant pain. She reported moderate, pressure-like, abdominal pain radiating to her left shoulder, rated 5 out of 10 in severity. The patient reported a history of similar postprandial pressure-like abdominal pain and nausea with additional brown emesis 1 week prior, for which she was seen in a different ED and was admitted overnight for NG tube placement and decompression. Upon arrival to ED, patient's vital signs were: BP: 164/80 HR: 93 RR: 16. Exam was significant only for mild epigastric and left upper quadrant abdominal tenderness, with a soft, non-distended abdomen and normal bowel sounds. She was first given IV fluids, protonix, and zofran for symptom control during the ED workup. The patient reported significant relief of pain after NG tube decompression. Labs, including CBC with differential, CMP, lactic acid, and PT/PTT were significant for hypokalemia (3.2mmol/L) and mild hyperglycemia (108mg/dL). An abdominal/pelvic CT with contrast revealed a diaphragmatic hernia with displacement of the gastric antrum and pylorus above the level of the GE junction and fundus extending into the left hemithorax through a diaphragmatic defect in a configuration compatible with a mesenteroaxial gastric volvulus and a probable associated gastric outlet obstruction. The patient was transferred to a tertiary care center for surgical repair. The patient underwent an esophagogastroduodenoscopy, a laparoscopic paraesophageal hernia repair with mesh, and Nissen fundoplication. Surgical findings included gastric erosion at the gastroesophageal junction and a large hiatal hernia with a majority of the stomach in the chest cavity. A laparoscopic Nissen fundoplication was performed to hold the stomach in the correct orientation within the abdominal cavity. There were no complications.

Discussion: This case provides a useful look at a standard presentation and treatment of a rare and potentially life threatening condition. Our patient's risk factors and presenting complaints were typical of acute gastric volvulus: an elderly female with a past medical history of chronic hiatal hernia presenting with acute abdominal pain radiating to the scapular region and with a recent history of an episode of similar pain one week prior. Though the presentation and risk factors were consistent with an acute gastric volvulus, it is still considered a less likely differential diagnosis due to its low incidence. In this case, as well as in most cases of GV, prompt radiologic studies were key in identifying and confirming the diagnosis.

27. Homelessness and Healthcare: Identifying Challenges and Solutions in Providing Healthcare to Homeless Populations

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California Northstate University College of Medicine

Introduction: Providing consistent, high-quality healthcare to homeless populations has proven to be a significant challenge without simple solutions. Solving the root cause of these health issues, the homelessness, would do the most to address these challenges.

Methods: Our methods consisted of scouring online research databases for peer-reviewed publications on Google Scholar, PubMed, and OVID using the search term: “Homelessness, Healthcare”.

Results: Homeless populations have difficulty accessing healthcare for a variety of reasons, from economics, transportation, stigma against the homeless, and concern over leaving their shelter unprotected. Combined with the harsh environmental factors they face day-to-day, health outcomes are significantly worse in homeless populations compared to individuals with stable housing situations. These worsened health outcomes range from the severity of acute conditions, prevalence of concurrent chronic diseases, mental health concerns, substance abuse, and mortality rates. Various programs have tried to solve these health issues by looking at methods such as providing regular meals at homeless shelters, providing counseling on tobacco and alcohol use, and interviewing individuals about their experiences interacting with the healthcare system. Most significantly, programs striving to reduce homelessness by getting the homeless population into stable long-term housing has proven to be the most effective in reducing health issues.

Conclusion: While addressing the health disparities that the homeless population faces is an important short-term concern, addressing the root problem of a lack of stable housing will in turn fix the health disparities in the long-term as well.

28. Hemorrhagic Cough Due to Muscle Tear while on Warfarin: a Case Report

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INTRODUCTION: Rectus sheath hematoma tends to account for less than 2% of patients presenting with acute abdominal pain. It tends to be difficult to diagnose since it is sometimes mistaken for an inflammatory process, leading to delays and unnecessary laparotomies. In a review of 126 rectus sheath hematoma patients at one institution, Cherry et al. described a female to male ratio of 1.8:1 and an average age of 67.9 years. Additionally, 69% of patients were on some sort of coagulation therapy. 48% of the patients had nonsurgical abdominal trauma, with the majority of those (29%) suffering from cough [1]. The pathophysiology of a rectus sheath hematoma is typically due to rupture of the muscle itself or hemorrhage of the inferior epigastric arteries that supply it. Inciting events involve either direct trauma to the muscle, or forceful rectus abdominis contractions, such as those seen in intense bouts of coughing. Diagnosis is typically confirmed with CT scan or ultrasound [2].

