FOURTH ANNUAL
STUDENT RESEARCH DAY

Friday, November 1, 2024

Sam Houston State University
College of Osteopathic Medicine

GUEST SPEAKER

Mark D. Hornstein, MD

Mark D. Hornstein, MD, is Professor of Obstetrics, Gynecology, and Reproductive Biology at Harvard Medical School in Boston, Massachusetts. He holds the Kosasa Family Distinguished Chair in Obstetrics and Gynecology. He is also Director of the Division of Reproductive Endocrinology and Infertility in the Department of Obstetrics and Gynecology at Brigham and Women's and Massachusetts General Hospitals in Boston, Massachusetts. Dr. Hornstein received his medical degree from the University of Cincinnati in Ohio. Subsequently he completed an internship and a residency in Obstetrics and Gynecology at the Brigham and Women's Hospital/Massachusetts General Hospital Integrated Residency Program, an affiliate of Harvard Medical School, where he served as Administrative Chief Resident. His training also included a fellowship in Reproductive Endocrinology and Infertility at Brigham and Women's Hospital.

Dr. Hornstein's research interests are in the medical management of endometriosis as well as predictors of success and national trends in in vitro fertilization. He has served as Principal Investigator or Co-Principal Investigator for several studies on endometriosis and IVF. Certified by the National Board of Medical Examiners and the American Board of Obstetrics and Gynecology, he is the author of more than 150 original reports, reviews, book chapters, and abstracts. In addition, he serves as an ad hoc reviewer for scientific publications, including the *American Journal of Obstetrics and Gynecology*, *Fertility and Sterility*, and the *New England Journal of Medicine*. A Fellow of the American College of Obstetricians and Gynecologists, Dr. Hornstein is a member of the American Society for Reproductive Medicine, New England Fertility Society, and the Massachusetts Medical Society. He is the recipient of the Partners in Excellence Award, Mass General Brigham Pillars of Excellence Award, and the ASRM Arnold P. Gold Foundation Humanism in Medicine Award for Practicing Physicians and has been repeatedly named among the Top Doctors for Women in *Boston Magazine*.

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BIOMEDICAL RESEARCH (BIO)

These projects involve the application of the natural sciences, are performed in the laboratory setting, and will often require additional training (provided by the program) for working with animal tissue, human tissues, cultures, or biosafety protocols. Often, these projects seek to identify the underlying physiological, anatomical, and/or cellular process that influence health and disease.

Investigating the Effects of Gain-of-Function Variants in SEPHS1 Through In-vitro and Zebrafish Models
Greta Sallese, Maegan Mendoza, Akhila Nair, Joseph Bartling, J. Yang, Vinoth Sittaramane
Advisor: Sureni Mullegama

SEPHS1 is a critical enzyme in selenium metabolism. We have identified de novo missense variants in SEPHS1 in patients with developmental delay, hypotonia, poor growth, and dysmorphic features, thus establishing a novel disorder, SEPHS1-associated neurodevelopmental disorder. The disease mechanism for this disorder is unknown. We hypothesize that the disease mechanism is gain-of-function, and the variants affect selenoprotein synthesis and downstream pathways in neurodevelopment. We utilized in-vitro studies and zebrafish to model patients' SEPHS1 variants. In neuronal cells, we assessed the impact on cell proliferation, ROS production and mRNA expression levels of genes encoding stress-related selenoproteins. Our findings provided evidence that SEPHS1 variants enhance cell proliferation by modulating ROS homeostasis suggesting a gain-of-function mechanism. In zebrafish, we injected mRNA transcribed from pathogenic and non-pathogenic SEPHS1 cDNA variants into 1-cell stage embryos. The embryos were assessed for morphological, neurological, and behavioral development at various stages (24-120 hours post-fertilization) using specific biomarkers. Immunostaining was used to evaluate protein expression patterns to reveal the effects of SEPHS1 variants on age-appropriate neural circuits and muscle development. Our findings provide insight into the molecular pathogenesis of this disorder and development of targeted therapeutic strategies aimed at improving patient outcomes.

The Effects of Reactive Oxygen Species on the Integrity and Morphology of Supported Lipid Bilayer Membranes
Osato Irorere, Jordan Lange, Elizabeth Duncan
Advisor: Paul Zarutskie

Introduction: Reactive oxygen species (ROS) can significantly impact the supported lipid bilayer (SLB) through lipid peroxidation, leading to membrane thinning, defect formation, and reduced lipid order. These structural changes facilitate ROS movement across the bilayer, causing damage, apoptosis, and increased oxidative stress. This pilot study aims to establish SLB as a model for investigating ROS-induced damage of oocyte membranes.
Methods: The SLB will be prepared using Phosphatidylethanolamine, Sphingomyelin, and Cholesterol. After the creation of the SLB, Methylene Blue will be used to generate ROS, when exposed to light of 660nm and oxidative damage to the SLB membrane. Atomic Force Microscopy (AFM) will be used to generate a high-resolution image of the SLB and visualize the changes in the membrane due to ROS exposure.
Anticipated Results: The generation of ROS in an SLB model as seen in AFM imaging is expected to show signs of oxidative damage, i.e. membrane thinning, surface roughening, pore formation, and potentially the complete breakdown of the lipid membrane.
Conclusion: This pilot study supports the SLB as the model to investigate ROS-induced oxidative damage on a biological membrane. AFM imaging has potential to reveal expected signs of damage, including membrane thinning, surface roughening, pore formation, and potential breakdown. The pilot SLB/AFM study will provide baseline data needed for the investigation of oocyte membranes.

Distinguishing Terbium from Divalent Cations and Trivalent Lanthanides Using a Plasmid Monoclonal Antibody-Assisted Gel Electrophoresis

Tyler Kucera
Advisor: Dennis Wooten

With the use of terbium for medical applications and its potential relation to chronic diseases, the ability to detect its bioavailability from other metals is important. The study assessed the mobility of a plasmid with terbium, containing the human metallothionein-II gene (hMT-II), metal-responsive transcription factor (MTF-1) protein, and an anti-MTF-1 protein monoclonal antibody, compared to divalent cations and other trivalent lanthanides in 0.8% agarose gels. Along with testing the migration patterns of the plasmid with the hMT-II gene, similar tests were run that included the plasmid without the hMT-II gene to assess the mobility pattern of terbium compared to divalent cations and other lanthanides in 0.8% agarose gels. The plasmid, MTF-1 protein, and anti-MTF-1 protein monoclonal antibody complex, with and without the hMT-II gene, presented similar mobility patterns specific for terbium when compared to divalent and other trivalent lanthanides on the 0.8% agarose gels. The results suggest that the plasmid with or without the hMT-II gene has metal-specific mobility patterns. The unique mobility patterns may be used to distinguish the bioavailability of terbium from other metals in solution. With the strong interest in using terbium for biomedical applications, the antibody-assisted agarose gel electrophoresis can provide a method to assess the potential toxic effects of terbium by examining its bioavailability.

Developing Visible Chromophore Reporters for Analysis of Biofilm Gene Expression in E. coli

Andrew Bates, Alex Crofts
Advisor: Lora Hooper

Escherichia coli (E. coli) is a commensal gut bacterium, but some strains are pathogenic. E. coli forms biofilms to survive stressful conditions, relying on the curli protein for adherence and flagellin for motility. While fluorescent microscopy has previously been used to study biofilms, the necessary equipment is expensive, so we explored using visible chromophore expression reporters as a cost-effective alternative. The purpose of this research was to create gene expression reporters using visible chromophores to visualize flagellin and curli regulation for better characterization of biofilm physiology. Molecular biology tools were utilized to build gene expression reporter constructs and electroporation transferred them into our E. coli strains of interest. Once transferred, colonies were then patched onto LB-no salt agar with chloramphenicol and placed at 25C to induce biofilm formation conditions for 7 days. We saw expression of both chromophores, with the pink pigment production matching a positive control strain for curli protein production. The pink curli reporter had the highest intensity towards the center of the biofilm while the purple flagellin reporter was more intense towards the edge.
The chromophore expression reporters retained their plasmid and visible pigment expression to the naked eye, which suggests that these constructs are viable options to study biofilm gene expression.

Deep Learning-Based Coronary Artery Segmentation in X-ray Angiography: Enhancing Diagnostic Efficiency

Jennifer Li, Helen Gomes
Advisor: Syed Hasib Akhter

Introduction: X-ray coronary angiography (XCA) is a crucial imaging technique that provides coronary vasculature assessment and intraoperative guidance during coronary artery disease management. However, existing approaches to automating the diagnosis process face limitations in effectively removing background noise and isolating coronary arteries. This study aims to improve the automatic segmentation of coronary arteries in XCA to provide accurate and timely diagnoses and streamline operations.

Methods: A deep neural network-based segmentation algorithm was used to generate coronary artery segmentation masks. A small hand-crafted coronary segmentation mask dataset (n=90 patient data, each containing an average of 24 sample images) was created to finetune a foundational model (SAM by Meta).

Results: The trained model has an average Dice score of 0.79 on test data. The generated masks will be used to isolate context-based arteries for further medical analysis.

Discussion: This research addresses the critical need for rapid and accurate evaluations of coronary angiography, which is pivotal in determining the need for cardiovascular interventions and promptly treating any conditions found. By improving the automatic segmentation of coronary arteries, this study contributes to enhancing the efficiency and accuracy of XCA analysis, leading to more timely and effective cardiac care.

Therapeutic Benefits of Magnesium in Patients with Long-COVID

Tyler Wood, Brittany Bass
Advisor: Hatem Elshabrawy

Background: COVID-19 is a respiratory disease caused by the novel coronavirus, SARS-CoV-2. Magnesium has a key role in cognitive function, protects against neuroinflammation, and has been shown to be significantly reduced in patients with severe COVID-19. Therefore, magnesium supplementation could be effective in alleviating neurologic symptoms of long-COVID. Our objective is to review and highlight the benefits of magnesium in long-COVID patients.

Methods: Using PubMed, we conducted a literature search with the terms: "Long covid and brain fog", "Magnesium and COVID-19", "Long COVID improvement", and "Magnesium in cognitive health" and reviewed studies published between May 2013 and January 2023. Our search yielded 6,265 publications; however, we reviewed 8 articles, relevant to our objective, to support our study.

Results: Patients with severe COVID-19 showed reduced serum levels of magnesium. We identified several studies explaining the benefits of magnesium in long-COVID patients. Since magnesium is required for normal cognitive function, we believe that magnesium supplementation serves as a potential alleviator of COVID-19 and long-COVID symptoms particularly brain fog and other neurologic symptoms.

Conclusions: In this presentation, we aim to provide insight into the benefits of magnesium in alleviating the symptoms and progression of brain fog in patients with long-COVID.

Effects of Podophyllotoxin on Supported Lipid Bilayers: Measures of Membrane Integrity

Jordan Lange, Elizabeth Duncan, Osato Irorere
Advisors: Hosam Abdelhady, Paul Zarutskie

Introduction: Lateral fluidity and impermeability to ionic species make the supported lipid bilayer (SLB) a comparable cell membrane model. In treating genital warts, Podophyllotoxin (POD) inhibits microtubule formation and suppresses cellular nucleotide transport. The dermal application of POD is absorbed via hair follicles and sebaceous glands and may have biological effects on reproductive tissue. Recent studies have demonstrated reproductive toxicity in oocytes. Using atomic force microscopy (AFM) this study explores the effects of POD on membrane integrity of SLB.
Methods: SLB preparation combines phosphatidylcholine, phosphatidylethanolamine, sphingomyelin, cholesterol, in chloroform/methanol. SLB is exposed to different concentrations of POD (25, 50, 100 μM). AFM will be used to visualize changes in the SLB membrane. Anticipated Results: Observe AFM changes in SLB model due to disruptions in the cytoskeletal network, as irregularities in the surface topography, changes to membrane elasticity, and formation of membrane vesicles/micro particles. We anticipate changes as a dose response reflective of the POD concentration.
Conclusion: This pilot study defines POD dose dependent effect change on SLB morphology and nano mechanics. AFM changes in the SLB model promote a better understanding of POD safety/therapeutics, support the recent findings demonstrating reproductive toxicity in oocytes, and promote further study of the POD biological effect on the oocyte membrane.

Developing Integrin Alpha 6 (ITGA6) as a Target for Cancer Therapy Using Humanized Zebrafish Tumor Xenografts

Siddarth Srikumar, Zakir Khan
Advisor: Vinoth Sittaramane

Cancer mortality is primarily due to tumor cell invasion and metastasis, making the identification of targeted therapies for metastasis increasingly important. ITGA6 is significantly upregulated in various human tumors and is implicated in angiogenesis, invasion, and metastasis, though its precise role and therapeutic potential remain unclear. We hypothesized that manipulating ITGA6 levels in tumor cells or the microenvironment would alter metastatic behavior. To test this, we developed an in vivo model using humanized zebrafish tumor xenografts, transplanting human tumor cells into zebrafish embryos. ITGA6 expression was altered using cDNA transfection and siRNAs, while human ITGA6 was introduced into the microenvironment via RNA injections. Tumor angiogenesis and metastasis were analyzed using immunostaining and confocal microscopy. Our results indicate that ITGA6 is critical for angiogenesis and metastasis, functioning both cell-autonomously and non-cell-autonomously. Domain analyses revealed that the extracellular component (Alpha6P) is particularly pro-angiogenic and pro-metastatic. Additionally, treatment with ITGA6 inhibitors showed anti-metastatic and anti-angiogenic effects in vivo. These findings highlight the importance of ITGA6 in tumor growth and metastasis, supporting further investigation as a therapeutic target.

Exploring the Impact of Thoracic and Peripheral Tumors on Aortic and Arterial Anatomy: A Case Study

Nancy Bachir, Aftab Shaik, Brooke Campbell, Brittany Bass, Annebel Hemphill, Yasmine Gharbieh, Grant Barber, Matt Hilton, Danielle Burget
Advisor: George Prada III

We aim to collect measurements of the main branches of the thoracic and abdominal aorta, and the distances from the aortic arch to the major vessels located in the upper extremity and neck. A dissection was performed in 6 cadavers to extract the aorta from the external iliacs inferiorly, to the aortic arch superiorly. From the aortic arch, the brachiocephalic trunk, common carotids, vertebral, and subclavian were included. Additionally, the upper extremity arteries were dissected to the radial and ulnar arteries. By assessing variations, this study aims to improve cardiothoracic (cardiovascular) surgical precision. After extraction of the aorta, proximal and distal branches were measured using high-precision electronic calipers. The data was consolidated from the 6 aortic dissections to analyze varying distances. Compare variations in the distances of the major branches of the aorta to each other and their respective locations. Analysis of such variations can be utilized by medical students during cadaver dissections to aid in identifying vasculature in the abdominal, thoracic, upper extremity, and neck regions. Differences in cadaver thoracic and abdominal aortic branches are due to embryologic development. Data findings reveal differences in the distances of the major aortic vessels, and distances from the aortic arch to the upper extremity and neck vessels. Further research is required to confirm data results and to enhance precision in cardiothoracic surgical techniques.

