2025 AOA Research Abstracts and Student Poster Competition

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This issue of the *Journal of Osteopathic Medicine* (*JOM*) features abstracts from the posters that were presented at the 2025 Osteopathic Medical Conference and Exposition (OMED25), which took place in Nashville, Tennessee, from September 25-28, 2025.

This year's abstracts were organized into Basic Science, Clinical, Health Services, Public Health, and International Health categories, indicated within each abstract immediately under the poster number. Abstracts submitted by students for the poster competition (designated with "*") were judged, and the first- and second-place winners are designated with "★".

To enhance the readability of this special feature, abstracts have been edited for basic style only. The content has not been modified; the information provided reflects information that was submitted by the primary author, including professional degrees and affiliations.

Neither the AOA's Bureau of Osteopathic Research and Public Health nor the *JOM* assumes responsibility for the content of these abstracts.

Poster No. *B-1
Abstract No. 2025-014
Category: Basic Science
Research Topic: Impact of OMM & OMT

Heart Rate Variability Biofeedback Improves Adaptability and Recovery to Acute Stressors

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Context: Psychological stress is a contributor to the development, progression, and negative outcomes in a variety of disease processes such as heart disease1, cancer2, type 1 diabetes3, stroke4, and autoimmunity5. The autonomic nervous system (ANS) plays an integral role in regulating physiological responses to stress and recovery for maintenance of health6. The sympathetic branch is typically linked to the "fight or flight" acute response to physiological or psychological stress whereas the parasympathetic branch is associated with the "rest and digest" state6. Chronic stress can trigger sympathetic nervous system (SNS) dominance, compromising overall health and disrupting homeostatic adaptability7. Heart rate variability (HRV) is widely used as a physiological measure of ANS balance, stress, and stress recovery as the shift to SNS dominance can be observed as a decrease in ambient HRV that fails to fully recover normal variability during resting, non-stressed states following an acute stressor7.

One proposed approach to rehabilitating ANS imbalance is the induction of respiratory coherence (RC). The process involves engaging in slow, paced diaphragmatic breathing at a resonance frequency of 0.1 Hz to mimic respiratory sinus arrhythmia (RSA), a state of cardiopulmonary coupling that superimposes the sinusoidal waveforms of heart and respiratory rates7. The synchronization between breath and heart rate is believed to reset the balance between sympathetic and parasympathetic activities8. RC is thought to influence ANS function by enhancing vagal tone, resulting in an observable increase in HRV indicating a parasympathetic shift8.

Heart rate variability biofeedback (HRVB) is a relatively new RC training method which uses wearables to track heart rate and HRV in real time to assist the user in achieving RC9,10. This practice has garnered attention for its impact on the ANS and cardiovascular health11. While there is a growing interest in HRVB and its potential to alter autonomic balance, there is a notable gap in the current literature regarding the benefits of limited, brief HRVB sessions and recovery from acute stress. Understanding the relationship between HRVB and HRV has implications for stress

reduction strategies potentially offering easily accessible and cost-effective tools for individuals to enhance their health. This research aims to bridge the existing gap in the current literature and contribute meaningful insights into the potential physiological effects of RC on ANS regulation. Insights gained from this research may serve to inform the development of therapeutic interventions and clinical practices aimed at the improvement of cardiovascular and autonomic health through HRVB.

Objective: To test the hypothesis that Heart Rate Variability Biofeedback (HRVB) can improve Heart Rate Variability (HRV) as a metric of adaptability and recovery to acute stress.

Methods: Study subjects included thirty-one healthy osteopathic medical school students. The study consisted of a within-subject design measuring HRV in the following chronological order: a five-minute baseline, an acute stress period, a five-minute recovery period, a ten-minute HRVB exercise, a repeated five-minute stress period, and a final five-minute recovery period. The acute stress periods were a physical stressor (participants performed a maximal handgrip contraction using a dynamometer for up to five minutes or until failure) and a cognitive stressor (completion of a five-minute 2-Back Test) administered in random order across participants. HRVB was conducted using a Heart Math Inner Balance device with guidance from the associated mobile application. HRV variables including root mean square of successive differences (RMSSD), standard deviation of normal-to-normal intervals (SDNN), high frequency (HF), low frequency (LF), and very low frequency (VLF). Recovery and stress periods before and after HRVB were compared. Mean HRV coherence ratios were also calculated to determine efficacy of the HRVB exercise.

Results: Participants HRV Coherence ratios (95% confidence interval) increased from 0.32 (0.15, 0.48, n=31) at baseline to 2.28 (1.5, 3.1, p<0.01) during HRVB. During recovery periods before and after HRVB, RMSSD increased from 33.4 (26.9, 40.0, n=31) to 37.5 (30.6, 44.5, p<0.01), SDNN increased from 43.8 (37.6, 50.1, n=31) to 50.7 (42.9, 58.6, p<0.01), HF increased from 549.1 (284.9, 750.6, n=31) to 750.6 (396.9, 1005.0, p<0.01), LF increased from 1222.4 (844.2, 1600.5, n=31) to 1910.1 (1162.8, 2657.4, p=0.02), and VLF increased from 181.4 (115.0, 247.7, n=31) to 302.6 (126.8, 499.4, p=0.18). During stress periods before and after HRVB, RMSSD increased from 30.1 (25.4, 34.7, n=31) to 33.8 (27.4, 40.1, p=0.04), SDNN increased from 37.0 (33.2, 40.8, n=31) to 42.9 (37.0, 48.8, p<0.01), HF increased from 477.2 (326.2, 628.2, n=31) to 610.2 (359.9, 860.5, p=0.04), LF increased from 817.9 (647.7, 988.2, n=31) to 1304.0 (891.0, 1716.9, p<0.01), and VLF increased from 108.5 (82.1, 135.0, n=31) to 148.7 (118.3, 179.2, p<0.01) following HRVB.

Conclusions: HRV describes the cardiovascular system's ability to adapt to intrinsic and extrinsic stresses via autonomic regulation of the sympathetic and parasympathetic nervous systems. HRVB offers a method to quickly improve adaptability and recovery to acute stressors, potentially improving coping skills.

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Informed Consent: Written informed consent was obtained from all participants prior to enrollment. Participation was voluntary, and confidentiality was maintained according to IRB guidelines.

Ethical Approval & IRB and/or IACUC Approval: This study was reviewed and approved by the Alabama College of Osteopathic Medicine Institutional Review Board (ACOM IRB) following full board review. The project was evaluated for compliance with institutional and federal guidelines for research involving human subjects. All procedures performed in this study were in accordance with the ethical

standards of the institutional and national research committees and with the 1964 Helsinki Declaration and its later amendments.
Support: None reported.
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Poster No. *B-2
Abstract No. 2025-017
Category: Basic Science
Research Topic: Impact of OMM & OMT

Osteopathic Medical Students' Perspectives on Osteopathic Manipulative Therapy during Third-Year Clerkships: A Cross-sectional Study of Three Osteopathic Medical Schools

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Context: Osteopathic manipulative treatment (OMT) is a core component of osteopathic education, yet many osteopathic physicians report minimal use in clinical practice. A national survey found that 77.7% of osteopathic physicians used OMT on fewer than 5% of their patients, and 57% reported not using OMT at all; lack of time and confidence were cited as major barriers [1]. Structured clerkship exposure has been shown to improve confidence and the likelihood of future OMT use [2–4]. However, few studies have directly compared student perceptions across institutions with different curricular approaches.
Objective: To determine whether instructional format and institutional differences during third-year clerkships affect osteopathic medical students' confidence, perceived preparedness, and intent to use OMT in future clinical practice.
Methods: A cross-sectional survey was administered to third-year medical students at Alabama College of Osteopathic Medicine (ACOM), Arkansas College of Osteopathic Medicine (ARCOM), and Oklahoma State University College of Osteopathic Medicine (OSUCOM) between April and June 2025. The survey assessed confidence in OMT skills, likelihood of future OMT use, and perceived preparedness based on third-year OMT training. Responses were scored on 5-point Likert scales and analyzed using descriptive statistics.
Results: Of the 60 students who accessed the survey, 59 (98.3%) consented and completed it in full, forming the final analytic sample. Participating institutions included Alabama College of Osteopathic Medicine (ACOM, n = 19), Arkansas College of Osteopathic Medicine (ARCOM, n = 29), and Oklahoma State University College of Osteopathic Medicine (OSUCOM, n = 11). Students rated their confidence in OMT skills, likelihood of future OMT use, and perceived preparedness for the COMLEX Level 2 OMT section using 5-point Likert scales. Mean confidence scores were highest at ARCOM (3.86 ± 0.88), followed by ACOM (3.63 ± 1.12) and OSUCOM (3.36 ± 1.03). Likelihood of OMT use was greatest at ACOM (3.42 ± 1.54), with lower averages at ARCOM (3.10 ± 1.59) and OSUCOM (2.45 ± 1.51). Perceived COMLEX preparedness was highest at OSUCOM (3.55 ± 1.13), followed by ARCOM (3.28 ± 1.19) and ACOM (2.89 ± 0.94). Although trends were observed, one-way ANOVA revealed no statistically significant differences between institutions for confidence ($p = 0.35$), likelihood of OMT use ($p = 0.27$), or perceived preparedness ($p = 0.27$).
Conclusion: This cross-sectional study surveyed third-year osteopathic medical students from ACOM, ARCOM, and OSUCOM to assess confidence in OMT skills, likelihood of future OMT use, and perceived preparedness for COMLEX Level 2. The survey was administered via Microsoft Forms between April and June 2025 and included 59 students after exclusion of one non-consenting respondent. Responses were scored using 5-point Likert scales and analyzed using descriptive statistics. ARCOM students reported the highest mean confidence (3.86), while ACOM students reported the greatest intent to use OMT (3.42), and OSUCOM students reported the highest preparedness for COMLEX Level 2 (3.55). These results suggest that differences in curricular structure may influence students' perceptions and preparedness related to OMT. However, findings should be interpreted cautiously due to the limited sample size and potential selection bias. Future research should investigate curricular content and longitudinal outcomes in larger, more diverse samples.

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Informed Consent: Participants provided informed consent electronically prior to completing the survey. The consent form outlined the purpose, procedures, risks, and confidentiality of the study, and participation was voluntary with the option to withdraw at any time. No identifying information was collected, and the study was approved by the ACOM Institutional Review Board.
Ethical Approval & IRB and/or IACUC Approval: Approved by the Alabama College of Osteopathic Medicine Institutional Review Board (IRB #2024-OMT-003).
Support: None reported.
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Poster No. *B-3
Abstract No. 2025-045
Category: Basic Science
Research Topic: Musculoskeletal Injuries and Prevention

Comprehensive structural analysis of piriformis muscle and sciatic nerve in cadavers: potential implications for piriformis syndrome and OMT

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Context: Piriformis syndrome (PS) typically presents as lower back and upper buttock pain that radiates down the leg. It is estimated that 0.3%–6% of regional pain can be attributed to PS, amounting to approximately 2.4 million diagnoses annually.[1] However, the actual prevalence is likely higher due to the condition's vague presentation and the absence of clear diagnostic criteria, making it a diagnosis of exclusion.[2] Previous studies have proposed etiologies such as lesions or chronic irritation of the sciatic nerve, leading to nerve entrapment by the piriformis muscle.[3] Recent ultrasound studies have suggested structural differences in pathological versus non-pathological presentations.[4-5] However, due to the deep anatomical location of both the sciatic nerve and the piriformis muscle, ultrasound sensitivity remains low. Currently, a combination of osteopathic manipulative treatment (OMT), physical exercises, and pharmacologic therapies is used in managing PS.[6]
Objective: To analyze the anatomical relationship between the sciatic nerve (SN), piriformis muscle (PM), body mass index (BMI), and other pelvic measurements to determine possible patterns supporting the entrapment theory in PS. Additionally, to identify anatomical features as potential predictive factors for PS and their implications for OMT targeting this region.
Methods: The gluteal region of 20 formalin-embalmed cadavers (11 females, 9 males; mean [SD] age, 76.7 [10.5] years; mean [SD] BMI, 22.7 [4.2]) from the Kansas City University Gifted Body Program were dissected and examined. All measurements were independently repeated by the authors to ensure accuracy. PM length was measured across the muscle belly from its origin on the sacrum to its insertion on the greater trochanter. PM circumference was measured at the midpoint of its length using a marked string. SN diameter was measured at its exit from the infrapiriformis fossa. Statistical analysis was conducted using Microsoft Excel.
Results: After excluding specimens due to quality issues or anatomical variations, 35 sciatic nerves were included in the final analysis. The mean (SD) circumferences of the SN and PM were 3.48 (0.53) cm and 4.41 (0.94) cm, respectively. No correlation was found between PM and SN circumference ($R = 0.01$). However, PM length showed a positive correlation with BMI ($R = 0.36$) and pelvic width ($R = 0.42$). Age was negatively correlated with both PM length ($R = -0.25$) and circumference ($R = -0.19$).Sex-based analysis revealed similar SN circumferences between males and females (Males: mean [SD], 3.62 [0.60] cm; Females: 3.43 [0.54] cm; $p = 0.33$). Males had a slightly greater PM circumference, although this was not statistically significant (Males: 4.78 [1.04] cm; Females: 4.22 [0.96] cm; $p = 0.10$). Individuals with BMI <25 had similar SN circumferences to those with BMI >25 (BMI <25: 3.51 [0.60] cm; BMI >25: 3.58 [0.55] cm; $p = 0.72$). PM circumference showed greater variability by BMI category (BMI <25: 4.34 [0.99] cm; BMI >25: 4.96 [0.95] cm; $p = 0.08$).
Conclusion: This study is the first to use circumferential measurements of the piriformis muscle to better capture its three-dimensional structure. The relatively consistent dimensions of the SN, in contrast to the more variable PM, are consistent with previous findings and suggest the PM may play a larger role in the pathophysiology of PS. Therefore, it should continue to be a primary focus of physical therapy and OMT. When considering BMI, a weak inverse correlation between SN and PM in individuals with BMI >25 may indicate differing PS pathophysiology across BMI categories. The observed correlation of piriformis length with BMI and

pelvic width underscores the importance of considering body morphology as a whole, although its direct contribution to PS remains uncertain. These findings may aid in optimizing the locations of local injections, surgical incisions, or other interventions targeting this region.

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Informed Consent: Informed consent not required.
Ethical Approval & IRB and/or IACUC Approval: The project was reviewed and approved by the KCU IBC.
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★**Poster No. *B-4**
Abstract No. 2025-028
Category: Basic Science
Research Topic: Chronic Diseases & Conditions

The Effect of MEHP on Macrophage Cells and Their Direct and Indirect Effect on Leydig Cell Steroidogenesis

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Context: Phthalates, such as di-(2-ethylhexyl) phthalate (DEHP), are widely used industrial plasticizers present in numerous consumer products. Human exposures to phthalates are both extensive and continuous [1]. Once in the body, DEHP is metabolized into its bioactive form, mono-(2-ethylhexyl) phthalate (MEHP), which has been detected in various biological fluids including blood, urine, saliva, placenta, and amniotic fluid. MEHP is known to accumulate in tissues and has raised significant concern due to its potential to disrupt hormonal systems, particularly those involved in reproductive and metabolic regulation [2,3].

The research findings presented here underscore the capacity of MEHP to influence Leydig cell steroidogenic function both directly and indirectly, primarily through modulation of immune responses that contribute to endocrine disruption. These findings support the osteopathic principle that the body operates as an integrated whole, where disturbances in one system can affect others. By examining how immune-mediated responses to environmental chemicals impact hormone-producing cells, this work advances a more holistic understanding of the mechanisms underlying endocrine and inflammatory diseases.