CASE PRESENTATION: We describe a case of cough-induced abdominal hematoma with ensuing hemoptysis in a 48-year-old male who had been receiving anticoagulation medication. He presented to the emergency department complaining of right-sided groin pain for 3 weeks, radiating under the umbilicus with discoloration to the pelvic area. The patient reported that his symptoms began after coughing forcefully during a recent upper respiratory infection. He had also noticed bruising in the lower abdomen and reported constipation with no bowel movements except with concurrent laxative therapy, symptoms that developed over the same time period. CT of the abdomen and pelvis showed a 11 x 9 x 6 cm hematoma originating from the right rectus muscle of the abdominal wall, extending into the intra-abdominal space and pelvis, causing mass effect on the bladder and intestines. The patient was transferred from the emergency department for evaluation by a surgeon. He was later discharged after a repeat complete blood count showed stable hemoglobin and hematocrit.

DISCUSSION: This case demonstrates that the anticoagulatory effect of coumadin may lead to hematomas located in uncommon areas, especially when coupled with external strain.

29. Post Thoracentesis: Trapped Lung Syndrome versus Pneumothorax

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Introduction: Trapped lung syndrome is defined as the inability of the lung to expand due to fibrous visceral pleural peel. 1 Trapped lung occurs when fluid is drained in the pleural cavity, but the lung is trapped or unable to expand due to improper pleural healing and inflammation. 2 The prevalence is 32 percent among those receiving ongoing thoracentesis procedures. 6 Trapped lung syndrome is strongly associated with chronic pleural effusion as well as cardiac surgery, trauma and other inflammatory processes involving the pleura. Similarly, lung entrapment is also caused by a visceral pleural peel, but contrary to trapped lung syndrome it presents with active pleural effusion, hemothorax, malignancy or inflammation. 2 Lung entrapment has been commonly used interchangeably with the term trapped lung, but these similar terms have subtle differences as entrapment refers to active inflammatory pleuritis while trapped lung is secondary to chronic fibrosis and collagen deposition. 2

Case Presentation: A 51-year-old female with a history of metastatic ovarian cancer on chemotherapy, malignant pleural effusion requiring repeat thoracentesis, and pulmonary embolism presented to the Emergency Department with worsening shortness of breath and dry cough. Her symptoms are secondary to recurrent malignant pleural effusions for which she requires consistent therapeutic drainage every 7 to 10 days. On examination, she was noted to be in respiratory distress with mild crackles at the base on the left and absent to little breath sounds in the right middle lung fields. Vitals upon initial presentation revealed tachycardia and tachypnea (Blood pressure: 125/56mmHg, Pulse: 115/min, Respiratory Rate: 18/min, O2 sat: 100% on 3L nasal cannula). Labs revealed a mild anemia without leukocytosis or shift (Hgb: 10.2). Initial chest X-ray revealed a permanent chest tube in place on the left, bilateral airspace and linear opacities, large right-sided effusion and small left lung effusion. A thoracentesis was performed in the Emergency Department. Post procedural chest films raised concern for a pneumothorax versus trapped lung syndrome. Chest tube placement was held off, and she was admitted for observation.

Discussion: It is vital to differentiate a pneumothorax from trapped lung syndrome as these conditions may look similar on chest films, but their management differs significantly.

30. Observation of complement activation in human retinal endothelial tissue in response to hyperglycemic environment

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Introduction: Chronic hyperglycemia is known to be associated with endothelial cell dysfunction, as well as clinical complications including retinopathy, neuropathy, and atherosclerotic disease. Even so, the specific biochemical pathway for endothelial cell dysfunction has yet to be fully described. Our study aims to observe the presence of complement activation in the setting of hyperglycemia.