Evaluating the Impact of Elastic-scattering Spectroscopy and Machine Learning on Skin Cancer Detection Among Nurse Practitioners and Physician Assistants

Cason Hucks, Travis Smith, Will Best, Patrick Davis
Advisor: Janet Gregory

Methods: This was an observational, randomized, web-based, multi-reader multi-case study. Clinical cases were presented to participants via an online survey, after which they were asked to answer a diagnostic (malignant/benign), management (investigate, not investigate), and confidence (1-10) question. After their initial assessment of the case, participants were shown the ESS device output, which is displayed as either "Investigate Further" or "Monitor", with an added spectral score (1-10) for lesions with an "Investigate Further" output. After seeing the device output, they reviewed the case again and answered the same previous questions. The primary outcome measure was sensitivity and specificity performance for diagnostic and management decision making.
Results: Among primary care NPs and PAs, diagnostic sensitivity and specificity significantly improved with device use, from 77.1% to 79.4% (p = .0123) and 45.6% to 50.0% (p < .0001) respectively. Management sensitivity also significantly improved while using the device, from 84.2% to 88.2% (p < .0001). Whereas management specificity decreased from 34.7% to 32.5% (p = .0056).
Conclusion: The ESS device demonstrated significant improvements in both diagnostic and management decision making among primary care NPs and PAs. The use of this device shows promise in assisting primary care providers in clinically assessing suspicious lesions which may ultimately lead to lower morbidity and mortality in those with skin cancer.

Integrin Alpha-6 (ITGA6) and Cucurbitacin B: In Vitro Approach to Target Metastases for Cancer Therapy

Zakir Khan, Siddarth Srikumar
Advisor: Vinoth Sittaramane

High cancer mortality rates underscore the need for research into cancer mechanisms, especially metastasis. Integrin alpha-6 (ITGA6) is upregulated in various cancers, including breast and prostate tumors, and may influence tumor development, though its precise role in driving tumor growth remains unclear. We investigated ITGA6's role in tumor cell invasion and migration, hypothesizing that it is essential for these processes. We predicted that increased ITGA6 would enhance invasion and migration, while decreased ITGA6 would reduce them.
We demonstrated ITGA6 expression in prostate and breast cancer cells via immunostaining. ITGA6 levels were manipulated using siRNAs for knockdown and cDNA transfection for overexpression, with validation by real-time PCR. Cell morphology and invasion were analyzed with ImageJ, and migration was assessed using a Transwell migration assay. Cucurbitacin B (CuB) was tested for its ability to reduce ITGA6 expression via a wound closure assay. Our results showed that decreased ITGA6 led to reduced migration and metastatic ability, while upregulation enhanced it. CuB treatment lowered ITGA6 levels, decreasing invasion. These findings link ITGA6 to tumor cell metastasis and highlight CuB's therapeutic potential, advancing our knowledge on ITGA6's role in the tumor microenvironment to improve cancer therapies.

An Analysis of Wellness Responses in Female Lacrosse Athletes Throughout Their Menstrual Cycle

Gabrielle Marchelli, Hannah Humphries
Advisor: Jennifer Bunn

Intro: The purpose of this study was to assess the differences in wellness responses in Division 1 women's collegiate lacrosse athletes who took hormonal contraceptives (HC) versus those who were naturally cycling (NC), and while menstruating and not menstruating. Methods: Female collegiate lacrosse athletes (HC = 12, NC = 11) completed daily surveys scoring their session ratings of perceived exertion (sRPE) and wellness via several wellness domains: muscle readiness, energy, sleep quality, yesterday's nutrition, mood, health status, and stress. Athletes also indicated their menstrual cycle status as "menses" or "not menses". Analyses compared differences between HC/NC groups and differences with menstruation on game and training days for their wellness and RPE. Results: On game days, athletes had higher energy scores when they were not menstruating (NC = 4.1 ± 0.3, HC = 4.1 ± 0.3) compared to when they were (NC = 3.9 ± 0.3, HC = 3.9 ± 0.2, $p = 0.025$), but there were no group differences. On training days without menstruation, HC users had a higher sRPE (669.1 ± 96.1 AU) than the NC athletes (565.2 ± 98.2, $p = 0.006$). Discussion: These results suggest that athletes adapted to physically stressful scenarios regardless of their menstrual cycle, which may be nuanced for team sport compared to individual sport athletes. An increased perception of exertion with HC users may be due to accompanying inflammatory responses and changes in fat and lean mass that often accompany HC use.

Exploring Morphological Changes in Oocyte Membrane Models Following Microplastic Exposure Using AFM

Elizabeth Duncan, Osato Irorere, Jordan Lange
Advisor: Paul Zarutskie

Introduction: Microplastics (MP) enter the body through various exposure routes, impacting multiple organ systems, including the female reproductive system. MPs cause disruptions to intracellular oocyte processes that result in membrane destruction. No studies to date have visualized membrane morphological changes following MP exposure. AFM visualization of oocytes is a new field that analyzes surface nanomechanics. With the utilization of a supported lipid bilayer (SLB) as a comparable model to oocyte membranes, AFM could provide data on the impact MPs have on oocyte morphology.
Methods: A SLB model will be prepared by combining membrane lipids and chloroform into a lipid film. Integrins containing green fluorescent protein (GFP) will then be incorporated. The SLB will be visualized using fluorescence microscopy (FM) prior to AFM. A particular MP, polystyrene, will be applied to the SLB incrementally, with imaging conducted after each application.
Anticipated Results: Based on previous data of oocyte apoptosis and necrosis following microplastic exposure, we expect FM will show GFP relocalization following exposure to polystyrene and AFM will show a significant disturbance in SLB integrity.
Discussion/Conclusion: The impact MPs have on oocyte morphology remains largely unknown. This pilot study, using the SLB as a model of an oocyte membrane and the data collected from AFM imaging, will set a foundation for future experiments on the effects of MPs on the oocyte membrane.

Assessment of Gadolinium Bioavailability vs Other Heavy Metals Using a DNA/Monoclonal Antibody System on Agarose Gel Electrophoresis

Theophile Destain
Advisor: Dennis Wooten

This project aimed to develop an assay capable of determining that an aqueous medium contains biologically relevant ionized heavy metal contaminants that may assess durability of metal implants or identify heavy metal toxicity of contrast media. Agarose gel electrophoresis was ideal for assessment of ionic heavy metal bioavailability. Bioavailability of heavy metals in biological macromolecules cannot be readily assessed with atomic absorption spectroscopy or inductively coupled plasma mass spectrometry due to non-biological conditions. Therefore, simpler methods that assess heavy metal and biological molecule interactions under physiological conditions are key. Heavy metal-dependent electrophoretic migration patterns assessed heavy metal ion interactions with selected biological macromolecules. The human metallothionein-II (MT-II) gene cloned in a plasmid (pUC57-MT) was used with commercially available metal-responsive transcription factor-1 (MTF-1) protein and a commercially available monoclonal antibody raised against MTF-1 protein. The MTF-1 protein binds specific nucleotide sequences within the MT-II gene. The pUC57-MT plasmid was a binding target for MTF-1 protein and anti-MTF-1 monoclonal antibody to assess plasmid electrophoretic mobility changes in presence of gadolinium and different concentrations of selected heavy metals. Trivalent gadolinium was found to have a specific plasmid migration pattern, but further work is needed to characterize this novel assessment.

Visualizing Tau Protein Dynamics in Native Environments Using 4DAFM: Towards Therapeutic Targets for Alzheimer's Disease

Nishanth Punjaala, Hui Fang
Advisor: Hosam Abdelhady

Background: Tau protein stabilizes neuronal microtubules, but modifications like hyperphosphorylation lead to aggregation, a hallmark of tauopathies like Alzheimer's. Traditional imaging techniques lack the ability to capture spatiotemporal and nanomechanical data at atomic resolution. 4D Atomic Force Microscopy (4DAFM) offers real-time observation of tau structural dynamics in near-physiological conditions.
Methods: Tau 40-41 isoform protein samples (1 ng/ml) were deposited on mica and stabilized for 3 minutes. PinPoint mode-4DAFM was used in PBS to maintain a near-physiological environment, enabling accurate observation of tau dynamics.
Results: AFM imaging identified distinct stages of tau aggregation: small amorphous clusters, granular oligomers, annular structures, and dense neurofibrillary tangles (NFTs). This progression from tau monomers to NFTs highlights different morphological pathways during aggregation, offering potential targets for therapeutic intervention, particularly focusing on NFTs in Alzheimer's.
Conclusion: AFM is a powerful tool for visualizing tau aggregation in near-physiological environments. By elucidating the mechanisms of tau aggregation, this study offers critical insights for developing therapies to prevent tauopathies, especially Alzheimer's. Future research will enhance imaging techniques and explore the effects of therapeutic interventions on tau fibril formation, contributing to a comprehensive understanding of tauopathies.

Mycobacterium Avium Complex Related E-cigarette or Vaping-Associated Lung Injury (EVALI) in Immunocompetent Adults

Mariam Afzal, Zakir Khan, Sarib Sultan
Advisor: Hatem Elshabrawy

Mycobacterium Avium Complex (MAC) lung infections, typically seen in immunocompromised individuals, are increasingly affecting healthy U.S. adults and raising health concerns. Research on vaping and MAC-associated lung injury is limited. This study investigates the link between rising vaping rates and MAC-related E-cigarette/vaping lung injury (EVALI). We conducted a literature search on Google Scholar with keywords: "EVALI-associated MAC growth," "U.S. vape shop density," "NTM growth," "THC vape contents," and "vaping immune response" identified 574 articles. Of these, 27 articles from 1994 to 2024 addressed vaping's impact on lung health. Preliminary findings suggest that substances, such as vitamin E acetate, silica, and iron in vape cartridges may promote MAC growth and contribute to EVALI. The interaction of iron with organic acids in vape aerosols generates reactive oxygen species, potential factors for lung damage, and increased MAC susceptibility. Vaping has been associated with lipid-laden alveolar macrophages, reduced neutrophil migration, and increased reactive oxygen species, potentially heightening MAC-associated EVALI risk. Evidence indicates that vaping may create conditions favorable to MAC growth, possibly contributing to the rise in MAC infections among healthy individuals. Findings on EVALI can be used to educate vulnerable populations about the risks and consequences of vaping, however further research is needed to confirm a direct causal relationship.

The Effects of Menstruation and Hormonal Birth Control on the Performance of Female Collegiate Lacrosse Player

Hannah Humphries, Gabbi Marchelli
Advisor: Jennifer Bunn

Half of female athletes choose to use hormonal contraceptives (HC) to control menstrual flow and reduce the symptoms that accompany menstruation, with little regard to performance-altering side effects. This study compared the mechanical and physiological load placed on Division I female collegiate lacrosse athletes (1) with and without HC use and (2) with and without menstruation during training sessions and games. Athletes' (HC users = 9, naturally cycling athletes = 9) workloads—total distance traveled (TD), max speed, accelerations, decelerations, and high intensity distance (HID)—were measured through wearable microtechnology in training sessions (n = 87) and games (n = 17). Repeated measures analyses of variance showed no group differences based on HC use or not, and no within subjects differences for menstruation for training or games. However, menstruating athletes taking HCs performed worse during menses in every measure during games, with a 5.1% decline in decelerations, 3.4% decline in TD and HID, 1.2% decline in max speed, 1% decline in accelerations. Naturally cycling athletes did not show this same decline with menses. Given that withdrawal bleeding exacerbated performance reduction of HC users, it may be beneficial for these athletes to consider skipping their withdrawal bleed if it is likely to coincide with a game. Further research needs to be done to see if these trends are consistent across other female athletes in other sports.

Unraveling the Evolutionary Diet Mismatch and Its Contribution to the Deterioration of Body Composition

Sandi Assaf, Jason Park, Naveed Chowdhry, Meghasree Ganapuram, Shelbin Mattathil, Rami Alakeel
Advisor: Owen Kelly

Modern humans evolved over the millennia consuming a whole food diet. This diet provided all the essential nutrients (macro- and micro-nutrients) and numerous other compounds present in whole plants and animal foods which are less understood and referred to as the dark matter of nutrition. This consumption pattern contributed to a diverse metabolome. Modern food production has degraded this evolutionary metabolome and has introduced new compounds into the human diet that have never existed before. Essential nutrients have been engineered to be included in ultra-processed foods (UPFs) and readily available for consumption. However, modern foods lack the dark matter of nutrition, which may have various health benefits. UPFs may be contributing to increased rates of chronic disease, specifically osteosarcopenic obesity and its associated health issues, as well as affecting bone and muscle development. This is due to the accrual of fat mass, both overtly and hidden, as they are calorically dense and highly palatable. The diversity of the evolutionary metabolome allowed humans to thrive and evolve. Today's UPFs are far removed from it as modern manufactured foods have greatly diminished the number of phytonutrients in the human metabolome. The effect of whole foods and UPFs on the metabolome and health requires investigation so future dietary guidelines can reflect the optimal evolutionary conditions.

Blueprinting the Prolonged Effect of Beta-Blockers on Cardiovascular-Renal Homeostasis and Hormonoimmunomodulation

Jason Park, Amethyst Hamanaka
Advisor: Hosam Abdelhady

Beta-blockers (BBs) are widely administered as adjunctive therapy for a wide spectrum of cardiovascular diseases, considering their profound benefits in reducing heart rate (HR) and blood pressure (BP), and preventing arrhythmias. However, long-term use of BBs may interrupt the regulation of renal-cardiovascular cascade, leading to potentially negative health outcomes. The underlying rationale and key goals of this review is to evaluate the diametrical effect of BBs on cardiovascular and renal systems by focusing on three main considerations: 1) to delineate the effects of BBs on cardiovascular-renal systems, especially focusing on cardiovascular remodeling, alterations in renal perfusion dynamics—including glomerular filtration rate (GFR), renal blood flow (RBF) and renin-angiotensin-aldosterone system (RAAS)— as well as modulation of inflammatory and immune markers 1; 2) to review the possible deleterious implications of long-term BB therapy, including systemic changes including alterations in inflammatory and metabolic functions 2,3; and 3) to outline future research directions, which aim to unravel the underlying mechanisms and biochemical pathways by which BB therapy can be optimized and translated into personalized, targeted therapeutic strategies that balance its protective cardiovascular effects while mitigating specific renal risks 4,5.