Objective: In this study, we use RAW 264.7 macrophages and MA-10 Leydig cells to investigate how MEHP influences the cross-talk between immune cells and the male reproductive system. Specifically, the study addresses three central questions: (1) How does MEHP, the primary metabolite of DEHP, promote the pro-inflammatory phenotype in RAW 264.7 macrophages? (2) In what ways does TNF-α, released by activated macrophages, affect Leydig cell steroidogenic function, particularly the expression of the steroidogenic acute regulatory (STAR) protein and mitochondrial cholesterol translocation? (3) What are the underlying mechanisms by which MEHP activates inflammatory signaling pathways in RAW macrophages?

Methods: The RAW 264.7 cell line was obtained from the American Type Culture Collection (ATCC® TIB-71™). MA-10 mouse Leydig tumor cells were generously provided by Dr. Mario Ascoli (University of Iowa). The cell metabolism was analyzed using the Agilent Seahorse XF HS Mini Extracellular Flux Analyzer using Real-time ATP production rate assay kit on RAW 264.7 macrophages and MA-10 mouse Leydig tumor cells following exposure to MEHP (0-300 mM) or DMSO (vehicle control) for 24 hours. Preparations of the cells and assay kits were done using manufacturer's instructions. Flow cytometry was also used to assess changes in mitochondrial reactive oxygen species (ROS) production in both cell lines following exposure to MEHP (0-300 mM) or DMSO (vehicle control) for 24 hours. For Progesterone quantification, Progesterone production in the supernatant was quantified by enzyme-linked immunosorbent assay (ELISA) using Enzo Life Sciences kit according to the instructions of the manufacturer.

All experiments performed were done in triplicates and presented as mean +/- standard error of the mean (SEM). Group differences were assessed using one-way analysis of variance (ANOVA), followed by the Tukey-Kramer honestly significant difference (HSD) post-hoc test to determine statistically significant differences between group means. Dose-response analyses were used to evaluate changes in ROS fluorescence (via flow cytometry DCF and MitoSOX Red staining), ATP production (via Seahorse assay), and steroidogenic protein expression in Leydig cells (via ELISA).

Results: MEHP exposure induced morphological changes in RAW 264.7 macrophages, including increased cell size and granularity, as observed by light microscopy and confirmed through flow cytometry. MEHP treatment also led to a dose-dependent increase in TNF-α secretion. At the highest tested dose (300μM MEHP), there was a 1.5-fold change in TNF-α compared to the control. This was also accompanied by elevated levels of intracellular and mitochondrial reactive oxygen species (ROS), as measured using DCF and MitoSOX fluorescence, respectively. The mean fluorescence intensity of the MitoSOX and the DCF analysis were both significant at the 100, 200, and 300μM concentrations. Furthermore, MEHP activated the p38 MAPK signaling pathway, linking oxidative stress to pro-inflammatory signaling. The TNF-α released by MEHP-activated macrophages significantly inhibited luteinizing hormone (LH)-stimulated progesterone production in MA-10 Leydig cells. This inhibition correlated with decreased expression of the steroidogenic acute regulatory (STAR) protein, a critical mediator of cholesterol transport into mitochondria for steroid biosynthesis, indicating an indirect mechanism by which MEHP impairs endocrine function. Mitochondrial function analysis revealed increased membrane potential but reduced ATP production and oxygen consumption rate in macrophages following MEHP exposure, suggesting a shift toward metabolic stress consistent with inflammatory activation. Collectively, these findings demonstrate that MEHP promotes inflammatory cytokine release by macrophages and the resulting TNF-α production disrupts steroid hormone production, highlighting the broader impact of phthalate exposure on both immune regulation and reproductive health.

Conclusion: Plastics are ubiquitous in post-industrial societies, and as plastics degrade, microplastics and other plastic-derived compounds can enter the human body, raising concerns about their potential harmful effects. Numerous studies have demonstrated the impact of MEHP and other microplastic-associated chemicals on various cell types and organs involved in endocrine and reproductive function. With fertility rates in decline and growing evidence linking plastic exposure to reproductive dysfunction, understanding the underlying mechanisms is critical for informing preventive strategies and therapeutic interventions.

The findings of this study provide novel insights into how MEHP modulates immune-endocrine interactions. Specifically, our data show that MEHP activates macrophages and promotes the release of pro-inflammatory cytokines, impairing steroidogenic function in Leydig cells. This work reveals both direct and indirect pathways by which MEHP exposure can disrupt hormonal balance and reproductive health.

Despite these significant findings, several limitations should be noted. The RAW 264.7 macrophage cell line, although widely used in vitro, does not fully replicate the complexity of primary macrophages in vivo. Additionally, the concentrations of MEHP used in this study, while useful for elucidating mechanistic pathways, may not accurately reflect environmentally relevant exposure levels or account for the cumulative effects.

Furthermore, this study used MEHP to assess cellular responses. In real-world environments, plastic degradation also releases micro- and nanoplastics, along with a variety of chemical additives. Based on preliminary data, we hypothesize that MEHP impairs succinate dehydrogenase activity, potentially contributing to mitochondrial dysfunction and oxidative stress. Future research should aim to confirm this by directly measuring succinate dehydrogenase activity. Additional studies should also incorporate primary immune cells, environmentally relevant plastic particulates, and mixed chemical exposures to better simulate the complex exposure landscape that influences reproductive and endocrine health.

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Poster No. B-5
Abstract No. 2025-021
Category: Basic Science
Research Topic: Chronic Diseases & Conditions

Physiologic Responses to Non-invasive Cervical vs. Auricular Vagus Nerve Stimulation – A Pilot Study

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Context: The body is capable of self-regulation and self-healing. Vagus nerve stimulation (VNS) may promote self-regulation and self-healing through its well-established effects on the autonomic nervous system [1], the immune system [2], on stress [3], and potentially through other mechanisms. Several non-invasive techniques for VNS are currently available, including transcutaneous auricular vagus nerve stimulation and transcutaneous cervical vagus nerve stimulation. Cervical VNS potentially activates efferent and afferent vagal nerve fibers, while auricular VNS activates the auricular branch of the vagus nerve, which is a purely afferent nerve. Therefore, the physiologic responses and clinical effects of cervical and auricular VNS may differ.
Objective: The objective of this study was to compare the physiologic responses to cervical vs. auricular VNS in young healthy study participants. Specifically, we assessed heart rate, blood pressure, and alpha and beta waves in the electroencephalogram (EEG).
Methods: This study was approved by the Institutional Review Board of Burrell College of Osteopathic Medicine (IRB# 0165_2025) and all study participants provided informed written consent. The study was designed as a randomized controlled trial. Study participants (n=13) were recruited from the local Las Cruces, NM area. Inclusion criteria included: Age 18 to 40 years and both sexes. Exclusion criteria included: Pregnancy or nursing mothers; cardiac conditions (e.g., cardiac arrhythmia, heart failure, coronary artery disease); chronic diseases (e.g., hypertension, diabetes, rheumatic conditions); acute illnesses (e.g., fever, common cold, etc.); use of prescription medications other than contraceptives; any condition that may interfere with the experimental protocol. Volunteers were randomly assigned (by rolling a die) into one of three experimental groups: (1) time control group (no intervention); (2) cervical VNS; and (3) auricular VNS. The experimental protocol consisted of a 30min baseline recording, followed by 18 minutes of either cervical VNS, auricular VNS, or no intervention (time control group) and 15 minutes of recovery. Cervical VNS was conducted using the Pulsetto device (https://pulsetto.tech/, Vilnius, Lithuania). Stimulation parameters were: bilateral cervical stimulation at 25 Hz and 100 μs pulse width. For auricular VNS a bipolar clip electrode was attached to the tragus of the right ear. The electrode was connected to a TENS unit (EMS 7000 or EMS 7500, Current Solutions, LLC, Austin, TX). The stimulation parameters were: unilateral auricular stimulation at 10 Hz and 300 μs pulse width. For cervical and auricular VNS, the stimulation current was slowly increased until a mild tingling sensation was experienced that was not associated with pain. For cervical VNS the stimulation current was below 40 mA. For auricular VNS the stimulation current was between 2 and 3 mA. Throughout the experimental protocol, the electrocardiogram (ECG), arterial blood pressure (Finapres, Model 2300 BP Monitor, Ohmeda, Madison, WI), and a single-channel EEG (NeuroSky Mindwave Mobile 2, NeuroSky Inc., San Jose, CA) were recorded continuously. Heart rate was derived from the ECG, systolic, mean, and diastolic blood pressure were derived from the Finapres signal, and the alpha and beta waves were derived from the EEG signal using the HemoLab software [4]. We did not consider delta, theta, and gamma waves for this study, because delta and theta waves are only relevant during sleep, while our participants were conscious and because gamma waves are representative of high brain activity associated with heightened cognitive processing, which was not part of our study protocol. Data are presented as means±standard error of the mean (SEM). Two-way Analysis of Variance (ANOVA) with the groups as independent and the time (baseline, stimulation, recovery) as repeated measures was used for statistical analysis. A P-value of less than 0.05 was considered statistically significant, p-values between 0.05 and 0.10 were considered trends. Differential cardiovascular and cerebral responses to VNS compared to the time control group may potentially enhance self-regulation of homeostatic functions through VNS.
Results: Study participants (3 male, 10 female) were in the overweight range (BMI: 27.3±1.0 kg/m2) and 27.1±1.3 years old. Mean blood pressure decreased during cervical VNS (95.2±3.2 mmHg at baseline to 84.6±3.1 mmHg during

stimulation, n=5, P=0.05) but not in the time control or auricular VNS groups. No significant changes in heart rate were observed in any group. The amplitude of alpha waves in the EEG increased significantly in the cervical VNS group (0.71±0.08 arb. units at baseline vs. 0.86±0.07 arb. units, n=5, P=0.02) but not in the auricular VNS or time control groups. No significant changes were observed for EEG beta waves in any group.

Conclusion: Cervical VNS caused a substantial decrease in blood pressure, indicating perturbation of homeostatic functions which may potentially support the self-regulatory capacity of the body. The lack of a blood pressure response to auricular VNS may be due to the unilateral vs. bilateral stimulation and the absence of a direct activation of efferent vagal nerve fibers. Importantly, the EEG showed an increase in alpha waves with cervical VNS, indicating a more relaxed and calm state, which may contribute to the decrease in blood pressure through reduced sympathetic activity. The absence of any physiological responses to auricular VNS in our pilot study may be related to the site of stimulation at the tragus which may be less densely innervated by the auricular branch of the vagus nerve than the cymba conchae that has also been used for auricular VNS. Currently, the study is still ongoing, and the number of research participants is on the low site, limiting the statistical power of our study. Nevertheless, our preliminary data supports the idea that bilateral combined afferent and efferent cervical stimulation is capable of eliciting more pronounced physiologic responses than unilateral afferent auricular VNS.

All authors contributed equally to this work.

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Informed Consent: This study was approved by the Institutional Review Board of Burrell College of Osteopathic Medicine (IRB# 0165_2025) and all study participants provided informed written consent.

Ethical Approval & IRB and/or IACUC Approval: This study underwent full review and was approved by the Institutional Review Board of Burrell College of Osteopathic Medicine (IRB# 0165_2025).

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Poster No. *B-6

Abstract No. 2025-060

Category: Basic Science

Research Topic: Acute and Chronic Pain Management

Comparative Efficacy of Anesthesia Versus Osteopathic Manipulative Treatment for Pain Outcomes in Postpartum Women: A Systematic Review and Meta-Analysis

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Context: Pain following cesarean section (C-section) and vaginal delivery is a common complication due to surgical scars and the healing process. The current standard to manage pain following childbirth includes a multimodal analgesic approach which requires the use of long-acting neuraxial opioids and adjunct drugs [1]. While many women who give birth opt to receive epidural anesthesia, a significant number of women prefer a drug-free labor process that includes osteopathic manipulative treatment (OMT). Current literature focuses on the use of anesthetics and OMT as two separate entities to mitigate postpartum pain. However, existing literature lacks a comprehensive analysis of the role of anesthetics compared to the role of OMT in the effectiveness of reducing postpartum pain in C-section and vaginal delivery patients.

Objective: To determine whether there is a significant difference in Visual Analogue Scale (VAS) scores of pain experienced in C-section patients who receive anesthesia compared to C-section and vaginal delivery patients who receive OMT.

Methods: A systematic review and meta analysis of four databases (PubMed, JAOA, Google Scholar, and Cochrane Library) was completed following the PRISMA 2020 guidelines. Study types selected for analysis included randomized controlled trials (RCTs) and cohort studies. The inclusion criteria consisted of studies that utilized the Visual Analogue Scale for pregnant patients who received either local anesthesia or OMT as options for pain relief. Patients who received local anesthesia were further narrowed to C-section delivery, whereas OMT included both C-section and vaginal delivery. VAS scores were specifically analyzed at 24 hours postpartum. Of the 167 studies screened, 8 studies and 569 patients satisfied the criteria. Statistical analyses were conducted using R (version 4.3.0, 2023), and a random-effects meta regression model was conducted to compare mean VAS scores in order to account for between-study heterogeneity.
Results: The pooled random-effects mean VAS scores among pregnant patients following administration of anesthesia (n = 334) and OMT techniques (n = 225) were 2.10 (95% CI 0.98, 3.22) and 2.84 (95% CI 2.23, 3.45), respectively. Using the random-effects meta regression model to account for heterogeneity ($\tau 2 = 1.11$), the predicted mean VAS scores was 2.10 (95% CI 1.18, 3.02) after administration of anesthesia and 2.88 (95% CI 1.96, 3.80) after implementation of OMT. VAS scores in the OMT group were 0.78 points higher than the anesthesia group (β coefficient = 0.78; 95% CI -0.62, 2.18; p = 0.23) which was not a statistically significant difference.
Conclusion: Labor pain is among the most severe types of physical pain that women may experience in their lifetime [2]. While epidural anesthesia is considered the most effective method of pain relief during labor, the findings of our study indicate that there is no statistically significant difference in pain reduction between anesthesia and OMT techniques following childbirth, thus offering a possible alternative to efficiently manage postpartum pain. A limitation to this study included the lack of existing data on patients who received OMT after C-section (n = 22). Therefore, it was necessary to analyze both C-section and vaginal deliveries for OMT patients. More studies on OMT patients who had C-sections are necessary to further support the findings in this study.

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Informed Consent: N/A
Ethical Approval & IRB and/or IACUC Approval: Systematic reviews and meta-analyses are deemed exempt from the IRB review process.
Support: None reported.
Financial Disclosures: None reported.