Methods: Human retinal microvascular endothelial cells (HRMECs) were grown on coverslips and treated with incremental D-glucose concentrations: 5.5 mM, 20 mM, and 30 mM. Mannitol was used for osmotic control and lipopolysaccharide (LPS) as positive control for complement activation. 3 hours after glucose treatment, HRMECs were treated with anti-C3c and anti-C5b9 antibodies. 24 hours after the first antibody treatment, the anti-complement antibodies were treated with fluorescent antibodies, as well as DAPI staining. The coverslips were then visualized under fluorescent microscopy and the amount of fluorescence quantified using ImageJ.

Results: As of now, two experiments have been completed, which yield inconclusive results. Images of several slides were taken, but it is difficult to determine whether the fluorescent visualization was from the antibody or just artificial. Overall, it qualitatively appears that the fluorescence is relatively equal throughout all concentrations of glucose; however ImageJ has not been used yet.

Conclusion: Many obstacles led to the inability to gather adequate data. The first obstacle was learning how to utilize the fluorescent microscope, as well as altering the image to clearly see the fluorescence, which we are still troubleshooting. Second, lack of supplies, such as growth media, made it impossible to culture cells on time, resulting in substantial HRMEC loss. More trials must be run and research continued to draw a significant conclusion of the relationship between a high glucose state and the activation of complement. We hope to continue with experiments once adequate supplies and training is available.

31. BET inhibitor suppressed tumor growth and associated TME inflammation in mouse models of cutaneous T cell lymphoma

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Introduction: Bromodomain and Extra-terminal motif (BET) proteins epigenetically regulate gene expression critical for cell cycle and signaling pathways, implicating the potential for BET inhibitors as anticancer agents. BET proteins bind to acetylated-histone domains controlling cell cycle regulators through activation of RNA polymerases. OTX-015, a BET inhibitor, acts as an acetyl-histone mimetic that competitively inhibits the binding of BET proteins to chromatin. Antineoplastic effects of BET inhibitors have been shown to be effective at inhibiting the growth of many different cancers, particularly acute hematologic malignancies.

Methods: We previously established a cutaneous T cell lymphoma (CTCL) model in mice, utilizing topical application of a skin sensitizer, 2,4-Dinitrofluorobenzene (DNFB), for inflammation dependent tumor induction. In this study we use this model to examine the function of OTX-015, a potent BET inhibitor, in controlling the growth of MBL2 lymphoma cells and HH cells, a human CTCL cell line. Using WST-1 assay to measure cell proliferation changes with OTX-015 treatment in vitro, RT-PCR for expression changes and flow cytometry to determine early inflammatory changes within the tumor microenvironment.

Results: Through this study we found that at high concentrations (50mg/kg) of OTX-015 there is a greater reduction in IMQ-induced psoriasiform ear thickness compared to low concentrations (25mg/kg). Histological examination and TEWL measurements also revealed a greater reduction in epidermal hyperplasia and increased skin barrier function with higher concentrations of OTX-015 treatments without significant weight loss. Mechanistically OTX-015 has shown to decrease expression of Th17 inflammatory cytokines, and reduced infiltration of cell mediators in IMQ-induced psoriasiform dermatitis such as GDL T cells and Neutrophils.

Conclusion: OTX-015 has potent anti-tumor properties within our established CTCL mouse model and has shown to be a potential future treatment for cutaneous T cell lymphomas with further studies on toxicity and dose treatment.

32. Student interactive learning sessions (SILS) in a second-year medical school endocrine course

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Introduction: Medical students are increasingly choosing exam-focused online resources over traditional lectures. Student interactive learning sessions (SILS) are an alternative to lectures that provide team-based learning and active knowledge application. We hypothesized that in comparison to traditional lectures, a SILS-based curriculum would strengthen students' clinical application of course content and ultimately enhance engagement, mastery, and recall.