The Phase I Study of Circadian Focused Light Therapy for Fatigue Reduction in Progressive Multiple Sclerosis (NO-FATIGUE): Physiologic Basis and Intent

Sabeen Toranian, Amber Salter, Katie Tran, K. M. Blackburn, S.B. Munoz, C. Wright, P. Hardeman, K. Burgess, V. Gonzalez, L. Nguyen, C. Chapman, D. Dinov, R.N. Hogan, O. Stuve, P. Zee, J. Takahashi, B.M. Greenberg
Advisor: Peter Sguigna

Background: In Multiple Sclerosis (MS), fatigue is one of the most common complaints, affecting up to 95% of patients. Despite the tremendous progress in disease modifying therapies over the last three decades, fatigue in MS remains without a targeted, approved therapy. While fatigue is complex and often multifactorial, one of the proposed mechanisms of fatigue in MS is circadian desynchronization due to diminished activation of the intrinsically photosensitive retinal ganglion cells. This deficit can potentially be overcome by light therapy.
Objectives: To describe a phase I trial design to generate safety and biomarker data on a novel light therapy technique targeting ipRGCs to reduce fatigue via a proposed mechanism of circadian rhythm resynchronization.
Methods and analysis: A Phase I study of Circadian Focused Light Therapy for Fatigue Reduction in Progressive Multiple Sclerosis (NO-FATIGUE) is an open label, single arm, single center study. The primary endpoint is treatment emergent adverse events. Exploratory endpoints will include measurements of participants' fatigue, sleepiness, quality of life, disability, circadian rhythms, and sleep outcomes.
Conclusion: The NO-FATIGUE study will develop safety and mechanistic biomarkers for light therapy in progressive MS for fatigue reduction. The data will serve as a foundation for better mechanistic understanding of one of the more complex symptoms in MS.
Keywords: light therapy, sleepiness, multiple sclerosis, fatigue.

CLINICAL MEDICINE/COMMUNITY HEALTH RESEARCH (CC)

These projects aim to produce knowledge valuable for understanding human disease, preventing, and treating illness, and promoting health. These projects embrace a continuum of studies involving interactions with patients, diagnostic clinical materials or data, or populations.

Unmasking Hidden ASCVD Risk in High-Performing Athletes: A Case for Advanced Lipid Profiling

Matt Mackler, Sabrina Brown
Advisor: Diego Alvarez

Background: Acute myocardial infarction (AMI) in middle-aged, fit amateur athletes during competition is a rare event. These individuals present minimal risk due to their fitness and lack of traditional risk factors. AMI in this population is linked to extreme exertion or harsh environmental conditions. In the absence of an influential factor, these fit individuals advocate for advanced lipid testing to assess atherosclerotic cardiovascular disease (ASCVD) currently underestimated by standard lipid panels.

Case: A 55-year-old male Ironman triathlete with a family history of hypertension and hypercholesterolemia experienced a sudden AMI during an Ironman race. He was successfully resuscitated with CPR and defibrillation, followed by emergency angioplasty and stent placement.

Decision-Making: Post-discharge advanced lipid testing revealed highly atherogenic small dense LDL particles (sdLDL-P) and increased LDL particle numbers, both missed by prior annual lipid panel assessments. Despite a low calculated ASCVD risk for the prior five years, the combination of sdLDL-P and an ASCVD family history likely contributed to the AMI. This case demonstrates that rigorous training, a healthy lifestyle, the absence of coronary symptoms, and normal standard lipid panels could fail to recognize ASCVD risk.

Conclusion: This case highlights the limitations of standard lipid testing in athletes and underscores the importance of advanced lipid profiling in this population group.

Acute Myocardial Infarction in an Ironman Triathlete: Hormetic Responses and Myocardial Recovery in Elite Athletes

Sabrina Brown, Matt Mackler
Advisor: Diego Alvarez

Background: Heart failure commonly follows acute myocardial infarction (AMI), causing systolic and diastolic dysfunction. Severe cardiac stress post-AMI impairs recovery, even with medical management. In elite athletes, sustained cardiac stress induces hormetic protective mechanisms from chronic conditioning. However, how these adaptations contribute to post-AMI recovery remains unclear, given their lower risk for coronary events.

Case: A 55-year-old Ironman triathlete with a family history of hypertension and dyslipidemia suffered an AMI during a race. He was resuscitated via CPR, defibrillations, and stabilized in the Cath lab. Angiography revealed plaques in all vessels, with stents placed in the left circumflex (LCx) and left anterior descending arteries. The right coronary artery had chronic occlusion with significant collateralization from the dominant LCx, likely from long-term aerobic training. His ejection fraction (EF) remained above 50% and showed normal response to sub-maximal exercise (65% of max heart rate).

Decision-Making: Revascularization was achieved via angioplasty and stenting. Serial echocardiograms revealed focal hypokinesia in the left ventricle. A six month angiogram confirmed vascular patency. Occasional PVCs appeared during exercise eleven months post-event.

Conclusion: This case highlights how elite athletes' cardiac conditioning triggers hormetic mechanisms, enhancing recovery post-AMI. Further research is needed on these protective pathways.

The Dual Impact of Nutritional Deficiencies and Alcohol Consumption on Birth Defects in Pregnant Patients Post-Roux-en-Y Gastric Bypass Surgery

Sarah Mabee, Harrison Blefeld, Wyatt Mayer, Brooke Campbell, Aftab Shaik
Advisor: Owen Kelly

Roux-en-Y gastric bypass (RYGB) surgery is a widely utilized procedure for weight loss and metabolic improvement in obese individuals. Although RYGB surgery effectively reverses obesity—a known risk factor for birth defects—pregnancies following this procedure paradoxically exhibit an increased incidence of birth defects. Traditionally, these adverse outcomes have been attributed to nutritional deficiencies resulting from the malabsorptive nature of the surgery. However, recent studies indicate that patients who have undergone RYGB are also at a higher risk for alcohol abuse.
This research delves into the multifactorial nature of the increased risk of birth defects in pregnant women with a history of RYGB surgery. We propose that the combination of nutritional deficiencies and increased rates of alcohol abuse significantly contributes to this heightened risk of birth defects.
By exploring the interplay between these factors, we aim to provide a comprehensive understanding of the risks associated with pregnancy post-RYGB surgery. We emphasize that the high rate of birth defects in this population is a multifactorial problem, resulting from both the nutritional deficiencies inherent to the surgery and the increased likelihood of alcohol abuse. This understanding underscores the importance of holistic patient management, addressing both nutritional and behavioral health aspects, to mitigate these risks and improve pregnancy outcomes for women who have undergone RYGB surgery.

What Matters Most to You Today? Cultivating a Culture of Hospitalists Asking and Understanding their Patients' Priorities

Ilsa Siddiqui, Ashish Gandhi, Syed Salman Ali, Saj Patel, Molly Kantor, Rachel Luke
Advisor: James Harrison

Introduction: Hospitalized adults often report that their physicians do not know what matters most to them, which may lead to dissatisfaction and poor patient experiences. Asking "What Matters" can align care with a patient's goals and priorities.[1] Currently, no standardized workflow exists to elicit this in the inpatient setting. This project seeks to foster a culture where hospitalists ask patients daily,"What Matters Most to You Today?"
Methods: In the implementation phase of this project, we collected survey data to assess the frequency and categories of responses to this question in patients hospitalized in general medicine units. Patients were identified through daily lists and excluded if they had delirium, end-stage dementia, or interpersonal conflict. Interpreters were used as needed. Patients were approached on weekdays and consented to a four-question survey, with data captured in Qualtrics.
Results: Over 18 days, 120 responses were collected. Forty patients were interviewed, while others were unavailable or not interviewed for clinical reasons. Of those interviewed, 31% were asked,"What matters most to you today?" by their main doctor, and 53% knew who their doctor was. When asked what mattered most, patients reported health improvement, to go home, or to get faster care.
Discussion: This project aims to fill a gap by understanding what matters to patients and aligning care with their needs. The project continues, aiming to have at least 60% of patients asked this question.

Nutritional Habits of Second Year Osteopathic Medical Students

Sarib Sultan, Neha Thippana, Sandi Assaf
Advisor: Owen Kelly

Medical students often face significant challenges in balancing academic demands with maintaining a healthy lifestyle. This survey study assesses the habits of second-year medical students at SHSU-COM, comparing their lifestyle choices to national health recommendations. .

The results reveal that students engage in an average of 3.4 days (95% CI: 2.97-3.84) of vigorous activity per week. These figures fall above the recommended guidelines for physical activity1,. Students report sitting for an average of 8.07 hours per day (95% CI: 7.32-8.82), which is lower than the 9.5-hour average reported by the general population2.

In terms of diet, students are consuming an average of 4.42 servings of fruits and vegetables per day, aligning with the American Heart Association's recommendation of 4-5 servings (95% CI: 3.84-5.01). However, fast food consumption remains high, with students averaging six fast food meals per week, compared to the general population's three3 [95% CI: 5.24-6.76].52.4% of students do not have the time to shop for groceries or meal prep for a more balanced diet (95% CI: 1.3-1.62). In addition, 46.3% of students believe that it is too expensive to grocery shop and find healthier options to fast food (95% CI: 1.38-1.7).

The study shows SHSU-COM students meet fitness goals but need to reduce fast food intake and sedentary behavior. While fitness programs exist at the school, more initiatives for healthy eating and movement are needed.

Effects of Indomethacin Tocolysis on Adverse Outcomes in Preterm Neonates

Louise Nicolette Mendoza, Vinayak Govande
Advisor: Muppala Raju

Background: Yearly, over a million infants die due to prematurity. Indomethacin is a tocolytic used to delay delivery and treat Patent Ductus Arteriosus (PDA). Existing studies yield mixed results. PDA raises the risk of intraventricular hemorrhage (IVH) and necrotizing enterocolitis (NEC).

Objective: To evaluate the effects of indomethacin tocolysis on neonatal outcomes in preterm infants.

Methods: This case-control study analyzed infants <34 weeks gestational age (GA) born to 66 mothers from January 2014 to April 2020. Infants receiving antenatal indomethacin within 30 days of delivery were matched with those born to mothers without tocolysis by GA, birth weight, and sex. The primary outcome was the incidence of PDA and its management type. STATA v12.1 was used for statistical analysis.

Results: In 132 infants, the tocolytic group had higher risks of mortality, IVH, acute renal failure, and PDA. Median gestational age was 28.1 weeks, and birth weight was 1170 g. More infants were delivered vaginally (50% vs. 18%, $p < 0.001$). Multivariate models showed no significant differences for IVH (OR=9.58, p=0.055), PDA (OR=2.45, p=0.055), NEC (OR=0.4, p=0.36), and acute renal failure (OR=5.73, p=0.12). Exposure to <200 mg of indomethacin had a higher mortality risk (p=0.03).

Conclusion: No clear association was found between antenatal indomethacin and adverse infant outcomes. The indomethacin group showed higher incidences of IVH and acute renal failure, warranting further studies.

Examining the Factors Surrounding the Outcomes of Postpartum Visits to the Emergency Room

Ariana Montes, Emma Doty
Advisors: Paul Zarutskie, Janet Gregory

Introduction: Disparities in healthcare are seen in maternal outcomes (MO) among the rural and uninsured. Emergency Departments are increasingly taking the burden of maternal and postpartum healthcare demands. An MO study suggests that identifiers of racial/ethnic minority groups, socioeconomic status, and age correlate with longer waits, lower triage ratings, and differences in maternal mortality.

Methods: A retrospective chart review examining postpartum demographic trends was performed using the Health Cost Utilization Project National Emergency Department Dataset (HCUP-NEDs). The general postpartum group was compared to a high-risk subgroup using established guidelines. Outcome of emergency department visit (OEDV) is either admission, routine discharge, or left against medical advice. Data was analyzed using Chi-square.

Results: Using ICD-10 codes, 99838 postpartum patient visit data from 2020-2021 were isolated. OEDV showed significant differences in race, socioeconomic status, and age (p = 2.2e-16, 6.99e-15, 1.0e-4, respectively) in both the general postpartum group and the high risk group. Payment method/insurance status was also significant in the general postpartum group (p = 2.2e-16).

Conclusion: Findings suggest in both the general and high risk postpartum groups that specific identifiers exist in defining similar OEDV, with the exception being payment/insurance status. The underlying causation between patient demographics and visit outcome warrants further study.

The Effects of the Modifiable Health Factors Nutrition, Exercise, and Sleep on Stress Levels in Medical Students

Alexander Koh
Advisor: Owen Kelly

Despite the importance of modifiable health parameters for promoting general well-being, there is a notable lack of effort to address it across the U.S. and worldwide. Recent studies show a major discrepancy between understanding the overall health benefits of healthy lifestyle habits and what is practiced, even during medical school education. This discrepancy suggests a disconnect between the understanding and application of important health measures, even among future healthcare providers. Perhaps the three most notable modifiable health factors include nutrition, sleep, and exercise. Furthermore, stress levels are known to be high in medical students, but the contribution of healthier lifestyle habits to stress is poorly understood. This study gathered data on nutrition, sleep, exercise, and stress levels in second-year medical students at Sam Houston State University College of Osteopathic Medicine. The goal was to determine if correlations exist between stress and the three lifestyle factors. An overall positive correlation between unhealthy habits such as lack of sleep, exercise, and healthy eating was expected with stress levels. The results weakly support these claims, with the strongest correlation between hours of sleep (R=0.30). Days of vigorous exercise per week had a correlation value of R=0.14, while daily protein intake was R=0.11. Although weak, these findings suggest that further studies may link lifestyle habits and stress in medical students.