Poster No. *B-7
Abstract No. 2025-023
Category: Basic Science
Research Topic: Chronic Diseases & Conditions

Physiologic Responses to Postural Changes, Autonomic Maneuvers of Ice-Cold Water Imbibement – A Pilot Study

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Context: In our previous survey study, patients with paroxysmal atrial fibrillation (pAF) reported self-management strategies used in their home setting to terminate pAF episodes. These strategies included postural changes, autonomic maneuvers, and ice-cold fluid imbibement, among others. In alignment with the 2nd osteopathic tenet, applying these self-management strategies may have activated their inherent self-regulatory and self-healing mechanisms to ultimately convert their paroxysm into sinus rhythm. It is currently unknown, which exact physiologic mechanisms are activated by the patient-reported self-management strategies and how such physiologic mechanisms can contribute to the conversion of pAF to sinus rhythm. Thus, we investigated the physiologic responses to postural and an autonomic maneuver and to imbibement of ice-cold fluid.
Objective: The long-term goal of our study is to develop effective and safe self-management strategies to convert pAF into sinus rhythm in the patient's home setting. The specific objective of this study was to unravel the physiologic responses to postural changes (lying on left or right side, raising legs), autonomic maneuvers (diving response), and ice-cold fluid imbibement. Specifically, we assessed the responses of heart rate, arterial blood pressure, stroke volume,

cardiac output and total peripheral vascular resistance to these interventions. Once these physiologic responses are better understood, effective and safe self-management strategies may be developed.

Methods: This study was approved by the Institutional Review Board of Burrell College of Osteopathic Medicine (BURRELL IRB 0164_2025) and all study participants provided written informed consent. The study was designed as a randomized trial with a repeated measures design. Young and healthy adult study participants (n=14) were recruited from the local Las Cruces, NM region. Inclusion criteria were: 18 to 40 years of age; both sexes. Exclusion criteria were: pregnancy or nursing mothers; cardiac conditions (e.g., cardiac arrhythmia, heart failure, coronary artery disease); other chronic conditions (e.g., hypertension, diabetes, rheumatic conditions); acute illnesses (e.g., fever, common cold, etc.); use of prescription medications other than contraceptives; any condition that may interfere with the experimental protocol. Study participants were randomly assigned (rolling a die) into three groups: (1) postural interventions; (2) diving response; (3) ice-cold fluid imbibement. Some subjects were enrolled in multiple groups separated by a minimum of two nights. Experiments for all three groups were performed in the supine position. Participants were asked to keep their eyes open and not to fall asleep. A 30-min baseline recording preceded the interventions of the respective groups. For group 1 (postural interventions), participants were positioned in the right or left lateral decubitus position, or lying on their backs with their legs raised on a leg wedge (height of the wedge 20 cm) for 10 minutes each in a randomized order. For group 2 (diving response), participants wore an ice-cold face mask (ZNÖCUETÖD, http://Amazon.com) while performing three inspiratory breath holds (for as long as they were able to) separated by 3-min rest periods. For group 3 (ice-cold fluid imbibement) participants drank 500 mL of ice-cold water as fast as they comfortably could. Thereafter study participants were followed up for 30 minutes. Volunteers were instrumented with four spot electrodes (right mastoid process, suprasternal notch, xyphoid process, medial to the left midclavicular line 5 cm below the xyphoid process) for impedance cardiography (Minnesota Impedance Cardiograph Model 304B) and a cuff on a left-handed digit (middle, index, or ring finger) for recording of arterial blood pressure (Finapres, Model 2300 BP Monitor, Ohmeda, Madison, WI). The impedance cardiograph provided the electrocardiogram (ECG) together with the electrical impedance (Z0), the change in electrical impedance (ΔZ), and the first derivative of ΔZ (ΔZ/dt). The Sramek-Bernstein equation [1] was used to calculate stroke volume (SV). Cardiac output (CO) was determined by SV times heart rate (HR, derived from ECG) and total peripheral resistance (TPR) was determined by mean blood pressure (MBP) divided by CO. Data were acquired and analyzed using the freely available HemoLab software [2]. Data are presented as means±standard error of the mean (SEM). One-way repeated measures analysis of variance (ANOVA) was conducted to compare hemodynamic parameters at 3 time points during the baseline recording (0-10 min, 10-20 min, 20-30 min) with 3 time points during the interventions (group 1: left, right, leg raising; group 2: three consecutive breath holds; group 3: (0-10 min, 10-20 min, 20-30 min following drinking). Statistical significance was assumed for $p<0.05$; trends were assumed for 0.05

Results: Systolic blood pressure increased with leg raising (121.8±4.3 mmHg at baseline vs. 139.4±7.2 mmHg, n=8, P=0.02), the diving response (121.9±3.0 mmHg at baseline vs. 136.1±5.0 mmHg, n=8, P=0.03), and ice-cold water imbibement (115.9±7.3 mmHg at baseline vs. 138.6±8.5 mmHg, n=6, P=0.03). Heart rate did not change significantly in response to any intervention in any group. The diving response significantly increased SV (64.9±8.3 mL at baseline vs. 111.3±5.5 mL, n=5, P=0.002) and CO (3.9±0.4 L at baseline vs. 6.4±0.4 L, n=5, P=0.002) and decreased TPR (23.9±2.4 mmHg*min/L at baseline vs. 15.7±1.5 mmHg*min/L, n=5, P=0.02). The left and right lateral decubitus positions tended to decrease SV (93.8±6.1 mL at baseline vs. 76.5±4.9 mL left [P=0.07] and 78.6±8.2 mL right [P=0.10], n=5) and CO (6.1±0.7 L at baseline vs. 4.7±0.3 L right [P=0.20] and 4.9±0.6 L left [P=0.13], n=5) and tended to increase TPR (14.4±1.1 mmHg*min/L vs. 18.6±1.1 mmHg*min/L left [P=0.05] and 18.6±2.2 mmHg*min/L right [P=0.06], n=5). Ice-cold water imbibement tended to increase TPR (18.7±1.6 mmHg*min/L at baseline vs. 24.5±3.6 mmHg*min/L, n=5, P=0.10). No adverse effects have been observed to any of the interventions.

Conclusion: We observed substantial hemodynamic responses to interventions used by patients with pAF in an attempt to revert paroxysms into sinus rhythm. These hemodynamic responses may activate intrinsic self-regulatory and self-healing mechanisms potentially contributing to the conversion of pAF. Mechanisms contributing to the conversion of pAF may include activation of atrial stretch receptors by changes in cardiac preload, activation of baroreceptor and cardiopulmonary receptor reflexes leading to changes in the autonomic innervation of the atria potentially affecting conduction velocity and refractory period of atrial myocytes. The results of our study provide a strong rationale for testing the effectiveness of some of these interventions in patients with pAF.

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Informed Consent: This study was approved by the Institutional Review Board of Burrell College of Osteopathic Medicine (BURRELL IRB 0164_2025) and all study participants provided written informed consent.
Ethical Approval & IRB and/or IACUC Approval: This study underwent full IRB review by the Burrell College IRB and was approved. The IRB approval number (BURRELL IRB 0164_2025).
AOA Grant Number: 19137759
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Financial Disclosures: None reported.

★**Poster No. *B-9**
Abstract No. 2025-053
Category: Basic Science
Research Topic: Chronic Diseases & Conditions

Atherosclerosis of the Heart, Head, and Gut: No Vessel is Safe

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Context: Atherosclerosis describes the pathologic process of artery lumen narrowing due to the buildup of plaque within the vessel wall. This commonly affects the carotid and coronary arteries, leading to ischemic heart disease and stroke. According to the Centers for Disease Control and Prevention, heart disease and stroke were listed as the first and fourth leading causes of death in the United States in 2023.^1 The process of atherosclerosis is a generalized process affecting all vascular beds (such as renal artery, coronary artery, peripheral artery, *etc.*). However, variability of sequence and severity of affect at various sites exists.^2,3 Multiple studies aiming at defining and delineating the relationship of atherosclerosis in different sites of the body and risk for morbidity and mortality have been published.^4 Further investigating the relationship of multivessel atherosclerosis in post-mortem patients can enhance understanding of disease progression and guide screening recommendations.
Objective: To determine the association between carotid and left anterior descending artery atherosclerosis and the presence of stenosis in the celiac trunk and superior mesenteric artery.
Methods: Samples from the left and right common carotid (CC) artery, the celiac trunk (CT), the superior mesenteric artery (SMA), and the left anterior descending were evaluated from sixteen female and fifteen male cadavers aged 58 to 96 years. Thirty-one cadavers - 30 of Caucasian descent and one African American - were examined. Because of prior treatment with stents, the left anterior descending (LAD) artery could not be examined in two donors. Gross and microscopic evaluation of the degree of stenosis was performed. Approximately 3mm segments were taken from each artery. Samples from the left and right CC arteries were taken from the most distal aspect at the bifurcation between the internal and external carotid to 3mm proximal. The LAD was taken proximally at the point where the LAD branches off the left coronary artery and 3mm distally before the first septal branch. The celiac trunk was cut proximally off the abdominal aorta. The sample was then taken from the free end of the celiac trunk to 3 mm distally. The SMA was cut directly off the abdominal aorta. The sample was taken from the free end of the SMA to 3 mm distally. The gross degree of atherosclerosis was examined visually within each vessel's lumen. For microscope analysis, hematoxylin and eosin staining was also performed on the samples. The percentage of vessel occlusion for each lumen was visualized under the microscope and recorded. Additionally, the presence of calcifications was observed and noted. Descriptive and statistical results were evaluated with SPSS Version 29.0.2.0.
Results: Atherosclerosis was found across multiple vessels. An independent T-test evaluated the degree of atherosclerosis in gross versus microscopic data. With no statistical difference between the method type and each vessel, microscopic data were used for descriptive and statistical results. Atherosclerosis was most commonly found in the LAD, affecting 72% of cadavers, followed by the right CC in 71% of cadavers, the left CC in 52% of cadavers, the SMA in 48% of cadavers, and the CT in 23% of cadavers. Of these cadavers with microscopic stenosis, the site with the greatest average percentage of occlusion was the LAD at 57%, followed by the SMA at 37%, the CT at 34%, the left CC at 30%, and the right CC at 29%. An ANOVA analysis of all vessels comparing their percentages of occlusion then revealed no statistical difference between the carotid arteries and the SMA and CT, between the LAD and right CC, and between the LAD and SMA. This data validates similar amounts of

stenosis throughout these vessels. Additionally, intraluminal calcifications were found in approximately 78% of all vessels with microscopic stenosis. This finding can aid in disease visualization during screening procedures.

Of the ten cadavers that had any degree of stenosis in the LAD and carotid arteries, 30% of cadavers also had stenosis in the CT. Of the ten cadavers that had any degree of stenosis in the LAD and carotid arteries, 50% of cadavers also had stenosis in the SMA. With the presence of multi-vessel disease, a correlation analysis was conducted to analyze how much stenosis is expected between the vessels and if the effect is consistent.

The correlation analysis was conducted between the percentage of microscopic lumen narrowing for each vessel type from the 29 donors, in which all vessels were analyzed. There was a significant and moderate correlation between the following:

- Left CC and LAD: Pearson correlation 0.433 and significance (2-tailed) < 0.019
- Left CC and CT: Pearson correlation 0.613 and significance (2-tailed) <0.001
- Left CC and SMA: Pearson correlation 0.375 and significance (2-tailed) <0.045
- LAD and Right CC: Pearson correlation 0.413 and significance (2-tailed) <0.026
- LAD and CT: Pearson correlation 0.478 and significance (2-tailed) <0.009
- LAD and SMA: Pearson correlation 0.371 and significance (2-tailed) <0.047

The CT and SMA had a large and significant correlation with a Pearson correlation of 0.764 and the two-tailed significance of <0.001. This multivariate correlation demonstrates that the stenosis is consistently and positively increasing in both vessels.

Conclusion: This study demonstrates the concern of atherosclerosis not only in the LAD and carotids but also in the celiac trunk and SMA. While this study found atherosclerosis to be more frequent in the LAD and right CC, atherosclerosis creates similarly sized luminal obstructions throughout the vessels analyzed. The correlation analysis further verified the interrelatedness of the vessels. Therefore, Despite the LAD having significantly higher degrees of stenosis compared to the left CC and the CT, the correlation analysis demonstrated a significant and moderate correlation, indicating a consistently positive relationship of stenosis. Therefore, atherosclerotic disease in either the LAD or left CC implies the presence and increased progression of stenosis in the CT and SMA, and vice versa. With the gross and microscopic data showing no statistical difference, methods such as ultrasound can be used to accurately visualize the amount of atherosclerosis. Screening methods to visualize calcium deposits in these regions may also aid in disease management, since the majority of all atherosclerotic vessels also have calcium deposits. These findings indicate that symptomatic disease in the LAD, carotid arteries, celiac trunk, or SMA may be a precursor for another atherosclerotic episode in the remaining vessels.

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Informed Consent: Per the Kansas City University Gift Body Program Certificate for Bequeathal, the donor and family agree that their body is bequeathed for medical and/or research such as the medical institution shall decide.

Ethical Approval & IRB and/or IACUC Approval: This study was approved by Kansas City University's Institutional Biological Safety Committee (IBC) for cadaveric based research. Material needed for submission included an annual initial/renewal IBC application; a personnel add packet for each investigator including a CV, a lab-specific training documentation form, and CITI trainings; a financial conflict of interest disclosure form for each research personnel, and approved Student Research Activity Application for any student except for Anatomy Fellows. The approved IBC number is 2148736-4.

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Poster No. *B-11

Abstract No. 2025-056

Category: Basic Science

Research Topic: Health Disparities/Social Determinants of Health

The Nose Knows: Gene Expression in the Olfactory Bulb Reveals Molecular Clues to Alzheimer's Progression

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Context: Alzheimer's Disease (AD) is the leading cause of dementia in older adults and is pathologically defined by extracellular amyloid-beta (Aβ) plaques and intracellular neurofibrillary tau tangles. In addition to these hallmark features, recent studies have emphasized the role of impaired adult neurogenesis and disrupted neural stem cell renewal in AD, particularly within the olfactory system—an area associated with early sensory decline in the disease. One gene of growing interest is Activity-Dependent Neuroprotective Protein (ADNP), a chromatin remodeler that functions as a transcription factor involved in microtubule stabilization, synapse formation, and neuronal survival. Mutations in ADNP are linked to neurodevelopmental and neurodegenerative disorders, including autism spectrum disorders, ADNP syndrome, and AD.

Objective: This study investigates whether differences in ADNP expression—or broader transcriptomic changes in the olfactory bulb—contribute to the distinction between early-onset and late-onset AD.

Methods: Data were obtained from the Gene Expression Omnibus (GEO; GSE113524) and included postmortem olfactory bulb RNA-seq data from 39 elderly donors: 20 controls, 9 early-onset AD patients (≤73 years), and 10 late-onset AD patients (>73 years). While the age cutoff used does not reflect the strict clinical definition of early-onset AD (≤65 years), the chosen threshold ensured a clear age gap between the groups and helped stratify the samples effectively. RNA sequencing was conducted using Illumina HiSeq 2500. Data were analyzed using Partek Genomics Suite, applying workflows for transcript-level splicing, differential gene expression (DGE) via ANOVA and Gene Set Analysis (GSA), and gene ontology enrichment. ADNP expression was specifically examined, and additional analysis included heat mapping, Venn diagrams, mutation frequency breakdowns, and 3D protein structure modeling using Phyre[2], PyMOL, and UniProt FASTA sequence Q9H2P0.

Results: Alternative splicing analysis revealed no significant differences in ADNP transcripts between early- and late-onset AD groups. Broad transcriptome analysis also yielded no significant changes in ADNP gene expression compared to controls. Consequently, ADNP was ruled out as a distinguishing molecular feature between onset groups in the olfactory bulb.

However, whole-transcriptome differential expression analysis revealed 137 genes significantly altered at $p < 0.01$. At this high-confidence threshold, no genes were shared between early- and late-onset AD groups. A Venn diagram demonstrated that 90 early-onset genes and 47 late-onset genes were uniquely altered compared to controls. When the threshold was relaxed to $p < 0.05$, the number of differentially expressed genes rose substantially: 662 in early-onset, 290 in late-onset, and 45 genes shared between both groups. A heat map revealed that early-onset AD subjects displayed greater upregulation of gene expression overall when compared to late-onset subjects, which may reflect a more aggressive or mutation-driven pathology in younger individuals.