Methods: All 96 second-year students in the 5-week 2019 Endocrine course at CNU College of Medicine participated in the SILS curriculum. Students were given optional anonymous online surveys before the course, at the end of each week, and after 12 SILS sessions. Survey questions assessed attitudes toward various aspects of the SILS curriculum. The surveys compared clinical application, engagement, and recall of the SILS and lecture formats, with an option to provide open-ended comments. Items were scored on a five-point Likert scale, with higher values representing greater satisfaction. Results were analyzed by comparing mean response values and open-ended comments were used to provide context to the survey results.

Results: The number of survey respondents ranged from 24 to 56. The main modes of learning reported by students during the course were 90% Boards and Beyond, 84% Anki, 60% Pathoma, and 29% SILS. In comparison to lectures ($\mu = 3.26$), SILS sessions provided enhanced clinical application ($\mu = 3.53$), with 66% of respondents agreeing that SILS enhanced clinical application. Traditional lectures ($\mu = 2.97$) were superior to SILS ($\mu = 2.87$) in regard to mastery and recall of course content, particularly among those who learn best by working independently. Overall, students were mildly dissatisfied with SILS ($\mu = 2.79$). Open-ended comments revealed a theme of dissatisfaction with the length and frequency of SILS sessions.

Conclusion: Students strongly prefer external online resources (e.g., Boards and Beyond, Anki) over both SILS and traditional lectures. In comparison to lectures, the SILS curriculum enhanced students' clinical application, self-directed learning, and engagement, but not their mastery and recall. Overall, students were mildly dissatisfied with SILS due to the considerable time requirement, among other factors.

33. Wake up! Wake up! Engaging verbal and nonverbal autism spectrum elementary school students in the Anatomy Academy service-learning environment.

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Introduction: According to the Centers for Disease Control and Prevention (CDC), 1 in 68 children in the United States have been diagnosed with autism spectrum disorder (ASD). The Utah Registry of Autism and Developmental Disabilities (URADD) records 1 in 50 8-year-old children have been diagnosed with ASD, the second highest prevalence in the country. Children with ASD are highly varied in their academic and social abilities, and thus attend school in various types of learning environments, ranging from neurotypic classrooms to special-needs classes to ASD-specific charter school classes. We developed Anatomy Academy, a community outreach service-learning program in which pre-professional and professional students serve as paraprofessionals – Mentors – to teach concepts of anatomy, physiology and nutrition that inform and inspire their students to adopt a healthy lifestyle. We have observed that children with ASD “wake up” during the Anatomy Academy experience.

METHODS: In our IRB approved study, we asked the following question: Do students on the autism spectrum participate in learning activities because Anatomy Academy provides an engaged learning environment, one-on-one attention with Mentor paraprofessionals, or both? In our experimental design, students with ASD started a classroom activity, led by a non-Mentor, with only a didactic exercise. This was followed by the introduction of their Mentors who minimally engaged with their students. Then, Mentors switched the activity to incorporate an active learning component.

RESULTS: We report that children with ASD become highly engaged in the Anatomy Academy learning environment as a result of a synergistic combination between interacting with caring and inspired Mentors who were teaching the wonders of the human body using a fun, active curriculum.

CONCLUSION: Children with autism flourish in a learning environment augmented by the presence of paraprofessional teachers and an engaged learning curriculum. Community support for special needs schools should consider providing this combination to enhance the learning experience of its students. Although the financial cost to implement service-learning opportunities like Anatomy Academy can be low, the key to success is developing attentive and well-trained paraprofessionals.

34. Discretionary Spending Priorities of Unemployed, Job-Seeking Adults Who Smoke Cigarettes

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Introduction: Tobacco use is detrimental to physical and financial wellbeing. Smoking is associated with unemployment and a harder time finding re-employment. The drive to smoke can induce deprivation. The current study surveyed unemployed, job-seeking smokers and examined prioritization of spending on cigarettes over other basic life needs overall and in relation to severity of nicotine addiction.

Methods: Adult, unemployed job-seeking daily smokers ranked items from 1 (highest) to 13 (lowest) for prioritization of their discretionary spending. The online survey randomly ordered the presentation of items. The Heaviness of Smoking Index (HSI, time to first cigarette and cigarettes per day) assessed severity of nicotine addiction.