Pelvic Inflammatory Disease Machine Learning Application

Emma Doty, Michelle Kha, David Doty
Advisor: Peggy Taylor

Introduction: Pelvic Inflammatory Disease (PID) is a causative agent to chronic pelvic pain, infertility, sepsis, organ failure, and fatality. Due to the diversity of risk factors, inefficient diagnostic processes for PID increases disease recurrence and severity. Due to complex etiology, machine learning would optimize PID diagnosis procedure. Deep learning (DL) models use artificial intelligence to identify variable dependencies and hierarchically organize disease features to improve diagnosis.
Methods: Individual inpatient records were obtained from the Health Cost Utilization Project Nationwide Inpatient Sample (HCUP-NIS) from the years 2012-2021. The data was subsetted to include childbearing-aged women from 2012 to limit findings to widely applicable variables. This subset was used to identify variables using a Chi-Square test that most correlated with PID diagnosis (a <0.1). These variables were used to train a DL TensorFlow model to correctly identify positive cases of PID.
Results: In the current data collection and analysis stage, the PID predictor model has 79.69% sensitivity and 96.04% specificity for 0.29% disease prevalence, giving the test a positive likelihood ratio of 20.12 and a negative likelihood ratio of 0.21.
Discussion: With further training, we predict the machine learning algorithm will increase accuracy in developing diagnostic criteria in order to efficiently prevent recurrent cases and lessen the healthcare burden of emergent PID.

Preferences and Perceptions of the Liquid Biopsy for Breast Cancer Screening

Naveed Chowdhry, Susan Peterson, Ehsan Irajizad, Seyyed Mahmood Ghasemi, Jurnie Hinde
Advisor: Abenaa Brewster

The liquid biopsy, which detects cancer biomarkers in blood, could revolutionize breast cancer screening. However, it is essential to understand women's perspectives on liquid biopsy as an adjunct or alternative screening tool. We quantified high- and average-risk women's preferences and perceptions of the liquid biopsy for breast cancer screening. As of July 18, 2024, 138 patients at MD Anderson Cancer Center in Houston, Texas completed a 20-item closed-ended questionnaire via email, short message service (SMS), and telephone. Women aged 40–75 years without a breast cancer diagnosis were eligible. Roughly 88% of respondents were "extremely" or "quite a lot" interested in liquid biopsy screening. Nearly all participants thought it was "very important" if the liquid biopsy may find breast cancer earlier than other tests (96%) and if the test was safe (93%). Most participants thought it was "not at all important" to avoid using the test if it could reveal breast cancer (75%) or if they had no symptoms to warrant its use (57%). No significant relationship existed between liquid biopsy interest and age (p = 0.068), education (p = 0.088), or race/ethnicity (p = 0.67). Overall, initial findings suggest that participants are receptive to liquid biopsies for breast cancer screening. To ensure a diverse sample, more responses are being collected. This study may inform on the types of interventions needed to educate patients on the role of liquid biopsy in breast cancer screening.

An Evaluation of Stroke Literature Pamphlets for Stroke Patients

Nathaniel Degen, Milan Sivakumar, Andrei Alexandrov, Savdeep Singh
Advisor: Thomas Varkey

Background: The American Stroke Association developed a series of pamphlets aimed at educating patients and families about strokes, accessible via their website. These materials are often used by healthcare professionals to help communicate critical information about strokes. It is essential to ensure the readability aligns with the average American eighth-grade reading level to meet the public need.
Methods: This study evaluated 50 stroke-related pamphlets from the American Stroke Association website, which fell into one of three categories: prevention, acute treatment, and post-stroke care. The text from each pamphlet was analyzed using the Gunning Fog index and Flesch-Kincaid Ease and Grade level programs, with data recorded in an excel sheet for further data analysis.
Results: The average Gunning Fog Index was 13.1 ± 4.0 (SD) and the average Flesch-Kincaid Grade Level was 10.1 ± 3.8 (SD). To meet the readability standards, appropriate for an 8th grade education level or below, target scores should be below 8.5 for Gunning Fog Index and 8.5 for Flesch-Kincaid Grade Level.
Conclusion: The patient education materials analyzed in this study were equivalent to 10th and 13th grade reading level. These findings highlight the need for improving the readability of patient education resources by adjusting language and explanations to lower education levels.

Clinical Implications of Anatomical Variations in Neck Vasculature: A Comparative Study Across Diverse Populations

Shelby Kvinta, Mario Loomis
Advisor: Jailenne I. Quiñones-Rodriguez

The head and neck region is primarily vascularized by the carotid and vertebral arteries, with the carotid system exhibiting a range of anatomical variations. This study evaluated the frequency and distribution of variations in the common carotid, external carotid, and internal carotid arteries while considering demographic factors such as sex and ethnicity. A comprehensive search of the PubMed database was conducted, covering studies published between 2000 and 2024. Twenty-six studies encompassing a diverse array of ethnicities—including Indian, Caucasian, Japanese, Turkish, Brazilian, Slovenian, Romanian, Irish, New Zealander, Thai, Saudi Arabian, and Croatian populations—were included in this analysis. Of the studies reporting gender-specific data, females exhibited a variation frequency of 19%, compared to 10% for males. Additionally, variation frequencies were analyzed by country, revealing regional differences. Specifically, the common carotid artery demonstrated a variation frequency of 1.76%, the external carotid artery 4.8%, and the internal carotid artery 3.3%. These findings underscore the clinical significance of carotid arterial variations for various medical fields, including vascular surgery, plastic surgery, otolaryngology, radiology, and emergency medicine. A comprehensive understanding of neck vasculature is crucial for optimizing surgical approaches and improving patient outcomes.

Perfectionism-Induced Stress: A Key Driver of Alcohol Abuse and Eating Disorders in Medical Students
Harrison Blefeld, Sarah Mabee, Wyatt Mayer
Advisor: Owen Kelly

Medical students exhibit a higher prevalence of alcohol abuse and eating disorders compared to the general population. We explore the relationship between these conditions, emphasizing perfectionism-induced stress as a key factor leading to this high prevalence. We highlight the impact of perfectionism in medical students, fostered by the demanding environment of medical training. Despite the sparse research directly linking these mechanisms in the medical student demographic, we propose that the intense stress and traits of perfectionism inherent in medical education significantly contributes to the high risk of these conditions. Such perfectionistic tendencies lead to significant stress, increasing the risk of maladaptive coping mechanisms like eating disorders and alcohol abuse. The review consolidates existing literature, suggesting that chronic stress and perfectionism in medical education heighten the risk of these conditions. Although there is a lack of data showing the rates of these comorbidities in medical students, the rate of eating disorders and alcohol abuse comorbidity is high in the general population. Using this information, we suspect that the comorbidity of eating disorders and alcohol abuse in medical students is high considering the high rates of both among medical students. Addressing these issues is essential for holistic support and well-being of medical students, which in turn enhances their ability to provide quality care as future physicians.

Anterior Cruciate Ligament Reconstruction (ACLR) in Young Female Athletes, Risk of Postoperative Opioid Misuse, and Negative Pregnancy Outcomes
Aftab Shaik, Sarah Mabee, Wyatt Mayer, Harrison Blefeld
Advisor: Owen Kelly

Younger female athletes are particularly vulnerable to anterior cruciate ligament (ACL) injuries and subsequent ACL reconstruction (ACLR) surgery, a procedure known for producing more intense pain compared to other knee surgeries. Females are more likely than males to require ACLR due to anatomical, hormonal, and biomechanical differences that increase their injury risk. Moreover, they face a heightened risk of developing chronic opioid use, dependence, and addiction, primarily due to differences in pain perception after ACLR. This issue is especially concerning for young women aged 14 to 21, who also have relatively high rates of conception in the United States. The propensity for opioid misuse in this demographic can lead to significant maternal and neonatal complications during pregnancy.
This narrative review addresses a critical gap in the literature by exploring the long-term effects of opioid misuse following ACLR on pregnancy outcomes. By focusing on young female athletes who may later become pregnant, we provide new insights into the intersection of ACLR, postoperative opioid misuse, and adverse pregnancy complications. Understanding these risks is crucial for physicians to improve treatment strategies and support for young women undergoing ACLR, ultimately enhancing health outcomes for both mothers and their children.

Evaluating the Cost-Effectiveness of Pathologic Analysis in Primary Total Shoulder Arthroplasty Procedures

Renee Megwa, Erik R. Nakken, Zhaorui Wang, William R. Aibinder
Advisor: Petra Rocic

Introduction: Pathology reviews are costly, routine practices with the goal to identify presence of unusual tissues. All total and reverse total shoulder arthroplasties (TSA) receive pathology reviews, regardless of preoperative diagnoses by surgeons. This study evaluated the cost-effectiveness of routine tissue pathology analysis between pre- and post-operative diagnoses made by the operating surgeon for TSA.
Methods: A retrospective review was conducted of patients who underwent a TSA from years 2013-2024. Patients who underwent a TSA whose tissue were sent in for pathologic analysis were included, and patients with revision surgeries were excluded. The cost per gross pathology report was determined using Medicare's fee schedule to calculate general costs. The operative and pathology reports were compared to identify if there were in agreement, disagreement, or discrepant that led to change of treatment.
Results: We identified 1,288 cases of TSA post adjustment for previous shoulder replacements. 94.7% of cases were in agreement on diagnosis between the surgeon and pathology report (with no discrepant diagnoses). The average cost of a gross pathology report is $16.27, with an average total of $20,955 (dollars).
Conclusion: Our findings suggest high agreement rates between pathology and clinical diagnoses, with patient care unaffected by pathology analysis. This indicates limited benefits and cost-effectiveness of routine pathological analysis in TSA cases.

Geographic Disparities in Trust and Satisfaction Among Pregnant Women: A Focus on High-Risk Conditions

Brooke Campbell, Sabrina Bharia, Aarzoo Maknojia
Advisor: Peggy Taylor

Provider trust during pregnancy is essential for adhering to treatment guidelines, especially in high-risk pregnancies. This study examines patient satisfaction in high- and low-risk pregnancies based on the geographical distribution (rural vs. suburban vs. urban) and level of trust in OB/GYN, identifying disparities in patient experiences. An online survey directed at pregnant women in the United States was conducted through Prolific, gathering data on their location, satisfaction, and level of trust in their OB/GYN. A statistically significant difference was identified in the distribution of community types for each risk category, with high-risk and low-risk pregnancies being most prevalent in suburban communities compared to rural or urban areas. High-risk participants exhibited significantly lower trust in their OB/GYN compared to those with low-risk conditions. Additionally, satisfaction was significantly lower in rural residents compared to suburban residents. The decrease in satisfaction with OB/GYN providers for participants residing in rural areas compared to suburban areas, suggests that geographic location may influence patient perception of care. Women with high-risk conditions were more likely to have less trust in their OB/GYNs. Findings from this survey can work to inform providers and improve practices specifically for women with high-risk conditions during pregnancy.

Visualizing Geographic Disparities in Cardiovascular Health and Clinic Density in Rural Texas Counties

Neha Thippana
Advisor: Owen Kelly

Background: In Texas, Cardiovascular disease (CVD) is a leading cause of mortality[1] with rural populations facing unique challenges with prevention and management[2]. To visualize some of these disparities, internal medicine clinic density was mapped with rural and urban Texas counties.
Methods: CVD incidence per county was retrieved from the CDC. Rural designations were sourced from the Texas Commission of the Arts. Using the ArcGIS geospatial platform, internal medicine clinic addresses throughout Texas were extracted. Wilcoxon rank-sum tests measured the differences in CVD incidence and clinic density between rural and urban Texas counties. R software was used to map counties by rural or urban status, and internal medicine clinics were geocoded and mapped to visually compare clinic density.
Results: Rural counties had significantly higher CVD incidence (W = 4693, p = 0.00888) and significantly fewer clinics, as seen by the Wilcoxon rank-sum test (W = 9381.5, p < 2.2e-12).
Conclusion: Rural Texas counties face a dual problem of higher CVD incidence and lower healthcare clinic density. Mapping these disparities can drive healthcare professionals and policymakers to visualize and prioritize improving care in these underserved areas [3]. More research is needed to identify optimal solutions for rural health in Texas.

Intraoperative Neuromonitoring during Distal Femoral Extension Osteotomies Often Identifies Potential Injury

Michael Abraham, Catherine Thompson, Kimberly Periman, Robert Lane Wimberly
Advisor: Michelle R. Christie

Background: Distal femoral extension osteotomies (DFEO) have a risk of neurologic injury of 5-40%.[1] Intraoperative neurophysiological monitoring (IONM) is standard of care for detecting and preventing neurologic injury during spinal surgeries.[2,3] We analyzed the efficacy of IONM in detecting neurologic injury during DFEO.
Methods: Retrospective review of patients undergoing DFEO by a single surgeon was completed. Age, neurologic diagnosis, and IONM data were collected. Somatosensory evoked potentials (SSEPs) from the posterior tibial and peroneal nerves included lumbar potentials and transcranial motor evoked potentials (TcMEPs) from the abductor hallucis and extensor digitorum brevis were analyzed using standard critical values in addition to operative to non-operative limb comparison.
Results: Twenty-five limbs in 17 patients with average age of 13 years were included. Nine patients had cerebral palsy (CP), two had genetic disorders, and six had other neurologic diseases. Six of the 25 (24%) had critical changes in IONM. Three occurred after extension and improved after decreased extension by the surgeon; two cases were due to limb positioning; and one case included tourniquet use. All cases had IONM potentials return to baseline at close of the surgery.
Conclusion: By using IONM during distal femoral osteotomies, surgeons will be aware of positioning and malalignment problems that may be corrected in real time and prevent permanent neurologic injury.

Investigating the Effectiveness of Illustration-Based Pamphlets in Improving Hypertension Patient Education and Understanding

Bhoomika Venkatesh, Sneha Karthikeyan, Shannen Dumadag
Advisor: Owen Kelly

The American Heart Association's hypertension management guidelines recommend positive diet and lifestyle changes to prevent and manage heart health. Patient education materials provided by healthcare professionals are a primary evidence-based resource for many. The prevalence of hypertension in underserved communities in rural Texas rises every year, where literacy rates average at a sixth-grade level and medical personnel are scarce. Patient education materials are predominately text and not engaging. Thus, materials need to be appealing and convey messages without requiring the patient to read. There is a lack of data related to the efficacy of patient education materials on positive lifestyle changes to prevent and manage hypertension. Therefore, this study aims to investigate the efficacy of visual-based hypertension education materials, used in conjunction with provider-led education, in patient engagement and knowledge of lifestyle changes needed to improve the prevention and management of hypertension in an underserved Texas community. We are currently developing visual-based educational materials with minimal text. Future work will focus on patient perceptions of current hypertension education literature compared to these visual-based materials. This will be followed by testing their effectiveness in a clinical setting. We anticipate that visual-based materials will be more effective at improving knowledge of hypertension management than the standard of care.