Gene Ontology enrichment analysis of early-onset AD genes indicated that the most significantly affected biological functions were DNA polymerase activity (POLE, POLN) and cell fate determination (PTCH2, DLL1). These pathways may suggest a mechanism of increased mutational load or genomic instability in younger-onset AD. In late-onset AD, altered functions included regulation of signaling receptor activity (MTRNR2L11, SHISA6) and glutamate receptor clustering (SHISA6), both of which are critical for synaptic function and age-related neuroplasticity.

Shared genes between early- and late-onset AD (n=45) were enriched for functions such as negative regulation of stress granule assembly (STYXL1) and positive regulation of apoptotic cell engulfment (ABCA7). Downregulation of STYXL1 may lead to pathological stress granule formation, which has been implicated in AD and other protein-aggregation diseases. Likewise, under-expression of ABCA7, a known AD risk gene, may impair clearance of apoptotic cells, resulting in chronic inflammation and neurodegeneration.

A 3D protein model of ADNP (Figure 5) was constructed to contextualize its structure-function relationships. The model, based on 65% of residues at >90% confidence, revealed a DNA-binding homeobox domain, nine zinc finger domains, and the neuroprotective NAP peptide sequence—highlighting ADNP's extensive role in transcriptional regulation and neuroprotection.

Conclusion: Several limitations must be acknowledged. First, the sample size (n=39) is relatively small, particularly when divided across three subgroups, which limits the statistical power and generalizability of our findings. Second, the use of olfactory bulb tissue—while relevant due to early anosmia in AD—may not reflect the full extent of disease-related changes occurring in more canonical regions such as the hippocampus or cortex. Third, the use of bulk RNA sequencing prevents analysis of cell-type-specific expression changes, which could obscure important molecular signatures. Lastly, our age cutoff for early-onset AD (≤73 years) was a pragmatic choice to ensure sample separation but does not reflect clinical consensus definitions. Despite these constraints, this study provides one of the first transcriptome-wide comparisons of early- and late-onset AD in the olfactory bulb and offers new directions for understanding the molecular heterogeneity of AD.

Despite the known correlation between ADNP mutations and AD, our transcriptome-level analysis revealed no significant expression or splicing differences in olfactory bulb samples across AD onset groups. This suggests that ADNP dysregulation may occur in other regions of the brain—such as the hippocampus or primary olfactory cortex—or act through post-transcriptional mechanisms. Nevertheless, transcriptome-wide analysis revealed meaningful molecular distinctions between early- and late-onset AD. Early-onset AD may involve more widespread transcriptional dysregulation and mutagenic pathways, possibly requiring more aggressive genetic insults to manifest disease at a younger age. In contrast, late-onset AD may be characterized by a subtler, progressive decline in regulatory and synaptic maintenance mechanisms tied to aging.

The identification of distinct and shared gene expression profiles and functional pathways suggests that therapeutic targets for AD may need to be tailored by age of onset. Furthermore, the observed differences support the hypothesis that early- and late-onset AD are not only temporally but mechanistically distinct subtypes of the same disease.

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Informed Consent: All of the publicly available data provided informed consent previously from their respective organizations.

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Poster No. *B-12

Abstract No. 2025-029

Category: Basic Science

Research Topic: Chronic Diseases & Conditions

Rotavirus Induced Alterations in Cellular Metabolism of MA104 Cells: Insights from Agilent Seahorse on ATP Production and Glutamine Catabolism

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Context: Rotavirus is one of the most common causes of diarrheal disease in infants and young children. Rotavirus vaccination has reduced the number of mortalities especially is the United States (1). However, the virus remains a significant cause of morbidity worldwide, especially in low- and middle-income countries. Rotavirus infection causes structural and conformational changes within the cell that ultimately disrupts homeostasis. Rotavirus infection demonstrates the osteopathic tenet of the interdependence of structure and function. Understanding how viral infection affects cellular functions could help us find new strategies to reduce disease severity especially where vaccination coverage is limited. In addition, this research could help point us to targeted antiviral treatments and provide better management for the disease. Previous research found that rotavirus utilizes glutamine catabolism to aid in its replication during late infection (2). There is a gap in knowledge of cellular metabolism during early infection. The Agilent Seahorse is able to determine shifts in cellular metabolism in real-time. The data output can be used to investigate how infection changes metabolism. By understanding the time-points of metabolic rewiring that is caused by rotavirus replication, inhibitors or nutrient restriction strategies could be explored as adjunct therapeutic options. This could lead to possible reduced times of infection and better health outcomes.

Objective: Viruses invade eukaryotic cells and initiate replication by hijacking the host cell's machinery to synthesize viral proteins and genetic material (3). By redirecting host resources, viruses can alter normal cellular processes, including metabolism. This project aims to investigate how rotavirus infection affects cellular metabolism at various stages of its replication cycle, with a particular focus on ATP production and nutrient utilization. Our investigation sought to determine how the stress of infection on the cell affects metabolism and viability rate of the cell.

Methods: Metabolic Analysis of mock infected and infected MA104 cells (simian kidney cell line) was done using the Agilent Seahorse XF HS Mini Extracellular Flux Analyzer with real-time ATP production rate and glutamine oxidation assay kits. MA104 cells were infected with SA11-4F (simian rotavirus strain) at a multiplicity of infection (M.O.I.) of five. Preparations of the cells and the assay kit were done using the manufacturer's instructions in triplicate reactions. Similar protocols were followed when conducting the glutamine catabolism assay to determine the extent of glutamine consumption during stages of infection. The Agilent Seahorse Analytics Program allows us to analyze the data to determine the significance between the control and the experimental data. The analytics program was used for all seahorse data. Cytoplasmic ATP production versus mitochondrial ATP production was calculated based on the oxygen consumption rate and extracellular acidification rate.

Results: The Seahorse data showed an increase in glycolytic ATP production in infected cells (104.77 pmol/min) in comparison to non-infected cells (32.01 pmol/min) at three hours post infection. The production of ATP in the mitochondria does not seem to dramatically increase. However, at three hours post infection there was an increase in total ATP production in the infected cells in comparison to the non-infected cells. At five hours post infection there was a decrease in glycolytic and mitochondrial ATP production in infected cells (65.9 pmol/min) versus non-infected (109.5 pmol/min). ATP production was calculated based on oxygen consumption rate and the extracellular acidification rate at 0, 10, 20, 30, 40 and 50 minute time points.

Conclusion: Rotavirus is a double-stranded RNA virus and does its replication in the cytoplasm making it plausible for cytoplasm ATP to increase in the cell because replication is actively occurring. This research provides more insight into rotavirus and its effects on host cell metabolism, particularly in terms of ATP production and nutrient utilization. The observed increase in glycolytic ATP production during early infection suggests that rotavirus may shift cellular metabolism toward glycolysis since replication is actively occurring in the cytoplasm. There is evidence of glutamine catabolism during late infection in the eukaryotic cell (2). Our findings support this hypothesis that rotavirus exploits specific host cell metabolic pathways to aid in its replication. Our data may indicate that ATP production via glycolysis is important for establishment of rotavirus infection and rewires pathways toward glutamine catabolism later in infection for assembly and release. These insights may contribute to the development of targeted interventions that limit viral replication, improve recovery outcomes, and reduce the severity of rotavirus-related disease, especially in vulnerable pediatric populations.

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Informed Consent: Not relevant
Ethical Approval & IRB and/or IACUC Approval: This project did not use human or animal subjects.
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★**Poster No. *B-13**
Abstract No. 2025-030
Category: Basic Science
Research Topic: Chronic Diseases & Conditions

The Synergistic Effect of MEHP and Nanoplastics on RAW 264.7 Macrophage Cells

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Context: Phthalates, such as di-(2-ethylhexyl) phthalate (DEHP), are chemical additives used in the manufacturing of plastic to enhance flexibility, durability, and elasticity in everyday consumer products. Since DEHP is not chemically bound to the plastic polymer, it can leach into the environment over time, especially as plastic materials degrade. During this degradation process, plastics can also release microplastic and nanoplastic particles, ranging in size from less than 100 nanometers to several micrometers, which, along with DEHP, contribute to human exposure through ingestion, inhalation, and dermal absorption. Once in the body, DEHP is metabolized into its bioactive form, mono-(2-ethylhexyl) phthalate (MEHP), which has been detected in human amniotic fluid, placenta, urine, blood, and saliva [1]. Both phthalates and plastic particles have been shown to penetrate certain cell types and accumulate in various tissues and organs, raising significant concerns due to their endocrine-disrupting potential and implications for reproductive and systemic health.

Macrophages, essential components of the innate immune system, play a critical role in regulating testicular function, including the support of Leydig cell steroidogenesis. In response to environmental toxicants like MEHP, macrophages can be activated toward a pro-inflammatory state. MEHP has been reported to stimulate the release of pro-inflammatory cytokines, such as tumor necrosis factor-alpha (TNF-α) and interleukins, in the mouse macrophage RAW 264.7 cell line. This immune activation, particularly the increase in TNF-α, may impair Leydig cell function and suppress testosterone production, suggesting that phthalate exposure disrupts testicular endocrine activity through immune-mediated and inflammatory pathways [2,3].

This work highlights the importance of understanding environmental contributions to systemic inflammation and endocrine disruption—an area central to the osteopathic tenet that the body is a unit, and that structure and function are reciprocally interrelated. By uncovering immune-metabolic links between toxicant exposure and hormonal imbalance, we contribute to a more holistic approach to diagnosing and preventing environmentally mediated disease.

Objectives: This research focuses on how environmental toxicants interfere with immune and mitochondrial function at the cellular level. The central focus is on the effects of mono-(2-ethylhexyl) phthalate (MEHP)—a biologically active byproduct of the common plastic additive DEHP—in combination with nanoplastics on RAW 264.7 macrophage cells. The aim is to determine whether MEHP and nanoplastics alter mitochondrial activity by influencing membrane potential, increasing reactive oxygen species (ROS), and triggering a shift toward an inflammatory phenotype in these immune cells. To address this central question, we also examined the effects of MEHP and nanoplastics on RAW 264.7 cells individually. These investigations seek to uncover how both nanoplastics and plastic-derived chemical pollutants impair key aspects of macrophage function at the mitochondrial and immunological levels.

Methods: The RAW 264.7 cell line was obtained from the American Type Culture Collection (ATCC® TIB-71™). Flow cytometry was used to assess changes in mitochondrial reactive oxygen species (ROS) production in RAW 264.7 macrophages following exposure to MEHP, nanoplastics, or a combination of both. Cells were divided into three experimental groups per treatment condition and exposed to either MEHP (0-300 mM) for 24, 48 or 72 hours; nanoplastics (0-300 mM) for 24, 48, or 72 hours; or a combination of both.

After incubation, cells were analyzed for hydrogen peroxide and superoxide generation using DCFH-DA (2,7-dichlorodihydrofluorescein diacetate) or Thermo Fisher MitoSOX™ Mitochondrial Superoxide stain, respectively. Control and unstained groups for each treatment group were included to establish baseline levels.

MEHP and Nanoplastic effects on RAW 264.7 cell reactive oxygen species (ROS) generation were measured via flow cytometry after staining with either Thermo Fisher MitoSOX™ Mitochondrial Superoxide Indicator or DCF hydrogen peroxide generation detection stain.

The results of the flow cytometer were viewed and assessed through the corresponding computer application. The device was calibrated to unstained and control RAW 264.7 cells, and flow cytometry fluorescence counts were plotted and overlayed to view differences in superoxide and hydrogen peroxide generation between the groups of cells incubated with the varying concentrations of MEHP or Nanoplastics previously described.

Results: MitoSOX Red and DCF fluorescence results indicate a strong dose-dependent increase in ROS following MEHP treatment. The mean fluorescence intensity of the MitoSOX and the DCF analysis were both significant at the 100, 200, and 300μM concentrations. Notably, the 300μM concentration for DCF had a value of 250, compared to the control, which read at less than 50. In contrast, nanoplastics cause only a slight dose-dependent increase in ROS. The combination of MEHP and nanoplastics also results in a dose-dependent increase in ROS, though it is unclear whether this effect is due to MEHP alone or a synergistic interaction between the MEHP and nanoplastics.

Conclusion: This study examines how MEHP and nanoplastic exposure affect inflammation and ROS generation. As these environmental toxicants continue to increase and enter the human body, it is vital that their potentially harmful effects on different areas of human health are investigated. While we propose a mechanism by which MEHP and nanoplastics influence ROS levels, key limitations must be acknowledged. The term “nanoplastic” covers a wide range of materials—here, we utilized only polystyrene, which limits the scope of our findings. Other plastics like polyethylene and polypropylene, which are also commonly found in the environment, may behave differently due to their unique chemical properties.

Prior work suggests nanoplastics may indirectly transport hydrophobic toxins to lipophilic tissues—including endocrine and reproductive organs—via a Trojan-Horse-like mechanism. This pathway was not explored here but may be relevant for future research on macrophage-mediated ROS production. The RAW 264.7 macrophage cell line, although widely used in vitro, does not fully replicate the complexity of primary macrophages in vivo. Additionally, the concentrations of MEHP and nanoplastics used in this study, while useful for investigating the effects, may not accurately reflect environmentally relevant exposure levels or account for the cumulative effects from chronic exposure. These factors call for cautious interpretation and underscore the need for more ecologically valid models and broader chemical scope in follow-up studies.

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Abstract No. 2025-109
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Research Topic: Acute and Chronic Pain Management

Reduced Opioid Prescribing in Psoriasis Patients Treated With IL-23 and IL-17 Inhibitors Compared to Methotrexate: A Real-World Cohort Study

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Context: Chronic inflammatory conditions, such as psoriasis and psoriatic arthritis (PsA) are associated with debilitating pain often leading to increased opioid prescription. Methotrexate is a widely used systemic therapy, though inflammatory pathways most associated with disease-related pain are not directly targeted. In contrast, emerging biologics, particularly IL-23 and IL-17 inhibitors, have demonstrated superior efficacy and more targeted control of inflammation. The osteopathic emphasis on minimizing harm and promoting health through holistic, non-opioid-based strategies underscores the importance of identifying treatment approaches that alleviate pain while reducing opioid reliance. Chronic pain management through targeted immunomodulation supports the body's innate ability to heal and function optimally - key tenets of osteopathic medical practice. This study explores the opioid-sparing potential of biologics, highlighting an opportunity for osteopathic physicians to apply pharmacologic innovations in a manner consistent with whole-person care and structural-functional preservation in inflammatory disease (1-2).

Objective: To evaluate the association of IL-23 and IL-17 inhibitors with reduced opioid prescribing compared to methotrexate in patients with psoriasis and psoriatic arthritis using real-world electronic health record data.

Methods: A retrospective cohort study was conducted using the TriNetX Global Collaborative Network, analyzing de-identified data from 86 healthcare organizations. Adult patients with a diagnosis of psoriasis or psoriatic arthritis were identified via ICD-10-CM codes and grouped based on treatment with IL-23 inhibitors, IL-17 inhibitors, or methotrexate. Patients with prior opioid prescriptions were excluded. Propensity score matching (1:1) was performed to balance demographics and clinical covariates including age, sex, race, obesity, and smoking status. New opioid prescriptions within six months post-treatment initiation were compared across cohorts. Adjusted odds ratios (aORs) with 95% confidence intervals (CIs) and p-values were calculated to assess significance.