Results: The sample (N=290) was 70% men, 42% African American and 30% non-Hispanic Caucasian, with mean age of 43 (SD=11), smoking an average of 12 cigarettes per day (SD=6) and 67% smoking within 30 minutes of waking. Overall, cigarettes (M=4.7, SD=3.1) ranked second in importance behind only food (M=2.5, SD=2.7); 45% of the sample ranked tobacco in their top 3 spending priorities and 26% ranked cigarettes as a higher priority than food. Cellular telephone charges, transportation, grooming, and clothing costs ranked third through sixth, respectively, prioritized less than food and cigarettes, but higher than other items (e.g. medical care, alcohol). Higher HSI scores significantly correlated with greater prioritization of tobacco ($r=-0.25$), and lower prioritization of food ($r=0.16$) and transportation ($r=.13$), p -values $< .05$.

Conclusions: Findings indicate cigarettes were highly prioritized, on average, ranked second only to food in discretionary spending, among job-seeking unemployed smokers. Cigarettes often were prioritized over job-seeking resources, particularly among more heavily addicted smokers. Tobacco addiction can preempt other basic life needs and reduce resources for finding re-employment.

35. Learning and Understanding Mental health: Pilipinos in America (LUMPIA)

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Introduction: In the Filipino American community, there is an issue of underutilizing Western mental health services. Some factors that feed into this problem include cultural stigma of mental health issues and care, alternative outlets for addressing mental health that are more accepted in Filipino culture, and a sense of cultural distrust of Western institutions. Filipino Americans show higher rates of depression and suicidal ideation and attempts suggesting an unmet need in this community. This internalized bias against Western mental health services may prevent Filipinos from getting the mental health treatment they need resulting in an unintentional, yet preventable disservice to the Filipino community.

Methods: Our research team conducted an online search on PubMed.gov using the search terms “filipinos, mental health” and “filipinos, depression”. We also conducted an online search on Google Scholar using the search terms “filipino mental health,” “Asian Americans mental health,” and “Asian American depression.” Next, we examined the references section of some of our resources for additional references. Some of our references were suggested to us by a local cultural psychiatrist with experience in incorporating culture into healthcare.

Conclusion/Summary: Few Filipino Americans pursue Western interventions to mental health despite being a high risk group. Thus it is imperative to explore other solutions to this problem. Extensive research already demonstrates a lack of interaction with Western mental health interventions among Filipinos, including potential barriers and causes for it. Recognizing these factors of negative bias and approaching mental health through a lens that is familiar to this community may lead to a more culturally sensitive and effective way of addressing mental health for Filipinos. Future studies should focus on ways of incorporating familiar elements of Filipino culture into such interventions, and assess the efficacy and feasibility of such hybrid mental health treatments.

36. Medical School Lecture Attendance and its Effect on Course Grades, Step 1 Scores, and Student Wellness

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Introduction: In recent years, there has been a noticeable decline in medical students' in-class attendance leading up to the end of their second year. We aim to further explore potential reasons behind the recent drop in medical students' in-class attendance, in hopes of optimizing the medical school curriculum such that it will best serve its purpose in training and graduating the next generation of physicians.

Methods: Students enrolled in several institutions were polled using a voluntary, anonymous, and non-incentivized electronic survey. Students were asked to rate their own levels of attendance. Attenders (ATs, >50% voluntary lecture attendance) and Non-attenders (NATs, <50% voluntary lecture attendance) were grouped in order to draw comparisons between their motivations for attendance and course performance.

Results: The average attendance by the end of preclinical years was significantly lower than at the start of medical school (2.0 vs. 4.3, on a scale of 1-5). Curriculum satisfaction did not seem to factor into the reason for attendance drop. Out of a total of 80 responders, 72.5% were self-classified as NATs and 27.5% as ATs. NATs were less likely to feel as though they had time to attend lectures, though there was no difference in self-reported time management skills and both groups equally valued flexibility to self-study. ATs appear to value social interaction more than NATs (4.0 vs. 2.6, on a scale of 1-5). Both groups were equally confident that they could achieve their desired score on exams, but ATs felt that lectures had a larger impact on their confidence than NATs (3.1 vs. 1.7, on a scale of 1-5). ATs most valued "establishing routine", "social engagement", and "preferred lecturers" while NATs most valued "other resources", "time/flexibility", and "watching lectures at their own pace". When asked what would motivate students to attend lectures, the top three responses were "more organized PowerPoints", "condensed presentations on high yield materials only", and "shorter lecture hours". The majority of respondents (62.4%) preferred that self-study hours be greater than lecture hours.