CC20
Reassigned

CC21

Development of Visual and Engaging Materials to Improve Pediatric Nutrition and Physical Activity Education

Amethyst Hamanaka, Isabella Larremore (Hudson)
Advisor: Owen Kelly

People living in underserved communities lack access to healthcare infrastructure and resources. In addition, physicians working in these communities face low doctor-to-patient ratios, which limit the duration of patient encounters. This time constraint significantly reduces opportunities for patient education, particularly regarding the importance of nutrition and physical activity—two of the modifiable risk factors for chronic disease. Standard printed materials (e.g., brochures, pamphlets) are relied upon to educate patients on various aspects of their disease/condition, placing the responsibility on the patient to learn, interpret and apply the knowledge. This practice may negatively impact patient outcomes. In pediatrics, nutrition and physical activity education are important aspects of care, especially for new parents caring for infants and toddlers. However, no educational materials exist, to our knowledge, that comprehensively cover these topics. Therefore, we created draft materials that tell parents which nutrients are essential and where to find them, how nutrition plays a role in growth and development, nutrition-rich foods availability in grocery stores, and convenient ways to engage in physical activity daily. We have engaged the help of the graphic design department to improve these draft materials into novel, visually engaging educational materials for use in the clinical setting.

Effect of COVID-19 on Efficacy and Toxicity of Botox Injections

Brittany Bass, Tyler Wood
Advisor: Hatem Elshabrawy

Background: Botox injections, derived from Clostridium botulinum, inhibit acetylcholine release at neuromuscular junctions, leading to skeletal muscle relaxation. However, recent studies suggest that prior COVID-19 infection or vaccination may alter the safety and efficacy of Botox injections. This review aims to examine the side effects and potential resistance in individuals with a history of COVID-19 infection or vaccination and to offer recommendations to mitigate these issues.
Methods: We searched PubMed using terms like, "COVID-19 and Botox," "Botox injections and COVID vaccine," and "Resistance to Botox and COVID." Our search, focused on studies published between December 2018 and March 2024, yielded 45 publications. Seven relevant studies were selected for detailed analysis.
Results: The studies indicate that individuals with prior COVID-19 exposure or vaccination experience an increased incidence of injection-site pain, mild to severe allergic reactions, and even resistance to Botox. These effects are more pronounced when Botox is administered shortly after COVID-19 infection or vaccination. Timing of Botox injections in such individuals is crucial to prevent hypersensitive reactions and reduce the risk of Botox resistance.
Conclusions: Our review highlights the importance of considering COVID-19 exposure or vaccination history before administering Botox injections. We provide recommendations to minimize adverse effects and optimize Botox efficacy in this population.

Disordered Eating and Infertility: How History of Eating Disorder May Affect Future Fertility

Courtney Blanchard, Alexis Wyrick, Caroline Cajas, Cayla M. Wagstaff
Advisor: Peggy Taylor

Several studies have established a relationship between active eating disorders and infertility in women, however a relationship between disordered eating history and future fertility complications has yet to be properly studied. Utilizing survey research distributed on public social media platforms the aim of this study was to find women aged 18-50 that had a history of disordered eating and ask about their current fertility status. If a woman fell into the appropriate age range, with a history of eating disorder and had been diagnosed with infertility she was then provided a more detailed survey to gather demographic and descriptive data. With the niche and sensitive nature of this survey very few women qualified when reaching out in public spaces leading to inconclusive results. This study was unable to determine a relationship between eating disorder history and current diagnosis of infertility. Further research in this area is needed to guide clinical practices related to eating disorder prevention and detection, as well as add to the literature in infertility risk factors.

Barriers to Management of Hypertension in High-Risk Pregnancies

Sabrina Bharia, Aarzoo Maknojia, Brooke Campbell
Advisor: Peggy Taylor

Hypertensive disorders are a significant cause of complications in high-risk pregnancies, contributing to adverse maternal and fetal outcomes. Pregnant women in underserved areas with hypertensive disorders face greater challenges which limit their ability to adhere to recommended management strategies. Challenges include limited access to consistent prenatal care specifically in rural areas in comparison to suburban or urban locations. Additionally, socioeconomic factors such as high healthcare costs and transportation difficulties serve as additional barriers to attending appointments and receiving adequate care. This study will analyze these barriers to management of hypertensive disorders during pregnancy. A follow-up survey through Prolific will be utilized and distributed to women across the United States. As surveys have already begun, a new follow-up survey will be utilized. Preliminary data has identified 44 women with hypertension within the cohort. The results of this proposed study will improve understanding of the various barriers that women face in managing hypertensive conditions during pregnancy. Findings from the survey will help reduce the burden women face with hypertension by informing healthcare providers and ultimately reducing maternal mortality and morbidity while also contributing to the knowledge about the challenges faced by those residing in rural areas.

Understanding Current Perceptions and Barriers of Utilization of Genetic Testing in Reproductive-Aged Women

Diane Ju, Lilian Zhan
Advisor: Peggy Taylor

Introduction: As genetic testing gains popularity, assessing its availability and awareness among the general population is crucial. Prospective parents can use these tests to identify carrier status and potential genetic abnormalities, influencing family planning decisions.
Methods: A survey will target 250 reproductive-aged individuals planning future pregnancies. Participants will be recruited via social media over six weeks. The survey will evaluate demographics, personal and family history, understanding of genetic testing, perceived benefits and risks, access to healthcare and genetic counseling, and relevant cultural or personal beliefs.
Anticipated Results: Patient preferences will be assessed through Likert scale and open-ended questions, with results analyzed using quantitative methods. Literature suggests that third-party reproduction, such as IVF or gamete donation, and a positive family history drive genetic testing. However, inadequate counseling often leads to confusion and stress. Survey results are expected to reflect these trends, with hesitation observed among younger women, those with less education, religious beliefs, negative family history, and/or lower income.
Conclusion: Interest in genetic testing among reproductive-aged women is high, but actual uptake remains low. This study aims to explore perceptions and barriers to access, aiming to better integrate genetic testing into reproductive care and improve health literacy.

Inspiratory Muscle Training with the O2 Trainer: A Pilot Study

Tiago Mcdown, Iztihaad Haq, Nancy Bachir, Courtney Noetzel, Brooke Campbell, Nidhi Vedire, Mohammad Mahdi
Advisor: Patrick Davis

Inspiratory muscle training (IMT) involves inspiration through a device that restricts airflow into the lungs. The O2 Trainer may be used as an adjunct treatment for respiratory conditions.

The aim was to analyze the effects of the O2 Trainer on maximum inspiratory pressure (MIP), forced expiratory volume (FEV), blood pressure (BP), heart rate (HR), hand grip strength, and diaphragm width in healthy subjects following a six-week IMT course.

Nine participants (ages 21-28) were enrolled in the study. Starting with a 6mm air intake hole, and decreasing the diameter as needed, each participant alternated between three breathing exercises requiring 30 breaths. Target completion was between 2-6 minutes, 5x/week. Measurements were taken before and after training.

Eight participants were included in the study, with one exclusion due to incomplete training. A paired samples t-test showed a significant difference in MIP between pre-IMT (M=97.34, SD= 37.28) and post-IMT (M = 114.3, SD= 31.43); $t(7) = 3.48$, $p = 0.01$. All other variables were nonsignificant.

This study was limited by a small sample size and less advanced equipment. We expected a statistically significant change in all variables; however, MIP may be the most critical value in IMT. These findings suggest the O2 trainer may improve MIP.

Further IMT studies should include randomized controlled trials with larger sample sizes to assess clinical relevance.

Osteopathic Medicine & Medical Education Research (OME)

Osteopathic projects aim to understand how specific osteopathic medicine influences health and physiology. Additionally, they seek to understand the use and practice of osteopathic techniques. Medical Education projects aim to advance the knowledge, skills, and professionalism of medical students by understanding and evaluating educational ecosystems. These ecosystems include policies related to admissions and curriculum, people who serve as teachers and mentors, instructional technology and other resources, the attitudes that pervade a given institution or educational experience, and even the medical students themselves.

Integrating Virtual Reality and Leap Motion Feedback for Enhanced Nursing Education: A Prototype for Teaching Sterile Glove Application

Ryan Genualdi, Sarah Mabee, Sean Hu, Andrea Doan, Cameron Collins, Luis Andrés Puértolas Bálint
Advisor: Robert Rice

Recent technological advancements, particularly in virtual reality (VR) and haptics, have revolutionized various industries, including healthcare education. Leveraging these innovations, we developed an innovative educational tool designed to enhance the training of nursing students in essential clinical skills. Our prototype integrates VR and haptics to teach the correct technique for donning sterile gloves, a critical skill for procedures such as inserting a peripherally inserted central catheter (PICC) line. Utilizing the Meta Quest 3 headset, Leap Motion for hand tracking, and Logitech webcam for passthrough visualization, we created an immersive learning experience. Nursing students can watch a video, featuring a skilled registered nurse demonstrating proper sterile glove donning, and practice along using VR hands. This approach aims to build muscle memory and improve skill mastery through repeated practice. Testing in a nursing school setting has shown the potential of this tool to enhance skill acquisition through interactive and immersive learning, marking a significant step towards integrating advanced technology into medical education for more effective training outcomes.

Assessing the Impact of an Innovative Learning Module on Medical Students' Interest and Knowledge in Histology

Muhanned Tokmachi, Gandhimathi Saravanan
Advisor: Yuan Zhao

Histology is a foundational component of medical education, but often receives less focus regarding student engagement and learning strategies. This study aimed to evaluate whether an innovative, interactive learning module could increase first-year medical students' interest and knowledge in histology compared to traditional methods. Two learning modules were provided to first-year medical students in their online course directory. The control group accessed a traditional PowerPoint with standard histology content, while the experimental group used an interactive module featuring point-and-click elements, in-module questions, and zoom-to-screen transitions. Both groups completed pre- and post-module surveys measuring interest, attitudes, and knowledge in histology. Seven students completed the modules across both groups. While the sample size limited statistical analysis, survey responses indicated a favorable reaction to the interactive module. Students reported increased interest and engagement, although measurable gains in knowledge were difficult to assess due to the limited participants. Despite low participation, likely due to module release timing, the interactive format showed potential for boosting student interest in histology. Future studies should introduce the module earlier and aim for larger sample sizes to better assess its impact on knowledge and engagement. Refining the module based on student feedback could further enhance its educational effectiveness.

Novel Dissection of the Cervical Sympathetic Trunk and the Posterior Approach of the Brachial Plexus

Annebel Hemphill, Olivia Eberwein, Zakir Khan, Sarib Sultan
Advisor: George Prada III

The purpose of this research is to introduce a novel dissection technique of the cervical sympathetic trunk and posterior approach of the brachial plexus to determine its efficacy, in conjunction with clinical anatomy textbook figures, to teach first year medical students at SHSU COM. Laminectomy procedure was performed to expose the spinal cord from C1 to T3 and the ventral and dorsal roots emerging from the spinal cord. The dorsal root ganglia (DRG) were dissected to show its connection to the cervical sympathetic chain, along with the brachial plexus trunks. Images of this novel dissection were used to create an online learning module. Qualitative and quantitative data, using a scale of 0-10, was collected from 25 students using a self-report survey. The donor images in the learning module improved the understanding of the spinal nerve organization (M=7.92), spinal nerve contributions to the brachial plexus trunks formation (M=7.32), brachial plexus trunk lesions (M=6.48), sympathetic chain organization (M=7.13) and the efficacy of cadaver images along with textbook (M=8.44). Qualitative feedback through two free response questions indicated that the inclusion of our cadaver images was effective for creating connections to increase the comprehension of the anatomy. Our results show that this novel dissection of the spinal cord and the brachial plexus serves as a useful educational tool for first year medical students and can be implemented in future classes.

Revolutionizing Osteopathic Education: Augmented Reality Training for Pelvic and Innominate Diagnosis

Andrea Doan, Sean Hu, Cameron Collins, Ryan Genualdi, Luis Andrés Puértolas Bálint
Advisor: Robert Rice

The healthcare industry is facing a growing demand for medical professionals, driving the rapid expansion of medical schools across the nation. This demand has created a bottleneck—an influx of students with increasingly limited access to experienced faculty for personalized, hands-on training. Nowhere is this challenge more evident than in osteopathic manipulative medicine (OMM), where fundamental techniques like pelvic and innominate diagnosis are difficult to teach in large labs. Innovative tools can bridge the gap between theoretical knowledge and clinical practice. Augmented reality (AR) is a breakthrough technology that offers an immersive interactive learning environment, with real-time and hands-on guidance. We developed a pilot program utilizing AR that overlays the instructor's hands onto real-world patients, allowing students to follow along and precisely contact the appropriate structures when learning how to diagnose somatic dysfunction in OMM. AR can transform osteopathic education, fostering deeper clinical understanding and higher proficiency in techniques. Creating more programs like this holds significant potential for honing skills not only for osteopathic medical students, but all students in healthcare.

The Impact of Peer-Assisted vs Expert-Led Learning on Undergraduate Medical Student Ultrasound Learning Outcomes and Perceptions: A Systematic Review

Tara Sheets, Melissa McNeil, Hallie Evans, Jailenne I. Quiñones-Rodriguez
Advisor: Rebecca Andrews-Dickert

Introduction: As ultrasound training integration in undergraduate medical education (UME) has grown, resource constraints of faculty availability has made implementation challenging. Some programs use peer-assisted learning (PAL), where trained students teach peers. This study aims to compare student learning outcomes and perceptions of PAL and faculty-only instruction in ultrasound UME.
Methods: A systematic review was conducted using nine search strategies across three databases. Inclusion criteria were the following: published in last 20 years, available in full-text English and explicitly referencing UME, PAL and ultrasound integration. AMSTAR guidelines were followed.
Results: The search yielded 148 citations, of which 22 were included after screening. Studies reported variation in topics covered, student education level, and peer tutor education level/training. Outcome measures included OSCE, written exam and perception. Most studies indicated comparable outcomes between faculty and PAL groups, while some found differences in student confidence and preference regarding PAL and faculty instruction.
Conclusion: Despite variation in curriculum and education level of students and peer tutors, learning outcomes were comparable between PAL and faculty teaching. Students perceived PAL in ultrasound positively, despite some studies reporting variability in confidence and preference of peer or faculty instruction. This systematic review supports the use of PAL in ultrasound UME.