Results: A total of 27,548 IL-23, 34,639 IL-17, and 76,851 methotrexate-treated psoriasis patients were analyzed. In psoriasis, IL-23 inhibitors were associated with a significantly lower risk of new opioid prescriptions compared to methotrexate (aOR: 0.583; 95% CI: 0.499–0.682; p<0.0001), with reductions observed across most opioids including tramadol (aOR: 0.283), hydrocodone (0.404), and morphine (0.546). IL-17 inhibitors showed modest but significant reductions (aOR: 0.824; 95% CI: 0.697–0.974; p=0.0233). In psoriatic arthritis patients, IL-17 inhibitors produced the most pronounced opioid-sparing effect (aOR: 0.686; 95% CI: 0.620–0.759; p<0.0001), with similar trends across opioid types. Methadone and buprenorphine differences were not statistically significant in any group.

Conclusion: These findings suggest that IL-23 and IL-17 inhibitors may have an opioid-sparing effect in clinical practice, which has implications for managing chronic pain in inflammatory skin and joint disease. However, causality cannot be inferred, and further prospective research is warranted to explore these associations (2-3). The potential to reduce opioid reliance aligns with osteopathic principles that emphasize whole-person care and non-opioid pain management strategies. By integrating pharmacologic advancements with individualized, holistic approaches to chronic disease, osteopathic clinicians may be uniquely positioned to mitigate opioid exposure while improving quality of life in patients with chronic inflammatory conditions (4-5). Moreover, this approach supports the osteopathic view that the body functions as an integrated unit and that optimal treatment addresses not only physical symptoms, but the emotional and social dimensions of chronic illness. Future studies should investigate whether the opioid-sparing effects observed here translate into improved functional outcomes and patient satisfaction, key measures of osteopathic care quality.

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Informed Consent: This study involved analysis of de-identified electronic health record data obtained through the TriNetX Global Collaborative Network. As no identifiable patient information was used and no direct patient contact occurred, informed consent was not required in accordance with institutional and federal guidelines.

Ethical Approval & IRB and/or IACUC Approval: This study involved the analysis of fully de-identified data and did

not involve any interaction with human subjects or access to identifiable private information. The research was conducted entirely through access provided by an external institution, and no Ohio University resources were used in the conduct, analysis, or reporting of this project. Per guidance from the Ohio University Office of Research Compliance, such a project is likely to be considered "Not Human Subjects Research" and does not require IRB review or approval. Therefore, an IRB exemption or approval letter was not issued. If further documentation is needed, I am happy to provide additional details or confirmation from the external data source.

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★Poster No. *B-17
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Category: Basic Science
Research Topic: Chronic Diseases & Conditions

Drugs of Abuse Increase SGK1 Expression in the VTA

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Context: Substance use disorder (SUD) has a major negative impact on individual health, in addition to creating financial burdens on the healthcare system (1). Despite this, current treatment is often unsuccessful, partly due to the limited understanding of the neurobiology involved in drug addiction. The mesolimbic reward system in the brain is highly involved in various aspects of drug addiction, including drug reward (2). Drug-induced cellular and molecular changes within the ventral tegmental area (VTA) can promote motivation to use drugs and drug-induced behavior. Our lab seeks to identify cellular and molecular changes in the VTA that promote drug responses to gain a better understanding of the neurobiology underlying drug reward. We previously identified serum and glucocorticoid-inducible kinase 1 (SGK1) as a target gene of interest, due to its increased expression in the VTA of mice following chronic cocaine or chronic morphine (3). However, it is unclear whether similar regulation occurs with acute drug exposure and how persistent SGK1 expression changes are. In addition, it is critical to determine in which cell type *Sgk1* is induced to fully understand its role in drug reward. Together, these studies will define how drugs of abuse alter VTA *Sgk1* expression, a necessary first step to explore the role of this gene in drug behavior.

Objective: To determine when drugs of abuse increase VTA *Sgk1* expression in the VTA and in which cell type this occurs to better understand the role of SGK1 in drug reward.

Methods: qPCR: We used quantitative polymerase chain reaction (qPCR) to determine VTA *Sgk1* expression following drug exposure. Mice were randomly assigned treatment groups, ensuring littermates were not in same group to avoid within litter biases. Mice were then given intraperitoneal (I.P.) injections of either saline, cocaine or morphine (15 mg/kg, 20 mg/kg). Injections were given once (acute administration) or for 7 days (chronic administration). Forced abstinence was performed by treating mice with either saline, cocaine, or morphine for 7 days then giving them a challenge injection of either saline, cocaine, or morphine on the 15th day. Mice were sacrificed at either 1 or 24 hours after the final injection and VTA was microdissected and flash frozen. The VTA were then processed for RNA isolation and qPCR analysis. Primers against *Gapdh* and *Sgk1 were calculate Sgk1 expression.* Data were normalized against saline treated mice and are represented as mean ± sem (n= 7-20 mice per group, 2-way ANOVA, *p<0.05).

TRAP: Translating ribosome affinity purification (TRAP) was used to assess whether *Sgk1* expression is induced in dopamine (DA) or γ-aminobutyric acid (GABA) neurons following chronic morphine exposure. Mice expressing EGFP-tagged ribosomes were generated by crossing EGFP-L10a mice with either DAT- or VGAT-Cre mice to label ribosomes in DA or GABA neurons, respectively. Mice were implanted subcutaneously with either a sham or morphine pellet to deliver morphine continuously for 5 days. VTA tissue was then microdissected, RNA was isolated from EGFP-bound ribosomes using anti-GFP beads, and qPCR was performed to quantify *Sgk1* expression in cell type–specific fractions. Data are represented as mean ± sem (n=2-3 mice per group, 2-way ANOVA, *p<0.05).

RNAScope: RNAScope was used to determine in which cell type *Sgk1* is increased in following drug exposure. For this work, we had to first validate that the *Sgk1* probe was specific for its target. DAT-Cre mice received intra-VTA infusions of a Cre-dependent virus expressing wild type (WT) SGK1 to overexpress *Sgk1* mRNA in VTA dopamine neurons. 2 weeks later mice had intracardiac perfusion performed with saline and formalin. The brain was dissected and immediately placed in formalin for post-fixation. 24 hours later brains were switched to a sucrose solution for cryoprotection. Brains were then sliced at 35 um and VTA slices

were processed for RNAScope analysis per manufacturer protocols. Probes against *Dat* and *Sgk1* were used to label DA neurons and asses *Sgk1* expression in DAT-Cre positive and negative mice.

Osteopathic significance: SUD represents a significant public health concern that impacts patients physically, emotionally, and socioeconomically, key domains of osteopathic holistic care. This study aims to clarify how drugs of abuse affect expression of *Sgk1* in specific cell types of the VTA, a key brain region in the mesolimbic reward system. By identifying when and where *Sgk1* is induced, this research may inform more effective, individualized approaches to treating SUD, aligning with osteopathic tenets that prioritize patient-centered care, disease prevention, and addressing the root causes of illness rather than only treating symptoms. Improved understanding of *Sgk1*'s role could advance targeted therapeutics that integrate with behavioral interventions, supporting comprehensive recovery strategies consistent with osteopathic principles.

Results: We found that VTA *Sgk1* expression is increased 2-fold 1 hour after both acute and repeated injections of cocaine or morphine (**p<0.001 and *p<0.05 respectively). However, only repeated injections of drug were sufficient to induce a 2-fold increase in VTA *Sgk1* expression 24 hours following the last injection (**p<0.001). During a forced abstinence paradigm, we found that *Sgk1* induction is not maintained through abstinence and expression is not enhanced following a challenge injection of either cocaine or morphine. These data suggest *Sgk1* is not a marker of drug-induced sensitization. We next used TRAP to determine in which cell type *Sgk1* may be induced in the VTA. Although *Sgk1* was significantly increased in whole VTA following morphine pelleting (*p<0.05), we did not find an increase in *Sgk1* expression in either DA or GABA neuron pulldowns following morphine administration. These data suggest that induction is occurring in alternative VTA cell populations or that *Sgk1* is not being actively translated. Validation of the *Sgk1* RNAScope probe was successful in that we were able to clearly see enhanced *Sgk1* staining in DA neurons of DAT-Cre mice.

Conclusion: Our lab has previously identified *Sgk1* as a gene of interest due to its induction following repeated injections of morphine or cocaine. VTA *Sgk1* expression is induced by cocaine and morphine 1 hour following acute or chronic injections, but only 24 hours following chronic injections. However, this induction does not persist through abstinence and is not a marker of drug-induced sensitization. The VTA is a heterogeneous brain region, composed of mostly DA neurons. however, *Sgk1* is not induced in VTA DA or GABA neurons following morphine pelleting, suggesting induction is occurring in another cell type or *Sgk1* is not being translated in these neurons. Using RNAScope will aid in identifying in which cell type *Sgk1* is induced. We have shown that the *Sgk1* probe we are using is specific for *Sgk1*, as indicated by colabeling of *Dat* and *Sgk1* in the VTA of DAT-Cre mice overexpressing WT SGK1. Future work will determine in which cell type *Sgk1* is induced in the VTA following drug exposure, with glial cells being likely candidates, to better understand this kinase's role in drug reward and support its therapeutic potential as a target for SUD treatment.

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Informed Consent: N/A
Ethical Approval & IRB and/or IACUC Approval: ROTO202300120, approval through 5/12/2026. The IACUC includes scientists, veterinarians, and local community representation. All are appointed by the MSU President. Protocols are submitted and approved triennially, with yearly IACUC inspections and updates. *This is to notify you that your application to use vertebrate animals in research, testing or instruction has been approved by the Institutional Animal Care and Use Committee(IACUC). The protocol is approved from 6/24/2024 to 5/12/2026. Investigator: Michelle Mazei-Robison Title of Protocol: Role of ventral tegmental area signaling mechanisms instress and drug addiction*
Support: Mazei-Robison was supported by NIH grants DA057418 and MH111604. Caico received support from the MSU T32 Interdisciplinary Program in Systems Toxicology and Pharmacology (IPSTP) and was awarded the MSU Outstanding Student Fellowship. These funding sources supported the care of animals in the MSU Campus Animal Resources (CAR) facility and covered costs associated with the purchase of reagents and equipment for molecular and imaging experiments. No additional financial or material support was provided by outside entities.
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Poster No. *B-18
Abstract No. 2025-115
Category: Basic Science
Research Topic: Chronic Diseases & Conditions

Liver Glycogen Phosphorylase as a Potential Sex Based Biomarker for Hepatitis C-Cirrhosis Progression to Hepatocellular Carcinoma

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Context: Hepatitis C virus (HCV) infection affects millions globally and remains a leading cause of cirrhosis and hepatocellular carcinoma (HCC). Our previous research has shown sex-based differences in estrogen receptor (ER) expression and further estrogen receptor (ER)-modulation in HCV-induced cirrhosis and HCC patients. It is well established that chronic HCV infections are more prevalent in men and progress more rapidly to liver cancer as compared to women. Post-menopausal women with reduced estrogen levels (comparable to men) were shown to have similar rapid disease progression as men. Interestingly, pre-menopausal women with normal estrogen levels typically have milder disease and a slower progression to HCC. As HCV is a leading cause of cirrhosis and HCC, identifying sex-based differences in disease progression can translate to more specific biomarkers for earlier detection and better treatments. Alpha fetoprotein (AFP) has been the biomarker for HCC since the early 1960s, although its sensitivity and specificity are rather low. AFP levels are not elevated in all patients who have HCC, and they can be elevated in other conditions such as cirrhosis or chronic hepatitis. Early studies of the enzyme family glycogen phosphorylase have shown to be implicated in cancers such as liver, breast, kidney, ovary, prostate, and many others. Glycogen metabolism can influence the tumor microenvironment by affecting immune cells.

Objective: We hypothesize that chronic HCV infection may induce gender-based differential inflammation leading to dysregulation of glycogen phosphorylase (liver isoform). The purpose of this study was to identify sex-based early cancer biomarkers in HCV-related cirrhosis and HCC by analyzing liver proteins with a specific focus on glycogen phosphorylase enzyme (liver isoform).

Methods: This study was conducted under exempt IRB exemptions (IRB letter attached). Deidentified discarded normal, HCV cirrhosis, and HCC liver tissues (both genders) were obtained from the National Institutes of Health Liver Tissue and Cell Distribution System (LTCDS) at the University of Minnesota, Minneapolis, MN. The tissues were sent to the NIH IDeA National Resource for Quantitative Proteomics core lab for DIA proteomic analysis. We conducted a proteomics study involving 65 (healthy, cirrhosis, HCC) liver tissues. DIA proteomics mapped 4445 proteins. Among the 4445 proteins, we further stratified proteins that showed sex-based biomarker significance. Our goal was to validate the presence and significance of these proteins. The enzyme liver glycogen phosphorylase (PYGL) was chosen to undergo further analysis by immunohistochemistry in paraffin embedded human liver tissue sections from the following groups: healthy controls, hepatitis C-induced liver cirrhosis, and hepatocellular carcinoma. Proteomic data were searched with an empirically corrected spectral library and analyzed in EncyclopeDIA using a 1% FDR threshold. Quantitative MS1 intensities were normalized using ProteiNorm, which compared multiple normalization methods. Data were statistically analyzed using limma with empirical Bayes smoothing. Proteins with FDR-adjusted $p < 0.05$ and fold change > 2 were considered significant. Immunohistochemistry (IHC) utilizing a DAB-based system (Vector labs) was conducted on paraffin embedded tissue sections of 38 samples (all three groups) and stained with polyclonal PYGL primary antibody from Thermo Fisher. Image analysis was completed using QuPath, an open-source bioimage software, to detect cells with PYGL expression in each tissue section. Once the stained cells were detected from control sections and PYGL stained sections, the differences were calculated. BioRender was used for data analysis by using ANOVA one-way analysis and Mann Whitney test with $P \leq 0.05$ was considered significant.

Results: In the proteomics study, PYGL was increased in both diseased groups. There were statistically significant ($p < 0.05$) differences between the following groups: hepatitis C-induced cirrhosis (HCV-cirrhosis) females compared to HCV-cirrhosis males and healthy females; HCC males and females compared to healthy controls, respectively. HCV-cirrhosis females showed significant upregulation compared to HCV-cirrhosis males (0.00006). In HCC patients, there was upregulation of PYGL, but no gender differences were observed. In contrast, IHC analyses showed decreased

expression of PYGL in HCV-cirrhosis and HCC patients compared to healthy patients. Further analysis utilizing Mann Whitney showed similar results. The following groups displayed reduced expression of PYGL with significant p values when compared to their healthy controls: HCV-cirrhosis female (0.03), HCC male (0.003), and HCC female (0.03). Decreased levels of PYGL by IHC need to be further validated by doing qPCR studies.

Conclusions: PYGL has been shown to have differential expression throughout healthy, HCV-cirrhosis, and HCC patients, furthering its potential to become a biomarker for disease progression. Its dysregulated expression early in HCV-cirrhosis patients shows early involvement in the disease process with further dysregulation in HCC patients, displaying its continued involvement. In addition, the similarities between expression in HCC males and females show dysregulation in both sexes. Increasing the sample sizes of both pre-menopausal females and post-menopausal females would explore the hypothesis that pre-menopausal females are somewhat protected from disease progression early on. It would also help elucidate if PYGL has a role in this protection. To our knowledge, this is the first report on PYGL's potential to serve as a gender-based biomarker in liver cirrhosis.