Conclusion: No significant differences were found between the confidence and performance of the groups. However, motivations and differing values were apparent and should be further explored as curriculum evolves.

37. Project Proposal: Physiology and Clinical Significance of Ghrelin

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Introduction: Ghrelin is a peptide hormone known for its role in the stimulation of appetite and feeding behavior, energy homeostasis, and carbohydrate metabolism. Ghrelin's orexigenic (appetite-stimulating) effects are mediated via metabolic need-driven homeostatic feeding as well as central actions on reward, memory, and motivated feeding behavior (1). Having only been recently discovered in 1999, Ghrelin's many putative functions have sparked interest in a variety of clinical applications; in this brief review we focus on the major effects of Ghrelin.

Methods: My method consisted of studying numerous peer-reviewed publications on PubMed with the following terms: "Ghrelin physiology"; "Ghrelin mechanism"; and "Ghrelin clinical significance". From there I studied common themes seen in the articles that I wanted to cover in more detail in my literature review, and focused my search terms to things such as "Ghrelin obesity"; "Ghrelin appetite"; "Ghrelin gastrointestinal disorders"; "Ghrelin homeostasis"; "Ghrelin Prader-Willi"; "Ghrelin metabolism"; "Ghrelin alcohol"; "Ghrelin sleep"; "Ghrelin eating disorders"; and "Ghrelin growth hormone". I ended up citing a total of 22 PubMed articles in my literature review.

Summary/Conclusions: I have completed an overview of Ghrelin's cellular characteristics and pathophysiology, its functions in the human body, and its major clinical applications. The functions I focused my literature review on were appetite regulation and fat storage, inhibition of insulin secretion, growth hormone release, reward processing, increased gastric acid secretion and intestinal motility, and sleep-wake cycle regulation. The clinical applications discussed in the review include appetite regulation and weight loss, Prader-Willi syndrome, chronic obstructive pulmonary disease (COPD), cancer therapy, gastroparesis, growth hormone deficiency, and alcohol use disorder. Studies show that there is inadequate postprandial suppression of ghrelin leading to a continued sense of hunger and difficulty losing weight in obese individuals; moreover, significant decreases are seen in serum ghrelin levels following bariatric surgery. Ghrelin is also thought to be involved in Prader-Willi syndrome, a genetic condition characterized by severe obesity and hyperphagia. Ghrelin also has therapeutic potential for patients with Emphysema (a subtype of chronic obstructive pulmonary disease) as well as for patients suffering from cancer, gastroparesis, growth hormone deficiency, and alcohol use disorder. My literature review and corresponding Board-style questions have been submitted, approved, and published by statpearls successfully as of 10/16.

38. Time to Benefit for Stroke Reduction after More Intensive Blood Pressure Control in Older Adults

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Background: While hypertension treatment in older adults decreases stroke, tight therapeutic control of blood pressure can also lead to immediate harms such as dizziness, orthostatic hypotension, and falls. Guidelines recommend targeting preventive interventions with immediate harms and delayed benefits to those older adults whose life expectancy exceeds the time to benefit. The time to benefit for hypertension treatment to prevent strokes is unknown; our objective was to estimate a meta-analyzed time to benefit for stroke prevention for hypertension trials.

Methods: Using two Cochrane systemic reviews (2017 and 2019), we identified randomized controlled trials comparing standard blood pressure control (placebo or usual treatment) versus more intensive blood pressure control that reported time to stroke outcomes. We focused on studies of older adults (study mean age >65 years). We fit Weibull survival curves and used a random-effects model to estimate the pooled annual absolute risk reduction between control and intervention groups. We applied Markov Chains Monte Carlo methods to determine the time to absolute risk reduction (ARR) thresholds (ARR = 0.002, 0.005, and 0.01).