Innovative Approaches in Medical Education: Utilizing VR to Visualize and Comprehend Embryological Development

Wyatt Mayer, Gabrielle Marchelli, Michael Bouchoukian, Robert Rice
Advisor: Jailenne I. Quiñones-Rodriguez

Emerging technologies offer innovative delivery of medical education, primarily virtual reality (VR), augmented reality (AR), 3D models/imaging, and mixed reality (MR). This study evaluated the potential of VR and AR as transformative methods for immersive, interactive content delivery to enhance understanding and retention. We reviewed major databases (2000-2024) for reports of emerging technology development, usage, and relevance for medical education. We converted physical 3D models into VR format to evaluate if comprehension of embryological processes improved. These VR models illustrate the intricate biologic processes from human embryonic fertilization to implantation. Our search found 32 relevant articles from 14 countries, 28.1% from the U.S. VR is the most frequent modality, followed by AR, MR, and 3D models. Notably, 62.5% of the reviewed articles were published after the COVID-19 pandemic, with the majority focusing on surgical and anatomical education (27.8%). The successful integration of emerging technologies is critical for the evolution of future curricula, particularly in enhancing the understanding of complex embryological concepts. VR shows great potential for improving the comprehension and retention of essential biomedical processes, offering valuable opportunities for both medical educators and clinicians to enhance teaching for students and patient education.

Extended Reality (XR) Simulations for Healthcare Education: A Proof of Concept

Sean Hu, Andrea Doan, Cameron Collins, Sarah Mabee, Ryan Genualdi
Advisor: Robert Rice

Introduction: An emerging problem to address is the growing student to instructor ratio. We attempt to leverage the impact of technology in education – simulation-based learning in AR/VR – to address the "educator shortage".

Objective: For this study, we will record proofs of concept of different procedural techniques in VR. This includes the tri-planar spine exam (OMT), standing flexion pelvic exam (OMT), bony landmark assessments of the foot (Athletic Training), and glove donning procedure (Nursing).

Methods: The hardware and software involved are the Meta Quest 3 headset, UltraLeap Leap 2 hand motion tracker, Logitech webcam, and Unity software. The Meta Quest 3 is used to enter the VR simulation on Unity, while the Leap 2 tracks the educator's hand movements in VR. The Logitech webcam allows the educator to see their real-life target areas.

Results: We successfully recorded the two OMT procedures. The recordings for the foot assessment and glove donning experienced noticeable technical difficulties.

Discussion: We suspect procedures with complex hand movements require tracking gloves. Future directions of this project are to introduce tracking gloves to evaluate recording capabilities and create more procedural simulations while acknowledging patient safety. We acknowledge the current limitations of such technology and are considering the appropriateness of certain protocols, including cost, academic impact and retention.

Insights from a De-escalation IPE event

Chetan Immanneni, Anna Birgisson, Alex Kho
Advisor: Karen Nelson

While medical students often have exposure to standardized patients to practice the standardized patient interview, it is often the case that they do not have opportunities to practice with patients who require de-escalation. In clinical settings, patients may present with noncompliance and anxiety. As Psychiatric conditions such as generalized anxiety disorder are comorbid in up to one third of patients with chronic illness, it is likely that medical students will eventually face a scenario where de-escalation is warranted.

We have conducted an interprofessional education event (IPE) centered on de-escalation techniques aimed to equip medical students with the knowledge and skills required to deal with scenarios in three varied clinical settings. With standardized patients such as one with "a panic attack" in various environments (ex. an emergent medical setting), we hoped to introduce medical students to scenarios that they may encounter in the future. Furthermore, we intended to allow students a chance to practice responding to such scenarios in a collaborative environment. We had experts as well in each room to help facilitate discussion and give feedback.

Given the geographic limitations that medical students often face, we are interested in investigating whether a virtual de-escalation IPE event can provide students with knowledge and skills regarding de-escalation techniques. This pilot study can help promote events at our institution and others.

Augmented Reality Simulations: Innovative Technology to Pass Along Years of Experience Outside of Limited Laboratory Hours

Cameron Collins, Sean Hu, Andrea Doan, Ryan Genualdi, Sarah Mabee
Advisors: Dennis Rau, Robert Rice

There are 16 new Osteopathic Medical schools in the U.S., less than 5 years old, with 9 more proposed or under construction, alongside 13 new MD schools (Gutman MD 2023). The need for medical doctors has increased, especially following the burnout caused by the COVID-19 pandemic. Research from the AAMC (Dill 2021) predicts a shortage of 17,800-48,000 primary care physicians and 21,000-77,100 specialty physicians by 2034. While new medical schools and graduates will help, the number of faculty to train them is not growing at the same rate, due to the aging physician workforce.

To address this issue, our team collaborated with Dr. Dennis Rau, D.O., to create an augmented reality (AR) resource for teaching Osteopathic Manipulative Medicine (OMM). We focused on the tri-planar diagnosis, a universal tool for evaluating the spine. Specifically, we targeted the thoracic region, which aligns with Fryette's Laws of spinal motion, making it suitable for learners at any stage. Using a LeapMotion 3Di camera and an Oculus Quest 3 headset, Dr. Rau's hand movements were recorded while interacting with a patient. The data was digitized by Dr. Luis A.P. Ballint in Unity Software into "ghost hands" that can be projected through AR, allowing students to follow along and enhance their diagnostic skills.

Utilizing Osteopathic Manipulative Treatment as an Adjunct Treatment for Chronic Migraines: A Systematic Review

Anuja Jayachandran, Christina Nguyen, Erica Frosch, Rachel Quintanilla, Swetha Prakash, David Cervantes, Gabriel Hapenciuc
Advisor: Townes Leigh

Introduction: Headaches, a common and debilitating ailment, could benefit from non-invasive Osteopathic Manipulative Medicine as an alternative therapy. This literature review's goal was to evaluate the efficacy of OMT as an adjunct treatment for chronic migraines.

Methods: An in-depth review was performed on the use of Osteopathic Manipulative Techniques (OMT) as a treatment for migraines/headaches. Databases Pubmed, Google Scholar, and OSTMED.DR were searched, with priority given to Randomized Trials (RT). Inclusion criteria included a publication date after 2013, RT pertaining to OMT, migraines, and headaches. Seven studies were included.

Results: Overall, it was found that OMT is an efficacious adjunct treatment for chronic migraines. General consensus is that OMT improved symptoms involved with migraines, including an increase in quality of life on standardized questionnaires, and significant decrease in headache frequency, etc.

RoBA: When completing the Risk of Bias Assessment, it was found that two articles were low risk, three had some concerns, and only one had a high risk of bias.

Discussion: It is clear that OMT is effective when used as an adjunct; more research is still needed in order to determine how to best utilize OMT. Directions for research include which techniques are most effective, and how to best combine them with current therapies. Due to limited literature on this, we hope to establish new standardized protocols and provide a direction for the future.

Effect of Osteopathic Manipulative Medicine on Cardiovascular Parameters

Jesus A. Osornio, Yasmin Obeidi, Emily Parker, Amritha Sivasankaran Nair, Sarib Sultan, Amber Adamcik, Anthony Avila, Arelys Hernandez, Alexandria Padro, Amanda Saenz, Patrick Smith, Edmundo Zorrilla, Jamie Eller, Simeon Nittala, Ava Stanczak
Advisor: Petra Rocic

Osteopathic Manipulative Treatment (OMT) offers new therapeutic perspectives for managing hemodynamic instability by promoting self-healing to achieve homeostasis. This project evaluated OMT's effect on baseline heart rate, blood pressure, radial artery diameter (D(ra)), and oxygen saturation (SaO2), as well as recovery metrics post-exercise. Ten healthy subjects were randomized to receive either OMT (n=5) or sham (n=5) treatment three times over a period of one week, on day 1, day 3 and day 7. All subjects performed exercise (stationary bike stress test to 80% of age-predicted maximal heart rate) on days 1 and 7. All parameters (HR, BP, D(ra) and SaO2) were measured at baseline and after exercise on day 1 and day 7. OMT was associated with decreased blood pressure after exercise (mean post-exercise systolic BP was 171 mmHg on day 1 vs. 154 mmHg on day 7, $p<0.05$) and improved HR recovery (mean post-exercise HR was 129/min on day 1 vs. 121/min on day 7, $p<0.05$). Radial artery diameter increased to a similar extent on both day 1 (28%) and day 3 (25%) in response to exercise in subjects who received OMT but not in those receiving the sham treatment, suggesting that OMT may induce vasodilation independent of known effects of exercise. These results suggest that OMT may ameliorate pathological cardiovascular responses to stressors and support its role as an adjunct treatment in patients with cardiovascular disease (CVD) or with risk factors for CVD to provide holistic care.

Virtual

Virtual presentations are offered to Student Doctors engaged in clinical or clerkship rotations, enabling them to share their research through pre-recorded presentations. These projects cover a wide range of topics, aligning with the categories of our in-person participants. Many involve our precepting faculty, whose support, and efforts we recognize, appreciate, and commend.

Human Assisted Logistic Optimization for Glial Cell Quantification in a Rodent Model of IVH

Sanjna Udtha, Miriam Zamorano
Advisor: Brandon Miller

Understanding the mechanisms of brain injury and recovery after intraventricular hemorrhage (IVH) may lead to better therapy for IVH. The objective of this study was to optimize a specific method to quantify the effect of IVH on markers of oligodendrocyte lineage cell development (NG2, PDGF, OLIG2, and APC) in the corpus callosum through human assisted logistics optimization (HALO) software algorithms. Intraventricular lysed blood injections on PND5 rat pups were used to simulate IVH. Immunohistochemical staining (IHC) was used to prepare tissue with the specific markers using DAB as a chromogen. Images of the corpus callosum of the control and IVH brain slices were captured on a light microscope at 20X magnification. Indica Lab's HALO software (v3.3.2541.133) with their Area Quantification FL algorithm (v2.1.7) was used to quantify the number of cells. Manual markup features were set through the entire analysis for a semi-automated quantification. T-student analysis was performed using GraphPad Prism software version 7.00 for Windows. This protocol allowed us to assess the efficacy of HALO for quantification of white matter developmental markers. Overall, there were no significant differences in the quantified markers between control and IVH tissue samples at 90 days post injury. However, we developed a protocol that can streamline analysis of white matter injury and development at other time points of IVH or in other disease models.

Caspase-1 as a Negative Feedback Proteostatic Mechanism for Amyloid Beta Aggregation in the Blood

Emma Zehe, Leslie Hudson, Gwynn Durham, Alexandra Herrera Martinez
Advisor: Diego Alvarez

Amyloid beta (Aβ) aggregation increases caspase-1 levels, a response associated with cognitive disorders and multiorgan dysfunction in critically ill patients. Whether caspase-1 acts as a downstream effect causing hyper-inflammation or acts as a protective response to prevent Aβ aggregation in the circulation remains unclear. Thus, we aimed to determine if caspase-1 inhibits Aβ aggregation, serving as a proteostatic mechanism.

Plasma samples from COVID-19 patients (n=25) were collected at ICU admission and processed via Ficoll gradient. Thioflavin T fluorescence (excitation/emission at 440/472 nm), a marker of Aβ aggregation, was measured using a monochromator plate reader after incubation with Aβ1-42 (control 1) or plasma samples with (experimental 1) or without caspase-1 (control 2). Samples were incubated for 16 hours, and fluorescence was measured at 10-minute intervals. Caspase-1 or vehicle control was added at either time=0 or time=16 hours (control 3/experimental 3). A one-way ANOVA compared Aβ1-42 fluorescence across groups.

Caspase-1 addition at time=0 significantly reduced Aβ aggregation in plasma ($p<0.001$). Adding caspase-1 at time=16 increased Aβ aggregation, similar to controls where Aβ1-42 aggregated without caspase-1. Caspase-1 reduces Aβ aggregation in plasma samples when introduced early but has no effect once aggregates have formed. The findings indicate that caspase-1 is an endogenous negative feedback proteostatic mechanism to prevent Aβ aggregation.

Differentiating Volatile Biomarkers in Exhaled Breath Using E-nose Technology

Jordan Pyatt, Saeed Menissy, Cameron Lee
Advisors: Diego Alvarez, Alexandra Herrera Martinez

Diagnosing health conditions often involves expensive and invasive tests that may be unavailable in some areas, leading to late detection of treatable conditions like cancer, diabetes, and COVID-19. There is a pressing need for a widely accessible tool to identify individuals with specific clinical diseases, risk factors, and responses to treatments. This study explores the emerging field of diagnostic medicine focused on analyzing the volatilome, a unique collection of volatile organic compounds (VOCs) emitted from the human body, to develop a non-invasive diagnostic tool. Breath samples were collected from SHSU COM students and analyzed using electronic (E-) nose technology, which employs cross-reactive nano-sensor arrays and artificial neural networks to create a "breathprint" for real-time analysis. Continued research will aid in identifying specific VOCs and contribute to a global database, enhancing our understanding of biochemical processes and the pathophysiology of diseases. E-nose technology offers a promising, low-cost, and non-invasive screening method that could revolutionize early detection, monitoring, and treatment of diseases.

Twist it, Bop it, Break it? Anatomical Predictors of Femoral Neck Fractures

Matthew Burgess, Jason Nikirk
Advisor: Jaime Hinojosa

Background: Femoral neck fractures are a prevalent injury in orthopaedic trauma, particularly in elderly individuals (489.3 per 100,000, aged ≥ 65), but the role of anatomical factors remains unclear.
Introduction: This study aims to investigate the role that femoral shaft torsion and neck-shaft angle play in the compressive strength of femurs to better understand how these features contribute to fracture susceptibility.
Methods: We will analyze 42 paired cadaveric femurs using CT and DEXA scanning to measure torsion, neck-shaft angle, and bone mineral density. Specimens will be categorized by torsion: retroverted (≤ 10°), normal (10°–20°), and anteverted (≥ 20°), as well as by neck-shaft angle: Coxa Vara (≤ 120°), typical (120°–135°), and Coxa Valga (≥ 135°). Each femur will undergo compressive axial loading until fracture occurs. Differences in fracture loads across groups will be analyzed using two-way ANOVA.
Discussion: As this is a proposed study, no data has been collected yet. We hypothesize that abnormal torsion and neck-shaft angle will correlate with reduced fracture load capacity, potentially identifying specific anatomical risk factors for femoral neck fractures. These findings could aid surgeons in managing and preventing such fractures.
Conclusion: This study seeks to clarify the role of femoral torsion and neck-shaft angle in fracture susceptibility.