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Informed Consent: This study is IRB exempt.

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Poster No. *B-19
Abstract No. 2025-040
Category: Basic Science
Research Topic: Osteopathic Philosophy

Evaluating the Accuracy and Educational Utility of ChatGPT in Osteopathic Manipulative Medicine (OMM) and Treatment (OMT): A Cross-Sectional Performance Study

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Concept: Osteopathic medical education includes instruction in osteopathic manipulative medicine (OMM) and osteopathic manipulative treatment (OMT), essential components of the COMLEX-USA Level 1 and Level 2 examinations. However, curricula for OMM vary widely across osteopathic medical schools, creating inconsistencies in student preparation. In response, many students turn to artificial intelligence (AI) tools like ChatGPT to supplement their learning. Although ChatGPT has shown utility in medical education more broadly, its accuracy and usefulness in OMM/OMT content remain largely unexplored.

Objective: To evaluate the accuracy of ChatGPT in answering COMLEX-style OMM/OMT questions, to assess the educational utility of ChatGPT as a supplemental learning tool for OMM/OMT topics, and to examine the implications of using AI in a context where curricular standardization is lacking across DO programs.

Methods: This study utilized a descriptive, cross-sectional design to evaluate the accuracy of ChatGPT in answering multiple-choice questions focused on osteopathic manipulative medicine (OMM) and treatment (OMT). A total of 50 questions were randomly selected from a larger pool within a subscription-based COMLEX-USA board preparation platform commonly used by osteopathic medical students. Questions covered a broad range of OMM/OMT domains, including viscerosomatic reflexes, Chapman's points, counterstrain, high-velocity low-amplitude (HVLA) techniques, and osteopathic philosophy. Questions that required

interpretation of figures or images were excluded. Each question was input into ChatGPT-4 using a standardized prompt: "Answer this COMLEX-style OMM question. Provide the correct answer choice and a brief explanation rooted in osteopathic principles." Responses were recorded in a structured spreadsheet and compared against the original answer key provided by the question source. Accuracy was determined based on whether the selected answer matched the correct key. The percentage of correct and incorrect responses was calculated to quantify ChatGPT's overall performance.

Results: ChatGPT correctly answered 32 out of 50 (64%) OMM/OMT-focused multiple-choice questions. There was no consistent trend in the types of questions it answered correctly versus incorrectly. Topics varied widely across question categories (e.g., counterstrain, Chapman's points, viscerosomatic reflexes), and no particular domain emerged as more prone to incorrect responses. When compared to aggregated student performance data available for each question, inconsistencies were observed. In some cases, ChatGPT answered a question incorrectly despite a majority of students selecting the correct answer. In other cases, ChatGPT answered correctly when the majority of students answered incorrectly. This variability suggests that ChatGPT's accuracy does not consistently mirror common student performance patterns or reflect specific topic weaknesses. Explanations provided by ChatGPT varied in both depth and clinical relevance. While some responses demonstrated appropriate osteopathic reasoning, others not only lacked nuance but included inaccurate or misleading information regarding OMM-specific principles and techniques.

Conclusion: This study demonstrates that ChatGPT correctly answered 64% of OMM/OMT-focused board-style questions, highlighting both its potential and its limitations as a supplemental learning tool in osteopathic medical education. While some explanations reflected sound osteopathic reasoning, others were vague, incomplete, or factually inaccurate. Notably, ChatGPT's performance showed no consistent trends across question topics, and often differed from the response patterns of osteopathic medical students. In an educational landscape where OMM curricula vary widely between institutions, students are increasingly turning to AI platforms to fill learning gaps. However, this study suggests that ChatGPT, in its current form, cannot be reliably used as a standalone resource for mastering OMM concepts or preparing for COMLEX examinations. Future work should explore strategies to enhance the model's alignment with osteopathic principles, such as tailored prompting, model fine-tuning, or the development of OMM-specific AI tools. Faculty involvement remains essential to guide students in responsibly integrating AI into their study routines, ensuring both accuracy and philosophical integrity in osteopathic training.

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Poster No. *B-20
Abstract No. 2025-078
Category: Basic Science
Research Topic: Osteopathic Philosophy

Enhancing Cricothyrotomy Training with Anatomical Accuracy: Early Findings from a Multi-Phase Study of CTM Variation

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Context: Emergency cricothyrotomy is a critical, time-sensitive procedure performed when other airway strategies fail. This is a rarely performed intervention, limiting the real-life experience that improves performance, highlighting the importance for high-fidelity training and its importance to procedure success. Current training models used in medical education and military simulation training scenarios often rely on simplified representations of the adult cricothyroid membrane (CTM), which may present challenges when translating these skills into real-time

emergency medical care. Current adult models do not reflect the significant anatomical variability seen in human donors, which suggest a limiting procedural accuracy and diminished provider confidence in emergent settings.

Objective: Our study aims to quantify variation in human CTM anatomy and use the results to guide the design of anatomically realistic, 3D-printable cricothyrotomy training inserts that better represent morphological variability. By promoting morphologically accurate hands-on procedural training through anatomically precise models, this project aligns with the osteopathic emphasis on structural relationships in diagnosis and treatment. Goals of the study include enhancing training quality for future osteopathic physicians and other clinical colleagues, thus ultimately improving patient outcomes in emergent situations.

Methods: Sixteen cadaveric donors (6 male, 10 female) underwent high-resolution imaging to reconstruct surface models of the laryngeal framework. Landmarks were placed across the structural boundaries of the CTM - the inferior border of the thyroid cartilage, the superior border of the cricoid cartilage and bilateral lateral cricothyroid ligaments. Generalized Procrustes analysis and principal component analysis (PCA) were used to evaluate 3D shape variation. These findings will help guide the development of interchangeable 3D-printed training inserts, which will later be tested in simulation settings with emergency medicine residents and paramedics.

Results: Quantitative shape analysis demonstrated considerable anatomical variation in the CTM region, particularly in anterior-posterior curvature, vertical height, and anatomical arrangement between laryngeal cartilages. The degree of variation was quantified with a Procrustes value of 0.0472, indicating a broad range of structural differences across donors. Comparison to standard adult cricothyrotomy training inserts revealed major disparities: commercial models are approximately 2.5–3.5 cm in height, with a uniform shape and exaggerated central access point that oversimplify the CTM's complex contours and boundaries. Furthermore, there are no demographic-based differences represented in the current training models. These inconsistencies suggest a need for more accurate training tools grounded in realistic human anatomy.

Conclusion: This study highlights that standard CTM training models are anatomically inadequate in comparison to human cadaveric morphology. Phase I morphometric analysis of this project offers the foundation for designing more accurate, high-fidelity 3D inserts to be used during standard clinical training procedures. Early Phase II prototyping is underway. Incorporating true anatomical morphology into cricothyrotomy training could improve palpation accuracy, reduce procedural hesitation, and ultimately improve performance and outcomes in emergency and combat care settings. Lastly, to strengthen the statistical power, an additional cohort of human donors will be included in the fall and winter of 2025.

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Informed Consent: N/A

Ethical Approval & IRB and/or IACUC Approval: This project does not meet the definition of human subjects research as defined in 45 CFR 46.102. Further review by the IRB is not required.

Support: None reported.

Financial Disclosures: None reported.

Poster No. *B-21

Abstract No. 2025-079

Category: Basic Science

Research Topic: Impact of OMM & OMT

Effects of Lymphatic Pump Treatment and Methotrexate in Arthritis Development and Behavior in Rats with Adjuvant-Induced Arthritis

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Context: Rheumatoid arthritis is a systemic autoimmune disease characterized by joint inflammation that eventually leads to joint destruction and loss of bone and cartilage. Osteopathic manipulative medicine is a unique treatment

approach that aligns with the osteopathic philosophy that the body maintains and self-heals under optimal conditions. Lymphatic pump treatment (LPT) is an osteopathic manipulative technique that serves a therapeutic role in increasing the drainage of inflammatory cells and mediators away from the arthritic joint. Methotrexate (MTX) is a first-line disease-modifying anti-rheumatic drug (DMARD) that is commonly used in rheumatoid arthritis treatment. However, MTX has been known to have increased levels of toxicity at high doses. We are studying whether implementing LPT along with low doses of MTX will significantly improve the efficacy of MTX.
Objective: To determine whether Lymphatic Pump Treatment (LPT) impacts Rheumatoid Arthritis disease progression as an independent treatment and as an adjunct to Methotrexate treatment.
Methods: A 13-day preventative rat study was performed. MTX was given 3 times to certain groups. LPT was administered daily 3 times a day to certain groups for 9 days. Ankle circumference, articular index scores (AIS), and pain scores were recorded daily as a measurement of inflammation. Spleen and popliteal lymph nodes (PLN) samples were collected. Flow cytometry was performed on cells from PLNs and spleens labeled for CD3, CD4, CD8, CD25, CD45R. ELISAs performed on homogenized ankle lysates were used to analyze CINC-1, CINC-2, TNF-α, IL-1β, and IL-6 levels. H&E staining was performed on ankle sections to evaluate tissue erosion, lining, and inflammation.
Results: MTX was shown to delay the development of arthritis. Animals receiving MTX showed significance of index score and ankle circumference by day 13, which indicated the therapeutic effect of MTX. The spleen weight significantly decreased with MTX treatment, but was unchanged with the lymphatic pump treatment ($p<0.05$). The PLN weight showed variability between animals in different treatment groups with no significant difference in the animals that received LPT. Through flow cytometry, animals that underwent MTX treatment had increased levels of CD3+ and CD4+ in the spleen. There were no significant changes in cell population in the PLNs. For both CINC-1 and CINC-2, there was no statistical significance for the animals that received LPT as an intervention. The animals that received MTX intervention resulted in a statistically significant decrease in CINC-1 and CINC-2.
Conclusion: MTX treatment delayed the development of AIA per ankle circumference and AIS. MTX significantly decreased levels of cytokines and chemokines in the AIA model. LPT as an intervention showed no difference in results from the sham model. Based on this study, LPT did not show negative effects as an adjunct treatment for RA. Future studies could use lower concentrations of MTX to determine potential adjunct therapeutic effects of LPT when added to MTX treatment. The MTX may be so effective that it is masking the effects of LPT.

References: N/A

Informed Consent: N/A
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Financial Disclosures: None reported.

Poster No. *B-26
Abstract No. 2025-124
Category: Basic Science
Research Topic: Chronic Diseases & Conditions

Modulation of Purkinje Cell Plasticity in the Cerebellum Using Electrical Stimulation: Investigating the Effects on Long-Term Depression

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Context: The cerebellum plays an essential role in movement coordination and balance, and its cortex comprises three layers: the granule cell layer, Purkinje cell layer, and molecular layer. Purkinje cell axon fiber is the sole inhibitory output of the cerebellar cortex to the deep cerebellar nuclei. Impairment of the cerebellar output or the related pathway can lead to cerebellar ataxia. Cerebellar ataxia can include abnormal extremity movements, eye and gait incoordination, and loss of balance. Transcranial electrical stimulation (tES) is a therapy that has helped with ataxic patients' symptoms.[1] Two types of tES have been used to treat ataxic patients, transcranial direct current stimulation (tDCS) and transcranial alternating current stimulation (tACS).[2] The physiological effects of tDCS and tACS are not well understood. To better understand the physiological effects of direct current stimulation (DCS) and alternating

current stimulation (ACS), the whole-cell patch clamp recordings were conducted on Purkinje cells from rat cerebellar slices with an applied E-field to mimic DCS and an alternating applied E-field to mimic ACS. The physiological responses of fast excitatory postsynaptic potentials (fEPSP) were used to monitor the changes in synaptic plasticity. It is hypothesized that applied E-field and alternating E-field modulates Purkinje cell plasticity.

Objective: To preliminary data was collected to examine the effects of direct current stimulation (DCS) on the Purkinje cell plasticity. The results suggested that E-field application enhanced LTD (T-test, p-value = 0.02, 8 cells without E-field and 9 cells with E-field). In this study, additional experiments were conducted to increase the sample size. The effects of ACS were also investigated.

Methods: This study follows the protocol (#A23-002) approved by the IACUC of PCOM. Whole-cell patch clamp technique was used to study the electrophysiological effects of E-field. Internal solution was prepared and stored in a freezer. Oxygenated external solution is prepared before each experiment. The cerebellum from Sprague-Dawley rat was dissected and sliced parasagittally (150 μm to 300 μm). A slice was added to the recording chamber and had continuous flow of oxygenated external solution. The glass electrodes were prepared using a micropipette puller (Sutter Instrument, P-87). Internal solution was backfilled into the glass electrode. Once a recording is established on a Purkinje cell, a series of paradigms under Clampex were used. The paradigms were: Basic properties test, Baseline fEPSP, Long-term depression (LTD) induction, and Post-LTD induction fEPSP. For the LTD induction, a stimulation paradigm of 5 Hz with a train stimulation at 100 Hz is applied in the molecular layer. Two silver wires in the chamber were connected to an isolator (100 μA) to generate the E-field. In the ACS experiments 50 Hz of alternating E-field was applied to the recording chamber with the same current density as in DCS experiments. Data analysis was performed using MATLAB (Mathworks). Customized MATLAB code was created to plot collected data. The Osteopathic significance is to improve a non-invasive technique to treat and manage symptoms of cerebellar ataxia, since there is no current cure for it.

Results: Parallel fiber Purkinje cell LTD was successfully induced by stimulation in the molecular layer. By removing any bias current and running 5 Hz at 100 Hz stimulation, LTD could be generated by the cell. The mean LTD responses of 10 recorded cells were then compared to the 12 recorded cells in which LTD was induced under E-field stimulation. E-field application did not enhance LTD based on an unpaired T-test (12 cells with E-field and 10 cells without E-field, p=0.19). The preliminary data of the alternating E-field application did not enhance the LTD (3 cells with alternating E-field and 10 cells without E-field).

Conclusion: The new results do not support the hypothesis that E-field stimulation modulates Purkinje cell plasticity, offering a better understanding for potential avenues for therapeutic interventions in cerebellar ataxia. The preliminary data of the alternating E-field did not support the hypothesis of modulating Purkinje cell LTD. A limitation is the small sample size for ACS. More experiments using ACS will be conducted to examine the plastic change of the Purkinje cell.

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Poster No. *B-27
Abstract No. 2025-125
Category: Basic Science
Research Topic: Chronic Diseases & Conditions

Improved Quantification of Reaching Smoothness in Ataxic Mice Following Cerebellar Transcranial Direct Current Stimulation Using a Curved Movement Model

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Context: Cerebellar ataxia impairs coordination of voluntary movement, often manifesting as reduced smoothness during goal-directed motor tasks. Transcranial direct current stimulation (tDCS) has been shown to be effective in modulating cerebellar output and restoring aspects of motor

function [1,2]. Traditional measures of movement smoothness, such as those based on linear path deviation or acceleration profiles, may underestimate normal kinematic variability. Inspired by ergonomic human motor control modeling [3], an updated smoothness index was developed using a curved motion path. Compared to a previous linear model, this was shown to more accurately discriminate between smooth and unsmooth movement by reflecting the natural curvature of mouse reaching behavior.

Objective: To determine whether cerebellar anodal tDCS improves smoothness in transgenic ataxic mice based on this new smoothness index. As noninvasive neuromodulation gains traction for treating hereditary cerebellar ataxias [4], quantifying subtle changes in motor behavior becomes essential. Our updated smoothness index may improve the detection of motor recovery in preclinical models and could serve as a valuable biomarker for functional improvements following tDCS.