Results: Seven eligible trials (n = 20918) were included in our survival meta-analysis with mean age ranging from 69-84 years and study follow-up times ranging from 2.0-5.8 years. We found that it took 2.6 years (95% CI: 1.3-3.9) to avoid 1 stroke for 100 persons receiving more intensive hypertension treatment (ARR = 0.01). It took 1.4 years (95% CI: 0.6-2.1) to avoid 1 stroke for 200 persons (ARR = 0.005) and 0.6 years (95% CI: 0.2-1.1) to avoid 1 stroke for 500 persons (ARR = 0.002).

Conclusion: More intensive hypertension treatment for 100 persons prevents 1 stroke in 2.6 years (95% CI: 1.3-3.9), suggesting that more intensive blood pressure treatment should be targeted to those with life expectancy >2 years. Incorporating time to benefit estimates into the blood pressure treatment would encourage a more explicit consideration of the risks and benefits of intensive blood pressure in older patients.

39. Anencephaly: A Review

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Introduction: Anencephaly is a pathology of development characterized by a fetus that has no calvarium, with a lack of most or all of the fetus' brain tissue. The condition is the result of a disturbance to the process of neural tube closure, causing the neural tube to remain unfused in its rostral end during fetal development. The purpose of this review is to address the pathophysiology, diagnostic testing, and clinical significance of anencephaly.

Data Collection: The method of data collection included widespread searching through peer-review publications on PubMed with the following terms: “anencephaly”; “neural; tube; defects”; “neurulation”; “primary; neurulation”; “secondary; neurulation”; “alpha; fetoprotein”; “pathophysiology; anencephaly”; “pathophysiology; neural; tube; defects”; “neural; tube; closure”; “diagnosis; anencephaly”; “folate; anencephaly”;

Conclusion: Anencephaly is not compatible with life. The most important aspect of the management of this condition is prevention. The simplest way to reduce the incidence of anencephaly is to advise women of childbearing age to take a supplement of folic acid. Maternal serum and fetal ultrasonography are diagnostic procedures during pregnancy for in utero diagnosis of any neural tube defect, including anencephaly. Early termination of pregnancy may be an option upon the diagnosis of anencephaly.

40. Endomyocardial Biopsies: Archaic or a Golden Standard

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Introduction: Endomyocardial biopsy (EMB) is a diagnostic modality used to evaluate cardiac diseases, especially those with molecular changes that can only be observed upon direct immunohistologic and molecular inspection. Performing a biopsy is not without complications, and less invasive diagnostic procedures such as cardiac magnetic resonance imaging outcompete EMB for certain indications. However, endomyocardial biopsies remain the standard procedure for the diagnosis of diseases such as hemochromatosis, myocarditis, amyloidosis, sarcoidosis and giant cell myocarditis, as well as allograft rejection monitoring in patients who underwent a heart transplant. As every diagnostic modality, the EMB procedure has unique characteristics in terms of sensitivity, specificity, and predictive values for different diseases. EMB is a multistep process consisting of deciding about indication, biopsy taking, sample handling, and interpretation. Apart from its clinical use, EMB serves also research purposes.

Indications: Endomyocardial biopsies can be used in order to 1) diagnose heart failure of unknown etiology, cardiac sarcoidosis, amyloidosis, inflammatory cardiomyopathies, storage diseases (such as hemochromatosis), cardiac masses, and antineoplastic side effects. It can also be used in order to 2) keep surveillance of heart transplant patients, or 3) to differentiate between constrictive pericarditis and restrictive cardiomyopathy or right ventricular myocarditis and arrhythmogenic right ventricular cardiomyopathy.

Methods: This article serves to provide information about which clinical presentations might be aided by the performance of an endomyocardial biopsy, as well as the statistics surrounding the usage of EMB's for diagnosis and for evaluation of heart transplant recipients post-operation.

Conclusion: EMB is essential to diagnose the diverse disease processes underlying cardiomyopathy presenting as heart failure. But sometimes the therapeutic consequence of EMB is limited. However, though biopsy might show normal tissue and no pathology, the use of additional methodologies besides light microscopy and staining such as electron microscopy and immunohistochemistry and molecular analysis aids greatly in finding a patient's diagnosis.