Amyloid Beta as a Pathophysiological Inflammatory Marker of COVID-19

Leslie Hudson, Emma Zehe, Gwynn Durham, Alexandra Herrera Martinez
Advisor: Diego Alvarez

COVID-19 pathogenesis involves hyper-inflammation and multiple inflammatory pathways. Amyloid beta (Aβ) aggregation is associated with hyper-inflammatory states. While COVID-19 immunologic pathways are identified, specific markers contributing to its pathophysiology are poorly understood. Thus, we seek to determine whether Aβ aggregates form in critically ill COVID-19 patients, serving as a biomarker. Plasma samples were collected from critically ill patients with COVID-19, sepsis, or other conditions at admission in the intensive critical care unit (ICU, n=25). Peripheral blood was processed via Ficoll gradient. Thioflavin T fluorescence, a marker of Aβ aggregation with excitation/emission properties at 440/472, was measured in a monochromator plate reader after incubation with Aβ1-42, plasma samples, or PBS. Fluorescence was measured for 16 hours with plates incubated at 37°C. A one-way ANOVA compared Aβ1-42 fluorescence across groups. All groups aggregated Aβ1-42 as evidenced by an increased rate of oligomerization formation (fluorescence) indicative of active seeds, with COVID-19 plasma exhibiting significantly higher aggregation (p<0.001). Marked Aβ1-42 aggregation levels in COVID-19 patients indicate its role in the pathophysiologic process and benefit as a biomarker. Further research will assess its correlation with post-COVID-19 syndrome and disease severity.

Mechanisms and Classification of Frailty Systems in Neuromodulation: A Comprehensive Narrative Review Discussing the Need for a Unified System

Molly Anthony, Taimur Hassan, Ryan Morgan, Forough Yazdanian, Khaled M. Taghlabi
Advisor: Amir H. Faraji

Introduction: Frailty is a critical factor influencing neuromodulator surgical outcomes. However, current assessment tools often fall short in specific clinical settings. This study serves as a basis for creating a novel frailty assessment tool designed to improve the precision and practicality of frailty evaluation.
Methods: Following PRISMA guidelines, we systematically searched PubMed, Scopus, Web of Science, and Cochrane databases through January 2024 using "frailty" and "neuromodulation" as search terms. Studies were selected based on whether they provided frailty and outcome data specific to neuromodulation patients.
Results: Twenty-two distinct frailty assessment tools were found. Those include CCI, mFI-11, RAI, Clavien-Dindo Classification System, YGTSS, YBOCS, BDI, GTS-QOL, HDRS, BBS, ADI, NMSQ, DRS, SCOPA-COG, SCOPA-PS, SPES/SCOPA, GS, GV, TUG, FES-I, MOCA, and TMT. These tools have all been successful in analyzing post-surgical data after neuromodulation. There were some commonalities between differing tools, such as age, BMI, diabetes mellitus status, motor tics, depression components, and activities of daily living (ADLs), such as walking and dressing.
Conclusion: All the elements of these tools can be amalgamated to form a single assessment tool or system, allowing enhanced surgery outcome analyses. Nonetheless, further studies are required to extract the most valuable variables from each that correlate the most with surgical outcomes.

Robotic Assisted Transabdominal Pre-Peritoneal Ventral Hernia Repair with Mesh: A Single Surgeon Retrospective Review of Over 200 Consecutive Cases

Michael Hernandez
Advisor: Joseph R. Karam

Intro: Abdominal ventral hernias are common issues, with significant costs arising from emergency repairs and postsurgical complications. While laparoscopic techniques have shown to be beneficial for recovery and complication rates, questions remain regarding recurrence rates. Dr. Karam's experience with robotic-assisted trans-abdominal preperitoneal (RA-TAPP) mesh placement suggests improved outcomes warranting further investigation.

Methods: We conducted a retrospective chart review and patient survey for individuals undergoing RA-TAPP ventral hernia repair with Dr. Karam from February 2016 to February 2023. The primary outcome was hernia repair reliability assessed via recurrence rate. Secondary outcomes included complication rates, infection rates, and patient-reported pain during follow-up.

Results: Dr. Karam's RA-TAPP procedures exhibited a recurrence rate of 0.5%, an infection rate of 0%, a chronic pain rate of 3%, and an overall complication rate of 0%.

Discussion: RA-TAPP shows promising outcomes compared to traditional laparoscopic and open approaches. Limitations include the small average hernia size (2-3 cm), follow-up methods (telephone and online), single-surgeon data, and potential selection bias due to pre-operative screening. Further research is needed to validate these findings.

Unlocking New Frontiers in PM&R: The Promise of Prescription Digital Therapeutics for Functional and Cognitive Recovery in Stroke, TBI, and SCI

Danyal Tahseen, Rhoda Hijazi
Advisor: Savitha Bonthala

Introduction: Prescription digital therapeutics (PDTs) offer evidence-based software interventions that improve outcomes in neurological conditions. PDTs have shown promise in other fields (e.g. psychiatry, dermatology), reducing symptom severity by up to 50% and doubling treatment retention in opioid use disorder. In Physical Medicine and Rehabilitation (PM&R), PDTs show potential in managing stroke, traumatic brain injury (TBI), and spinal cord injury (SCI). This review synthesizes current literature on PDT efficacy in functional recovery, cognitive rehabilitation, and symptom management for these use cases.

Methods: A PubMed search using terms like "prescription digital therapeutics," "stroke," "traumatic brain injury," and "spinal cord injury" was conducted. Studies focusing on PDTs in PM&R pathologies were included, while non-prescriptive tools and those without outcome data were excluded.

Results: PDTs for stroke, such as cognitive therapy apps, improved speech and motor recovery. In TBI, PDTs targeting memory and cognitive function enhanced attention and executive function. Early studies in SCI suggest PDTs can improve pain management and mobility through digital physical therapy. However, sustainability and regulatory concerns remain.

Discussion: PDTs are a promising adjunct to traditional rehabilitation in stroke, TBI, and SCI. While initial results are positive, more research is needed to validate long-term efficacy and integrate PDTs into standard PM&R care.

Common Misconceptions Among Healthcare Providers Regarding Strength Training in Pediatric Patients

Mahaa Siddiqui, Zainab Sherwani, Amayah Brown
Advisor: Elizabeth Sargent

Introduction: This study examines how providers recommend physical activity and strength training to adolescents, identifies gaps in these recommendations, and explores how education can improve their guidance.

Methods: A survey was distributed to 38 primary healthcare providers, gathering data on demographics, their current recommendations for physical activity (including strength training), and perceived barriers. Educational materials (pamphlets) highlighting the Center for Disease Control's (CDC) recommendations were then provided to participants along with a follow up identical survey.

Results: Primary survey results showed that general physical activity was commonly recommended among participants, but only a small percentage of providers advised strength training (with 87% primarily recommending it to ages 14-18). Providers reported concerns about injury risk and lack of proper training as key barriers to recommending strength training.

Discussion: The study highlights a significant gap in the inclusion of strength training in pediatric exercise recommendations, despite evidence of its benefits when performed safely. Addressing misconceptions and providing targeted educational resources could empower providers to confidently recommend and monitor strength training, which would improve children's physical health outcomes.

Patient Satisfaction in Obstetric and Gynecologic Care: The Role of Income, Pregnancy Loss, and Rural Disparities

Zainab Sherwani, Zainab Sherwani, Dania Muhammad, Roohi Maknojia, Morgan Apostol, Anya Lu, Grace Hildenbrand
Advisor: Peggy Taylor

Introduction: Patient satisfaction in obstetric and gynecologic (OB/GYN) care is vital for quality healthcare. This study explores the relationship between patient factors like income and living conditions in both high-risk and low-risk pregnancies affect satisfaction with OB/GYN care. It also examines whether previous pregnancy losses correlate with dissatisfaction and investigates differences in emotional support provided to low-risk versus high-risk patients.

Methods: A survey was distributed to currently pregnant women via Prolific, gathering comprehensive quantitative and qualitative data on their pregnancy experiences and satisfaction levels.

Results: Moderation analysis showed no significant difference in satisfaction between income levels for low-risk versus high-risk pregnancies. Prior pregnancy loss did not affect satisfaction levels. However, a significant difference was noted in overall satisfaction based on location; urban residents reported greater satisfaction than those in rural areas. Emotional support perceptions differed significantly, with high-risk patients feeling less supported than their low-risk counterparts.

Conclusion: The study noted that income and prior pregnancy loss do not significantly impact satisfaction levels. Urban patients reported higher satisfaction than rural patients, likely due to better access to care. Additionally, high-risk patients felt less emotionally supported, highlighting a critical area for improvement in emotional care.

The Impact of Circadian Rhythm Disruption on Metabolism and Mental Health in Medical Students

Imaan Ali, Kahon Ahmadi
Advisor: Petra Rocic

Research in the field of chronobiology suggests circadian clocks are imperative to human health, and prolonged interferences in circadian rhythms, such as chronic night shift work, can lead to significant health consequences including metabolic syndrome and mental health disturbances. This study will explore how circadian rhythm disruptions affect mental and metabolic health outcomes in medical students. Participants will report screen time, blue light and UV-blocking interventions, outdoor activity, sleep patterns, dietary habits, and exercise in an online survey, self-report mental health parameters (anxiety and depression) using standard questionnaires, and provide biomarkers of metabolic health (waist and hip circumference and heart rate variability). We hypothesize increased screen time, particularly at night, will be associated with higher levels of anxiety and depression, lower heart rate variability, and a higher waist-to-hip ratio, linking disruptions in circadian rhythms with disruptions in mental well-being and metabolism. We further hypothesize protective factors, such as the use of blue light-blocking glasses, time spent outdoors, healthier diet choices, and regular exercise, will correlate with lower anxiety and depression, better sleep quality, higher heart rate variability, and a healthier waist-to-hip ratio. This study will provide valuable insights into how circadian disruptions contribute to mental and metabolic health outcomes in medical students.

Exploring Patient Satisfaction and Emotional Support in OB/GYN Provider-Patient Relationship: The Impact of Marital Status and Parenthood

Dania Muhammad, Zainab Sherwani, Morgan Apostol, Brianna Castro, Roohi Maknojia, Anya Lu, Grace Hildenbrand
Advisor: Peggy Taylor

Introduction: Patient satisfaction and perceived emotional support are vital to quality healthcare, particularly in Obstetrics and Gynecology (OB/GYN). The influence of patient factors on patient-provider relationships is underexplored in this field. Our study examines key factors affecting patient satisfaction in OB/GYN through survey analysis.
Methods: A survey was created and distributed via Prolific that compiled data about women's pregnancy process. Questions covered a wide spectrum of data on experiences, perspectives, and satisfactions with care.
Results: Results from a survey were analyzed using independent t-tests and found that there is no significant difference in the level of satisfaction based on whether an individual has biological living children ($t(341) = .42$, $p = .339$). We found that there is no significant difference in perceptions of satisfaction with the care given by the provider based on the patient's marital status ($t(336) = .03$, $p = .489$). There is a statistically significant positive association between patient perception of emotional support by the provider and satisfaction with care provided ($r = .55$, $p < .001$).
Discussion: Our findings underscore emotional support as a vital component of quality healthcare. Training programs that enhance communication skills and emotional intelligence could foster patient satisfaction and improve care. Future research should identify best practices for integrating emotional support into routine OB/GYN care.

The Effects of Religion and Acculturation on Impulsivity and Risky Behavior

Miriha Meghani, Sydney Smith
Advisor: Ryan Marek

Research has shown that risky behavior and high levels of impulsivity can negatively impact a person's physical and mental health (Schwartz et al., 2011). Both risky behavior and impulsivity can exacerbate various other diseases such as addiction, bipolar disorder, and personality disorders (Chamberlain & Grant, 2019). Finding ways to mitigate these behaviors can help prevent harm (Schwartz et al., 2011). Religion and acculturation have both been identified as factors that may impact risky behavior and impulsivity, however, studies have conflicting conclusions (Smith, 2013). This study aims to clarify the current studies' conclusions and expand the literature. We hypothesized that acculturation and religion would moderate the association between impulsivity and risky behavior in Hispanic young adults. We surveyed 460 students at a large southwestern university. The results did not show significant correlations related to the primary hypothesis. There was a significant correlation between substance behavior risk and biculturalism, in that more monoculturalism was associated with more substance use risk. In conclusion, our findings do not establish a clear relationship between acculturation and religion regarding impulsivity and risky behavior. This may be attributed to a lack of diversity amongst our survey population, which may not represent Hispanic young adults as a whole. Future research should include students from other schools and young adults not enrolled in college.

Exploration of Utilizing Artificial Intelligence for Medical Students Communication Skills Learning

Brianna Castro, Josephine Chiu, Isaac Ballard, Karen Nelson, Paul Zarutskie, Oluwaseun Kemi Olaiya, Donggil Song
Advisor: Yuan Zhao

Effective doctor-patient communication, particularly breaking bad news (BBN), is essential but challenging. Traditional training often relies on standardized patient encounters. With the growing accessibility of artificial intelligence (AI), this study explores how engaging with ChatGPT in BBN scenarios affects medical students' confidence and perceived learning while assessing the benefits and limitations of AI in communication training. Students learned the SPIKES framework—a six-step protocol for BBN—and applied it in simulated encounters with ChatGPT. ChatGPT evaluated student responses using SPIKES, and scores were recorded. A grading rubric developed by the research team was used by ChatGPT and three faculty members to re-evaluate responses. A pre- and post-survey measured student confidence, trust in AI, and perceived learning. Paired t-tests compared survey results, and narrative responses underwent constant comparison analysis. Students reported significant increases in confidence regarding BBN and communication skills after the ChatGPT interaction. Trust in ChatGPT for teaching improved, while overall trust in AI remained unchanged. Notable grading inconsistencies between ChatGPT and faculty evaluations highlighted challenges in assessing communication skills. ChatGPT enhances medical students' confidence and skills in BBN, providing structured practice and feedback. However, it cannot fully replace in-person training due to limitations in emotional nuance.