Methods: Wild-type and transgenic ataxic mice (n = 3) were trained to perform head-fixed forelimb reaching behavior. Mice were head-fixed and placed on water restriction for at least two days preceding training for reaching behavior. They were trained to reach for water drops dispensed from a needle approximately 5 mm from the snout. Video recordings were done by Basler 1920-A Camera and processed in a Pylon interface. Arduino board was used to deliver water via a pump which delivered one drop every 5 seconds alongside an auditory cue (650 Hz for 500 ms). During each session, head-fixed mice reached for water drops dispensed from a fixed location, and reaching behavior was recorded using DeepLabCut's markerless pose estimation tracking software [5]. Trajectories were analyzed in MATLAB and aligned to a reference axis. Trajectories were exported to MATLAB for analysis. For each mouse, all reach trajectories were aligned and averaged to generate a reference curve representing the typical reach pattern for that individual. Smoothness was quantified using a composite index that incorporated three portions: (1) the average deviation of each reach from the reference curve, (2) the number of timepoints during which the forepaw contacted the water droplet, and (3) the number of velocity sign changes within the trajectory. After baseline recording, mice received 20 minutes of cerebellar anodal tDCS. Reaching behavior was then reassessed using the same protocol. Pre- and post-tDCS smoothness scores were compared using paired t-tests within individual mice.

Results: Preliminary analysis was conducted on smoothness scores in wild-type, heterozygous, and homozygous type 3 ataxic mice before and after anodal cerebellar tDCS. In the first wild-type subject, a trend toward improved smoothness was observed post-stimulation ($p = 0.14$), but this was not replicated in a second wild-type mouse ($p = 0.79$). A slight decrease in smoothness was observed in a heterozygous ataxic mouse post-tDCS ($p = 0.10$), though not statistically significant. Notably, in a homozygous ataxic mouse, smoothness significantly worsened after tDCS ($p = 0.02$), despite the animal demonstrating high baseline reaching performance. These results suggest that the effects of tDCS on motor behavior may differ by genotype and disease severity, emphasizing the need for further data from additional mice.

Conclusions: These preliminary findings demonstrate the feasibility of using a curve-based smoothness index to quantify forelimb movement irregularity in mice and track changes following cerebellar tDCS. However, no improvement was observed across wild-type or heterozygous ataxic mice, and a significant decrease in smoothness was detected in a homozygous ataxic mouse following stimulation. While this result may reflect individual variability or genotype-dependent responses, it also raises important considerations about the impact of tDCS in more severely affected subjects. Observed changes may also reflect confounding factors such as variability in age or animal fatigue, which highlights the need for replication in larger cohorts. Future experiments will be essential to determine whether tDCS modulates motor coordination in cerebellar ataxia and whether this refined smoothness index can detect meaningful therapeutic or adverse effects across genotypes.

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Informed Consent: NA

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Poster No. *B-28
Abstract No. 2025-087
Category: Basic Science
Research Topic: Chronic Diseases & Conditions

Investigating the Effects of Warfarin-Induced Calcification on Aortic Remodeling in a Mouse Model

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Context: Warfarin increases vascular calcification, which may lead to adverse cardiovascular events such as elevated pulse pressure and systolic hypertension due to reduced arterial elasticity, as well as exacerbation of possible comorbidities such as diabetes and hypertension (1-4). Vitamin K antagonists are used for the preventative treatment of blood clots; however, vitamin K is also required for the activation of matrix Gla protein (MGP). When fully activated, MGP is able to prevent calcification to a greater extent by binding to calcium phosphate within the arterial system and surrounding tissues to prevent calcification (5, 6). Inhibiting this mechanism leads to increased amounts of free calcium ions within the vasculature, ultimately leading to the increased calcification this study aims to quantify. Besides its effects on calcification, long-term warfarin treatment is associated with a higher occurrence of endoleaks after endovascular abdominal aortic aneurysm repair (EVAR) and/or aneurysmal sac expansion (7-9). Whether this is related to calcification and aortic remodeling is currently unknown. Through this study, we aim to elucidate the relationship between warfarin-induced vascular calcification and aortic remodeling, providing insight into the structural cardiovascular consequences of long-term anticoagulant therapy and its potential role in exacerbating vascular pathology.

Objective: To quantify the aortic dilatation and ascending aorta calcification in warfarin-treated mice using micro-computed tomography (microCT).

Methods: This study utilized DBA/2J mice homozygous for the low-density lipoprotein receptor (Ldlr) knockout (Strain #007068), obtained from The Jackson Laboratory (Bar Harbor, ME, USA). At 8 weeks of age, mice were randomly assigned to either a control group, which received a Western diet supplemented with 1.5% vitamin K1, or a warfarin-treated group, which received a Western diet containing 3.0 mg/g warfarin along with 1.5% vitamin K1 supplementation. Mice were maintained in groups of no more than five per cage under standard housing conditions with a 12-hour light/dark cycle at the New York Institute of Technology College of Osteopathic Medicine animal facility. All procedures were conducted in accordance with institutional and federal guidelines and were approved by the Institutional Animal Care and Use Committee (IACUC protocol #2022-OS-01).

Micro-CT: After 20 weeks of warfarin treatment, mice were euthanized, and tissue was preserved in formalin. The hearts were carefully dissected with the ascending aorta intact and immersed in mineral oil within sealed plastic tubes. Samples were scanned using a Bruker SkyScan 1173 micro-computed tomography (micro-CT) system at an isotropic voxel resolution of 10 μm. Image reconstruction was performed using Micro Photonics NRecon software, and three-dimensional visualization and analysis were conducted using Dragonfly software (Object Research Systems). Regions of interest (ROIs) encompassing the heart and proximal aorta were manually selected, and calcified tissue was segmented using a threshold of 130 Hounsfield units (HU), a validated cutoff for the detection of vascular calcification. Ascending aortic diameter was measured using Dragonfly software by properly orienting the 3D reconstruction and obtaining diameter measurements at three distinct locations along the ascending aorta.

Statistics: Statistical analysis was performed using GraphPad Prism 10 software (GraphPad Software, San Diego, CA, USA). Differences between control and treatment groups were assessed using unpaired two-tailed t-tests. A p-value of less than 0.05 was considered statistically significant.

Osteopathic Significance: The following methods aim to align with the tenets of osteopathic medicine by exploring the interplay between structure and function, as well as the body's capacity for self-regulation and self-healing.

Results: The preliminary data shows a significant increase in ascending aorta calcification found in warfarin treated mice compared to controls (0.163±0.046, p=0.0004). We observe a 27.1% increase in ascending aorta diameter in warfarin treated mice compared with controls (1234±26 vs. 971±26, p=0.0003).

Conclusion: Warfarin treatment significantly increased calcification in the ascending aorta, which was concurrently associated with aortic dilatation. This indicates a potential contribution of warfarin-induced mineral deposition to adverse aortic remodeling. Limitations of this study include the small sample size used to collect data, all of which are

from a homogenous genotype mouse model, which can affect the generalizability of these results. Additionally, the data collected was at 20 weeks for both two mice groups being fed their respective diets, so the study lacks the longitudinal capacity to display long term health consequences as well as the ability to quantify the progression of aortic calcification and dilatation over time. Additional studies can examine the physiological effects of ascending aortic dilatation and the physiological repercussions of ascending aorta calcification.

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Informed Consent: Not applicable.
Ethical Approval & IRB and/or IACUC Approval: Procedures and practices were approved and performed according to IACUC regulatory standards: IACUC protocol #2022-OS-01. Procedures also complied with the National Institute of Health Office Laboratory Animal Welfare Guidelines.
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Poster No. *B-30
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Research Topic: Chronic Diseases & Conditions

Genetic Deficiency of TNAP (Tissue-Nonspecific Alkaline Phosphatase) in Vascular Smooth Muscle Cells Does Not Affect Atherosclerotic Plaque Development in a Mouse Model

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Context: Atherosclerosis remains a major driver of cardiovascular morbidity and mortality, shaped by a combination of lipid accumulation, inflammation, and structural changes within the vascular wall (1). Vascular calcification is a strong predictor of major adverse cardiovascular events and mortality; however, the mechanisms of the cell-regulated calcification process that contributes to atherosclerotic plaque progression is incompletely understood. Tissue nonspecific alkaline phosphatase (TNAP) is an enzyme that hydrolyzes pyrophosphate, a potent inhibitor of mineralization, and has been implicated in promoting vascular calcification. When TNAP is over expressed in vascular smooth muscle cells, it is associated with increased calcifications (2). In this study, we wish to test whether TNAP is required for the development or the severity of calcified atherosclerotic plaques. Vascular smooth muscle cells (VSMCs), which are known to undergo phenotypic switching in response to vascular injury and metabolic stress, play a central role in both calcification and plaque development. Given TNAP's activity in mineral metabolism and the plasticity of VSMCs in disease states, investigating TNAP within this cell population offers a targeted approach to uncovering mechanisms that may link

vascular calcification to atherosclerotic burden. This study was designed to clarify the role of TNAP in VSMCs during atherosclerosis progression, with the goal of identifying novel pathways involved in vascular remodeling and cardiovascular risk.

Objective: To investigate the effect of TNAP deletion in vascular smooth muscle cells on the burden of atherosclerosis and cardiac structure and function assessed by echocardiography in LDL receptor mutant mice.

Methods:

Mouse Model

Vascular smooth muscle cell-specific TNAP knockout mice were generated by breeding floxed ALPL mice (Alpl^fl/fl; the gene encoding tissue nonspecific alkaline phosphatase) with SM22α-Cre transgenic mice, in which Cre recombinase is driven by the smooth muscle cell-specific SM22α gene promoter. The study was conducted on the LDL receptor mutant genetic background. All mice were homozygous for the WHC ("wicked high cholesterol") missense mutation (C699Y) in the low density lipoprotein receptor (Ldlr) gene that leads to severe hypercholesterolemia (C57BL/6J-Ldlr^Hlb301/J; Jackson Laboratory strain #005061; Bar Harbor, ME, USA). At 8 weeks of age, all mice were placed on a Western diet (TD.88137 high fat, high sugar, low fiber diet) to induce atherosclerosis. Up to ten animals per group were enrolled in the study. Investigators were blinded to the mouse genotypes.

Echocardiography

At 23 weeks of age, mice were anesthetized using 2% isoflurane, and heart rate was continuously monitored while maintaining body temperature between 40-42°C. Echocardiographic imaging was performed using the FUJIFILM VisualSonics Vevo 3100 high-resolution ultrasound system. B-mode images were acquired in long axis view, and M-mode images were obtained in short axis view for quantitative assessment of cardiac structure and function. Cardiac contractility parameters measured from M-mode images included heart rate (HR, beats per minute), left ventricular posterior wall thickness (LVPW, mm), left ventricular internal diameter (LVID, mm), left ventricular mass (mg), stroke volume (SV, μL), fractional shortening (FS, %), cardiac output (CO, mL/min), and ejection fraction (EF, %). To estimate plaque burden, near and far wall thicknesses of the aortic sinus were measured from the parasternal long-axis view at three distinct timepoints during isovolumetric contraction.

Statistical Analysis

Data were analyzed using GraphPad Prism 10 statistical software (San Diego, CA, USA). Data was tested for the normality of distribution by Shapiro-Wilk Test and for equal variances by F-test. Data not meeting statistical assumptions were transformed before further analysis. Two groups were compared by t-test or nonparametric Mann Whitney test. A p-value of less than 0.05 was accepted as statistically significant.

Osteopathic Significance

Based on the interconnection of our body systems, the progression of atherosclerosis may have effects that extend beyond cardiac function. Research that targets the mechanisms behind atherosclerotic progression may help increase knowledge of these specific non-cardiac effects, and allow osteopathic physicians to better understand the associated somatic dysfunctions and how to further treat it with osteopathic medicine.

Results: By the interim analysis (n=7 animals per group, pooled data from males and females), no significant effects of TNAP knockdown on aortic sinus plaque burden was observed (near wall plaque 0.320 ± 0.032 vs. 0.298 ± 0.063, p=0.429; far wall 0.302 ± 0.083 vs. 0.352 ± 0.056, p=0.239). Similarly, there were no differences observed in cardiac structure or function parameters between the two groups after 15 weeks on an atherogenic diet.

Conclusion: Despite the overwhelming evidence that increased TNAP activity is sufficient to promote vascular calcification, under the conditions of our experiment, TNAP expression in vascular smooth muscle cells was not required for the development of atherosclerosis. A small number of animals was a limitation to this study.

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Ethical Approval & IRB and/or IACUC Approval: Animal studies were approved by the New York Institute of Technology College of Osteopathic Medicine Animal Care and Use Committee (Old Westbury, NY) and complied with the National Institutes of Health guidelines for humane treatment of laboratory animals.

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Poster No. *B-32
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Research Topic: Chronic Diseases & Conditions

Targeting the Hedgehog Signaling Pathway in Oral Squamous Cell Carcinoma

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Context: Oral squamous cell carcinoma (OSCC) is the most common type of oral cancer and accounts for almost 190,000 annual deaths worldwide [1]. Living with OSCC can be extremely detrimental to a person's quality of life. Both the condition and its treatments – which include surgical resection, chemoradiotherapy, and immunotherapy – can cause disfigurement and functional complications with swallowing, speech, and taste. Despite available treatment options, the 5-year survival of OSCC patients has remained around 50% over the past 30 years and OSCC continues to demonstrate high rates of metastasis, recurrence, and drug resistance [2]. The Hedgehog (Hh) pathway is upregulated in OSCC and promotes cancer progression and chemoresistance [3, 4], making Hh signaling an attractive target for the treatment of OSCC. While recent studies have indicated the potential use of Hh pathway inhibiting (HPI) drugs to combat cancer, this phenomenon has not been well-studied in oral cancers [5-7].

The Hh pathway plays an important role in cell differentiation and proliferation, tissue regeneration, and epithelial-mesenchymal transition [8, 9]. Canonical Hh signaling is activated when a Hh ligand binds the transmembrane receptor, Patched (Ptch1). Upon ligand binding, Ptch1 relieves its inhibition of Smoothened (Smo), which is then able to activate glioma-associated oncogene (Gli) transcription factors. Gli transcription factors are then free to promote the transcription of Hh target genes. Smo is an essential membrane receptor for Hh activation and has thus become a popular target for Hh pathway inhibition [5].