Integration of Holistic, Personalized Management of an Anomalous Experience of Dissociative Identity Disorder in a Community Mental Health Setting: A Case Report

Trent Clark, Elizabeth Deya
Advisor: Henry Chavez

Dissociative Identity Disorder (DID) is classified by the DSM-V-TR as a dissociative disorder involving an individual disconnecting from memories, emotions, identity, or perception. A 30-year-old female presented to a psychiatric emergency crisis center for suicide and self-harm ideations. She reported previous diagnoses of DID and depression, stating numerous adverse life events and financial struggles created significant barriers to healthcare for over 15 years, worsening her conditions and contributing to her acute presentation. After a scholarly review, this case was identified as a rare instance of a DID patient receiving holistic care from a local crisis center. While hospitalized, she received holistic treatment that addressed both psychiatric and medical needs, mitigating socio-economic barriers to high-quality care. Treatment included group therapy, daily psychiatric assessments, medical surveillance, coping strategies, and individualized therapy to address past trauma. Fluoxetine was prescribed for her depressive symptoms. Upon clinical improvement and behavioral health team assessment, she was discharged with follow-up appointments and a social worker to secure housing and employment. This case demonstrates the osteopathic tenet of integrating holistic, multifaceted approaches that support the wellness of an individual as a dynamic being.

Associations Between Osteopathic Somatic Dysfunctions and Biometric Health Indicators in a Domestic Violence Shelter Population

Swetha Prakash, Molly Anthony, Jackson Wahman, Danyal Tahseen, Dominica Moussoki
Advisor: Luther Quarles IV

Introduction: This study examined the relationship between osteopathic somatic dysfunctions and health metrics in a domestic violence shelter population, addressing gaps in literature on biometric differences in underserved populations and exploring somatic dysfunction (SD) as a potential early indicator of future health conditions.
Methods: In this IRB-approved cross-sectional study, 13 participants were assessed using osteopathic techniques and biometric data collection. Pearson correlation and multivariate regression models analyzed associations, with significance at $p < 0.05$.
Results: Significant correlations were found between thoracic and cervical spine dysfunctions and elevated BMI ($r = 0.64$, $p < 0.05$) and neck circumference ($r = 0.58$, $p < 0.05$). Lumbar dysfunctions were linked to increased abdominal circumference ($r = 0.49$, $p < 0.05$) and respiratory rate ($r = 0.52$, $p < 0.05$). Rib dysfunctions were associated with slight increases in blood pressure and heart rate, though these were not statistically significant ($p > 0.05$).
Discussion: Findings suggest individuals with higher BMI, larger neck and abdominal circumferences, and altered respiratory rates are more likely to present with specific SD. Further research should explore somatic dysfunction as an early indicator for chronic health conditions and if early osteopathic interventions could prevent or mitigate future disease. Increasing access to osteopathic care may improve health outcomes in underserved populations.

Enhancing Spinal Cord Injury Rehabilitation: The Role of Adaptive Sports in Physical and Psychological Recovery

Rhoda Hijazi, Danyal Tahseen, Jackson Wahman
Advisor: Savitha Bonthala

Intro: Spinal cord injury (SCI) affects 17,810 new individuals annually in the U.S., leading to physical, psychological, and social challenges. Comprehensive rehabilitation must address both physical and mental health. Adaptive sports have emerged as a crucial tool, offering benefits beyond traditional rehabilitation.
Methods: Case studies and programs like wheelchair basketball, adaptive rowing, and functional electrical stimulation (FES) were evaluated for their impact on physical recovery, mental health, and social reintegration. Program evaluations were synthesized to assess improvements in strength, fitness, and psychological well-being.
Results: Adaptive sports participation led to a 30-50% reduction in depressive symptoms and improved life satisfaction. Participants showed enhanced muscle strength, cardiovascular health, and mobility. Motivation and self-esteem increased by 40% in participants versus non-participants. However, access to programs and equipment remained a significant barrier, especially in resource-limited settings.
Discussion: Adaptive sports provide significant physical and psychological benefits for SCI rehabilitation. Addressing access barriers is key to ensuring all individuals with SCI can benefit, maximizing their role in comprehensive rehabilitation.

V18

Promoting Wellness Through Preventative Care: A Student-Run Initiative Providing Health Screenings and Education for Vulnerable Populations

Jackson Wahman, Rhoda Hijazi, Dominica Moussoki, Danyal Tahseen, Molly Anthony, Swetha Prakash
Advisor: Luther Quarles IV

Intro: A student-led pop-up clinic at the SAAFE House in Huntsville, Texas, aimed to improve health knowledge, self-efficacy, and health behaviors in vulnerable populations. This study evaluated the impact of preventative health screenings on health literacy.
Methods: Screenings for vitals, BMI, glucose, cholesterol, blood pressure, and somatic dysfunction were conducted at five stations, with medical students providing consultations. Educational materials and healthcare resources were offered. Participants completed pre- and post-clinic surveys that focused on specific health knowledge metrics. Paired t-tests were used to assess the effectiveness of the intervention.
Results: Screenings indicated high rates of overweight status and elevated risks for diabetes and cardiovascular disease (CVD). Post-intervention surveys demonstrated significant improvements in health knowledge across several areas, including awareness of nutrition, exercise, and the importance of regular health screenings ($p < 0.05$).
Discussion: The pop-up clinic positively impacted participants' health knowledge and behaviors, as evidenced by significant improvements in survey responses. The intervention and resources increased participants' understanding of health risks and prevention. Limitations include the small sample size and reliance on self-reported data. Future research should explore the long-term outcomes and scalability of this intervention model to reach broader underserved populations.

Unseen Struggles: The Impact of Domestic Violence on Hypertension and Cardiovascular Risk in Female Survivors

Dominica Moussoki, Rhoda Hijazi, Danyal Tahseen, Jackson Wahman, Molly Anthony, Swetha Prakash
Advisor: Luther Quarles IV

Domestic violence (DV) against women is a hidden health burden contributing to underrecognized cardiovascular disease (CVD) risk, particularly hypertension. Chronic stress from prolonged DV exposure is linked to increased CVD risk. This study examines the association between DV exposure and heightened hypertension in female survivors.

A cohort study was conducted with women receiving services from SAAFE House in Huntsville, TX. Participants from residential and outreach programs attended a free health clinic where vital signs (blood pressure, cholesterol, glucose, BMI) were measured. Subjective data, consisting of past medical histories were collected through interviews. The ASCVD Risk Estimator Plus calculated CVD risk, and t-tests compared the DV group's ASCVD risk scores to those of the normal female population in Texas.

Data from 13 participants revealed significantly elevated ASCVD risk scores (mean: 13.8) compared to the normal population (mean: 5.0), with a t-statistic of 5.82 ($p < 0.001$). Participants showed high prevalence of elevated blood pressure, hypercholesterolemia, diabetes, and obesity, further increasing CVD risk.

These findings suggest that women exposed to DV are at a higher risk for hypertension and other cardiovascular conditions due to chronic stress and related risk factors. The results highlight the need for integrated healthcare interventions that address both the psychological and physical impacts of DV on cardiovascular health.

Podium

O1

Textile Flame Retardant, Tetrakis Hydroxymethyl Phosphonium Chloride (THPC) Induces Peripheral Nerve and Sensory Cilia Degeneration

Aarzoo Maknojia, Sabrina Bharia
Advisor: Vinoth Sittaramane

THPC is a common organophosphorus flame retardant used in textiles and household items, as well as a microbicide in water systems. Despite its widespread use, the long-term effects on human health remain unclear. Previous studies in mice and rats have shown that THPC at higher systemic doses leads to decreased motor activity, grip strength, work capacity, and sluggishness. However, the mechanisms of toxicity are not well understood. We hypothesized that treating zebrafish embryos with lower doses of THPC for shorter durations would produce similar phenotypes and reveal underlying neuromuscular changes via high-resolution microscopy. Our results showed that low concentrations of THPC caused significant developmental abnormalities, including pericardial edema, dorsal muscle curvature, and reduced body length. Behavioral assessments indicated decreased movement and velocity, suggesting potential neurodevelopmental deficits. Additionally, THPC disrupted spinal muscular organization, caused axonal defasciculation of peripheral spinal nerves, and led to degeneration of cilia in sensory ganglia. These findings indicate a risk for ciliopathies in other ciliated tissues. This further implies that THPC exposure at levels deemed safe may pose serious health risks, underscoring the need for stricter safety measures and further research.

O2

Stress, Burnout, and Health Perception Amongst Medical Students and the Need for Facilitation of Healthy Management Strategies

Robert Hayes, Grant Barber, Roohi Maknojia, Brianna Castro
Advisor: Karen Nelson

Medical school is notorious for its rigor and high stress environment. This emphasizes the importance of wellness, the development and implementation of practices to improve one's mental, physical, and overall health, especially in higher education. This study looked for notable trends in the academic and recreational habits of medical students to evaluate the role of wellness in medical education. Through survey data, we examined background and lifestyle information from 49 osteopathic medical students as well as their scores from validated scales including the Perceived Stress Scale (PSS) and the Maslach Burnout Inventory (MBI). Stress perception was found to be in the moderate category as a baseline. Burnout inventory indicated students are experiencing exhaustion weekly, depersonalization monthly, and accomplishment more than weekly. These findings support the long-standing idea of medical students experiencing higher than normal levels of stress and feelings of burnout as well as difficulties coping with these negative factors. Evaluation of coping methods in the form of therapy and counseling services, diet, tobacco, alcohol, and other drugs raise some concerns about how students are managing the stress and burnout they are experiencing. This encourages a need for more studies to investigate the specific etiologies that create these stressors and the implementation and effectiveness of strategies that could mitigate stress and burnout healthily among medical students.

Assessing the Impact of a Patient Advocacy Workshop on Empathy in Osteopathic Medical Students

Gandhimathi Saravanan, Muhanned Tokmachi, Karen Nelson, Brent Sanderlin
Advisor: Yuan Zhao

Empathy is crucial to medical professionalism and linked to improved patient outcomes. In osteopathic medicine, empathy is key to building strong patient relationships by understanding their concerns. This study evaluated the impact of a patient advocacy workshop on empathy among osteopathic medical students. All COM students were invited to complete a pre-survey, including demographic questions and the Jefferson Scale of Empathy (JSE), with higher scores indicating greater empathy. Students were also invited to participate in a workshop featuring real patient case studies, small group discussions, and presentations by heart disease patient advocates. The post-survey included the JSE and participants' perceptions of the workshop. A paired t-test was used to compare pre- and post-survey results, with a p-value <0.05 considered significant. 104 students completed the pre-survey, with an average JSE score of 114. 26 students attended the workshop, and 15 completed the post-survey. The average baseline JSE score for attendees was 118. Although there was no statistically significant change in JSE scores pre- and post-workshop, 93% of participants reported improved empathy skills after workshop. The workshop showed promise in enhancing empathy for medical students. Future iterations of the workshop should focus on reducing participant bias and expanding its scope. Broader implementation may support the development of empathetic physicians, ultimately improving patient outcomes.

Using Zebrafish as a Tool to Model a Loss-of-Function Patient Variant in SEPSH1 and its Role in Neurodevelopment

Akhila Nair, Greta Sallese, Maegan Mendoza, Joseph Bartling, Vinoth Sittaramane
Advisor: Sureni Mullegama

Selenophosphate is the primary selenium donor in the selenocysteine biosynthetic pathway. SEPHS1 and SEPHS2, selenophosphate synthetase paralogues, have yet to be implicated in human disease. We have recently identified a new disorder in SEPHS1. Nine individuals with gain-of-function heterozygous missense variants in SEPHS1 all share overlapping phenotypes: developmental delay, hypotonia, speech delay, and growth delay. In this study, we explore whether loss-of-function variants in SEPSH1 cause a phenotype in patients by utilizing patient data and zebrafish. A seven-year-old female presenting with learning disability, developmental delay and weakness, growth hormone deficiency and short stature presented to the genetics clinic for clinical exome sequencing (CES). CES revealed that the patient had a de novo frameshift variant in SEPHS1. We took advantage of the 98% homology match between humans and zebrafish to develop a loss-of-function zebrafish model. We developed a 25 bp antisense nucleotide targeting Sephs1 exon 1 and a 5 bp mismatch control. These were injected into 1-cell stage zebrafish embryos, which were then observed for neurodevelopmental endpoints over 5 days. Our findings indicate potential neuronal circuitry deficits in the spinal cord of Sephs1-deficient embryos compared to controls. Understanding the precise mechanism behind SEPHS1 mutations is instrumental in the development of therapeutic strategies for patients with neurodevelopmental issues.

Dentine Biomarkers of Metal Exposure and Neurocognitive Performance in Bangladeshi Children

Aneesha Vadde, Berna Rahi, Rasheda Sultana, Ambreen Khan, Karen Carreón García, Faruque Parvez, Khalid M. Khan
Advisors: Berna Rahi, Rasheda Sultana

Deciduous teeth develop in layers and are reliable indicators of prenatal and early childhood metal exposure. The objective of our pilot study is to examine the impacts of dentine biomarkers of nutritional and toxic metal exposure on neurocognitive performance (NP) in Bangladesh, a low-income country. Deciduous teeth were obtained from 80 school-aged children from an NIH-funded cohort in Araihazar, Bangladesh. Metal concentrations were measured at Columbia University using LA-ICPMS. NP was measured by a computer-based Behavioral Assessment Research System (BARS) and a tablet-based NeuroUX. Bivariate correlations were used to assess associations between metals and NP.

Average metal concentrations did not differ by sex except for calcium (p=0.03). Nutritional metals Li and Mg were correlated with faster NeuroUX matching-pair reaction times (p= 0.04 and 0.03, respectively), showing beneficial effects on processing speed. Toxic metal Pb showed a positive correlation with continuous performance task latency (p=0.03), which implied attention impairment.

Preliminary data indicated positive effects of nutritional metals and negative effects of toxic metals on NP. It is likely that confounding factors including environment, lifestyle, and metal interactions in the body masked the negative impact of certain toxic metals on NP. Our preliminary findings may develop larger studies, which could advise nutritional policy recommendations for low-income populations around the globe.

Mission of SHSU-COM

The mission of the SHSU College of Osteopathic Medicine is to prepare students for the degree of Doctor of Osteopathic Medicine with an emphasis toward primary care and rural practice; to develop culturally aware, qualified, diverse, and compassionate physicians, who follow osteopathic principles, that are prepared for graduate medical education and will serve the people of Texas with professionalism and patient-centered care.