Vismodegib and sonidegib are Smo inhibitors that are FDA-approved for the treatment of basal cell carcinoma (BCC), a cancer which also demonstrates Hh pathway upregulation. Vismodegib was recently shown to decrease OSCC cell viability in CAL27 cells [10]. However, compared to vismodegib, sonidegib has demonstrated more ideal pharmacodynamics, less adverse effects, and longer progression-free survival in the treatment of BCC [11, 12]. Sonidegib is currently in clinical trials for the treatment of various cancers, but it's effect on OSCC cells has not yet been elucidated.
Objective: To determine whether HPI drug sonidegib alters OSCC cell morphology and viability in a dose-dependent manner.
Methods: We used OSCC cells recently derived from distinct OSCC patients enrolled in an ongoing clinical trial (#NCT04188665). HSC2 cells from an established OSCC cell line were also used. Sonidegib was obtained from ChemieTek and dissolved in dimethyl sulfoxide (DMSO) to create a stock solution. Cells were treated 1, 10, 30, and 50 uM concentrations of sonidegib, with three replicates per treatment. Untreated cells served as a control. Cells were imaged before and after 24, 48, and 72 hours of treatment for morphology assessment. After imaging, cells were treated with Alamar Blue for two hours. The metabolic activity of each sample was then measured according to 570 nm wavelengths to determine cell viability. The 570 nm wavelength readouts for each replicate were averaged and compared to the average of control replicates. Cell morphology was analyzed qualitatively, and viability data was analyzed via two-way ANOVA (duration and dose) with Tukey's post-hoc multiple comparisons test. Parallel plate-pellets were taken for protein and RNA collection. Hh pathway signaling and/or its inhibition was validated using Western Blot and RT-qPCR, using Hh pathway targets such as Smo, Gli1, Ptch1, and Hedgehog-interacting protein (HHIP). The ΔΔCt method was used to analyze relative fold changes in gene expression.
Results: Morphology data for Sen12r cells demonstrated dramatic decreases in cell-cell adhesions after sonidegib treatment compared to untreated cells. At all time-points, 30 and 50 uM concentrations of sonidegib significantly decreased OSCC cell viability compared to the control groups, ($p<0.0001$). A decline was observed after 24-72 hours of 1 and 10 uM sonidegib treatments but these changes were not statistically significant. The effect of sonidegib on sen12r OSCC cells was dose-dependent but duration-independent. Viability and morphological analysis for HSC2 cells is in progress. Smo and Ptch1 expression was confirmed in Sen12r and HSC2 cells via Western Blot detection. Hh-responding target genes Gli1 and HHIP demonstrated reduced expression in Western Blot after sonidegib treatment compared to untreated cells. Analysis of RT-qPCR data showed a Gli1 fold change of 0.58 in the 50 uM group compared to control.
Conclusion: Taken together, our pilot data indicates that sonidegib alters morphology and decreases OSCC cell viability in a dose-dependent manner. Our results suggest

that the Hh signaling pathway may offer promising therapeutic potential as a target in the treatment of OSCC. Repurposing previously-FDA-approved drugs like sonidegib will be of great benefit to patients, as they have well-documented safety profiles and can offer quick relief to those battling OSCC.

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Poster No. *B-34
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Research Topic: Osteopathic Philosophy

Three-Dimensional Cardiac Morphology: A Comparative Imaging Study Using SPICE-CT and DICE-CT

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Context: Computed tomography (CT) of soft tissues traditionally lacks adequate contrast for detailed anatomical visualization without enhancement. Diffusible iodine-based contrast-enhanced CT (DICE-CT), which relies on Lugol's iodine immersion, has improved soft tissue imaging but requires extended diffusion times, often weeks to months, and is prone to tissue shrinkage and peripheral oversaturation, also known as "rinding" (1). Selectively perfusable iodine-based contrast-enhanced CT (SPICE-CT), developed by Witmer et al., offers an alternative through vascular perfusion of iodine, providing rapid, targeted soft tissue staining with minimal distortion (2). This study builds on prior work by evaluating SPICE-CT at higher Lugol's concentrations (3–5%) in ethanol-fixed cardiac specimens, with the goal of optimizing visualization and addressing key limitations of DICE-CT.
Objective: To assess whether SPICE-CT with Lugol's solutions up to 5% improves visualization of cardiac anatomy relative to conventional DICE-CT.
Methods: Ten ethanol-fixed porcine and deer hearts were thawed and cannulated through both the right and left coronary arteries. Each heart was perfused with either 3%, 3.5%, 4%, 4.5%, or 5% Lugol's iodine solution, with two

specimens allocated to each concentration. Perfusions were performed using 14-gauge catheters, which were secured in place with 4-0 silk sutures and reinforced with cyanoacrylate adhesive. Following perfusion, the hearts were wrapped in ethanol-soaked gauze, sealed in plastic, and stored upright to preserve anatomical orientation. CT imaging was performed using a GE LightSpeed VCT 64-slice scanner with a slice thickness of 0.625 mm. CT data were exported in DICOM format and analyzed using Avizo software to evaluate Hounsfield unit distributions, coronary vessel continuity, valve visibility, and the presence of artifacts such as starbursting or pooling. Comparative assessments were made across the different iodine concentrations and against a previously established DICE-CT protocol involving 1–3% Lugol's immersion over a four-week period (3). The primary outcomes included visualization quality of coronary vessels and valve structures, degree of soft tissue contrast, and the incidence of imaging artifacts. All specimens underwent identical handling and imaging conditions to ensure consistency across experimental groups. This study design allowed for controlled evaluation of Lugol's concentration effects on SPICE-CT imaging outcomes in preserved cardiac tissue.

Results: Hearts perfused with 4% and 4.5% Lugol's solution demonstrated the clearest visualization of distal coronary branches, valve leaflets, and chordae tendineae. These concentrations also yielded the highest peak Hounsfield values, exceeding 300 in several regions of interest. No tissue shrinkage or peripheral rinding was observed in any of the perfused specimens, even at the highest concentrations. Minimal iodine pooling was observed, and vascular contrast remained well-contained within the coronary pathways. Starbursting artifacts were noted in some samples, primarily near the atrial regions, but these did not obscure critical anatomical landmarks. In several specimens, partial or complete coronary occlusions prevented full administration of Lugol's solution, resulting in limited perfusion and reduced visualization in isolated regions. Valve structures, including the mitral and tricuspid leaflets and associated chordae tendineae, were more distinctly visualized at higher concentrations. Lower concentration groups (3% and 3.5%) provided acceptable visualization but showed reduced contrast and vessel continuity compared to the 4% and 5% groups. Compared to prior DICE-CT data using 3% immersion over four weeks, SPICE-CT at 4–5% achieved comparable or superior contrast within 48 hours and with fewer artifacts (3).

Conclusion: SPICE-CT using 4–5% Lugol's solution enables rapid and detailed visualization of cardiac soft tissues with minimal artifact. This method outperforms traditional DICE-CT in both processing time and preservation of anatomical fidelity. The ability to selectively perfuse cardiac vasculature allows for targeted contrast enhancement without the prolonged exposure times required for diffusion-based methods. Future work will explore the application of SPICE-CT in fetal pigs to evaluate its effectiveness in visualizing cardiac anatomy in situ. These advantages position SPICE-CT as a valuable adjunct to cadaveric anatomy education, enhancing students' ability to bridge gross dissection with clinical imaging interpretation.

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Poster No. B-35
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Category: Basic Science
Research Topic: Osteopathic Philosophy

Is Research Fun? A Survey of Osteopathic Medical Students

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Context: Critically appraising scientific literature is a foundational skill for physicians and an increasingly common expectation of osteopathic medical students [1]. In response, many osteopathic medical schools have expanded research opportunities to support residency preparation and academic development. While these efforts have improved access, less attention has been paid to how students *experience* research, and what drives their sustained engagement. Current literature explores how to make education more enjoyable, but rarely addresses research-specific experiences [2, 3]. This gap limits our ability to understand or influence learner motivation over time. Fun—a positive emotional experience arising from active engagement in enjoyable tasks—has been identified as a key factor in sustaining motivation. When research is experienced as fun, students are more likely to stay engaged, persist through challenges, and return to it voluntarily. Understanding what makes research fun for students may offer valuable insights into how to foster lasting involvement in scholarly activity within osteopathic medical education.

Objective: This study explored factors that contributed to perceptions of research as fun or not fun among osteopathic medical students and recent graduates of Noorda College of Osteopathic Medicine.

Methods: We developed a survey assessing students' experiences of fun in research based on a conceptual model developed through a systematic scoping review of fun in education [4]. Pilot testing was conducted with a group of osteopathic medical students to evaluate response time, item clarity, and the quality of responses. Pilot responses prompted minor changes to improve phrasing, and no concerns regarding question comprehension were identified. The final instrument contained 40 multiple choice questions and 2 short answer questions. The survey was distributed to students and recent graduates of Noorda College of Osteopathic Medicine via email, instant message, digital and printed flyers, and direct outreach. Data collection occurred from May 8th, 2025, to June 2nd, 2025. Free-response data were analyzed thematically, and quantitative responses were analyzed descriptively.

Results: Survey invitations were given to 585 osteopathic medical students. Among the 133 respondents (22.7% response rate), 15 (88.7%) participated in research prior to medical school and 131 (98.5%) participated in research during medical school. A total of 85 respondents (63.9%) replied that research was at least "somewhat fun", and 91 (68.4%) answered that they at least "somewhat agree" with the statement "I like doing research". Additionally, 97 (72.9%) reported that, if given the time and opportunity, they would be more involved in research. When asked what made research fun, respondents most commonly cited contributing to knowledge development, working with others, problem solving, critical thinking, and learning new skills when asked what makes research fun for them. Conversely, research was perceived as not fun when it involved compulsory participation, tedious work, challenges with completing experiments, difficulty with collecting data or publishing results, and high time commitment.

Conclusion: Osteopathic medical students at Noorda College of Osteopathic Medicine reported generally positive experiences with research and expressed interest in greater involvement when given adequate time and opportunity. Their reflections on what makes research enjoyable vs. unenjoyable highlight the importance of understanding learner perceptions to improve participation and support the development of a durable scholarly identity. Positioning fun as a meaningful factor in research engagement may offer a practical and underused strategy for cultivating sustained research involvement and advancing the scholarly growth of future osteopathic physicians.

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Informed Consent: Participants were provided a consent and disclosure form prior to taking the survey that detailed the research objectives, study design, potential harm, potential benefits, and compensation. This form also included contact information of the researchers as well as the NoordaCOM IRB.

Ethical Approval & IRB and/or IACUC Approval: This study was reviewed and approved by the Noorda College of Osteopathic Medicine IRB wherein members of the IRB committee reviewed the study protocol, provided feedback,

and requested relevant changes. After review, the study was deemed exempt. NCOMIRB Number: 25-004E.
Support: Funding provided by Noorda College of Osteopathic Medicine for survey participant compensation.
Financial Disclosures: None reported.

Poster No. *B-37
Abstract No. 2025-136
Category: Basic Science
Research Topic: Chronic Diseases & Conditions

Neutrophil-Mediated Neuroinflammation in Alzheimer's Disease: Breaching the Blood-Brain Barrier

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Context: The accumulation of neutrophils in the brain is currently being investigated as a novel characteristic of Alzheimer's disease (AD) with associated cognitive decline. Neutrophils express myeloperoxidase (MPO) and neutrophil elastase, both capable of generating reactive oxygen species. Despite their protective role of being among the first immune cells to arrive at an infection/injury, neutrophils can also contribute to tissue damage if their activation is unregulated. When the blood brain barrier becomes leaky due to inflammatory insults, neutrophil invasion becomes possible.
Objective: Our goal was to test a method for identifying neutrophils and to determine localization and numbers in human brain tissue for future spatial transcriptomic analyses.
Methods: We used immunohistochemistry to detect neutrophils in 10 different human brain samples. Our slides received a 1:500?L concentration of anti-MPO antibody, which has been validated to stain for neutrophils in AD patients. The slides were then preserved with a DAPI (nucleus) stain mounting medium and imaged with a slide scanner so we could visualize our slides and count the neutrophils. Measurements were collected through a program called: Zeiss-Zen. Brain tissue area was measured through FIJI, and neutrophil counts were calculated as neuts/mm2 to compare across different brain tissues.
Results: We preliminarily tested this method to assess neutrophils in the brains of patients with different post-mortem intervals, cognitive statuses of dementia, BRAAK stages, and ApoE genotypes. These patients were also diagnosed with varying levels of atherosclerosis and arteriosclerosis prior to death. Varying levels of neutrophils were counted across all 10 samples. The higher staged dementia cases (HSDC) showed increased levels of neutrophils, while the lower stages did not show as large of an increase. In addition, the HSDC had increased BRAAK scores and did not contain any of the neuroprotective ApoE2 genotype.
Conclusion: Although most of our donors were heterozygotes, ApoE4 is the greatest genetic risk factor for sporadic AD, increasing the risk 12-fold when homozygous for ApoE4. ApoE4 has been reported to have less of an inhibitory effect on MAP kinase compared to other ApoE genotypes. Therefore, this could potentially stimulate the abnormal survival of neutrophils in the neural parenchyma of patients with the dysfunctional ApoE4 genotype. In contrast, ApoE2 has been shown to be neuro-protective, which is the genotype we mainly see in the lower/intermediate staged dementia cases, but not in any of the HSDC. Further investigation to involve more donors from different ApoE genotypes, gender, and dementia stages is warranted. Once our staining and imaging is complete, spatial transcriptomic analyses will become the priority.

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Zenaro E, Pietronigro E, Della Bianca V, et al. Neutrophils promote Alzheimer's disease–like pathology and cognitive decline via LFA-1 integrin. *Nat Med.* 2015;21(8):880-886. doi:10.1038/nm.3913

Informed Consent: No informed consent as this is non human subjects research.
Ethical Approval & IRB and/or IACUC Approval: This project is registered with the Touro College of Osteopathic Medicine, Montana, under Project Number TCM-RP03. This project was determined to be non-human subjects research following the Touro University New York IRB Human Subjects Research Determination Form. National Institute of General Medical Sciences of the National Institutes of Health under Award Number P20GM152335 awarded to RRP and National Institute on Aging of the National Institutes of Health under Award Number RO1AG079224-01A1 awarded to THM.

Support: None reported.
Financial Disclosures: None reported.

Poster No. *B-39
Abstract No. 2025-139
Category: Basic Science
Research Topic: Chronic Diseases & Conditions

Block of the Cardiac Potassium Channel HERG by Extracellular Cations

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Context: Reduction of the current carried by the cardiac potassium channel HERG (human ether-à-go-go-related gene) has significant clinical implications, including prolonged QT interval and increased risk of Torsade de Pointes —a potentially fatal arrhythmia characterized by rapid heart rate and compromised cardiac output.1 Elevated levels of physiologic extracellular cations (e.g., calcium and magnesium), as well as environmental and toxicological cations (e.g., cadmium, chromium, arsenic), are increasingly recognized as factors potentially influencing HERG channel function. Increases in extracellular cations have been shown to slow HERG channel activation, increase channel deactivation, and shift the conductance versus voltage curve to more positive voltages.2 It has also been shown that H+ can reduce HERG current by a mechanism that does not involve an effect on channel deactivation and which may involve block.

Objective: To determine: 1) if various extracellular cations reduce HERG current, 2) the underlying mechanisms of HERG current reduction by different cations, and 3) whether these cations bind at a common extracellular site on the HERG channel.

Methods: Two-electrode voltage clamp technique was utilized to measure HERG currents in Xenopus laevis oocytes injected with cRNA encoding wild-type HERG or the double mutant G628CS631C. Based on a cryogenic-EM structure, both G628 and S631are located in the outer pore of the HERG channel.3 Xenopus oocytes were employed due to their robust expression and stability, ideal for electrophysiological assays. Current measurements were performed 2-5 days post-injection.Two distinct voltage protocols assessed current across a voltage range from -160 mV to +60 mV. Voltage protocol 1 measured current reduction over standard physiological voltages, while protocol 2 extended to more depolarized potentials, extracellular cations, including monovalent (H+), divalent (Ca2+, Mg2+, Co2+, Mn2+, Ba2+, Zn2+), and trivalent (La3+) species, were tested at concentrations reflective of physiological and pathophysiological scenarios. The ratio of current post-cation application to pre-cation application was calculated to determine the extent of current reduction.

Results: Our data indicate significant reduction of HERG current by extracellular cations, including monovalent (H+), divalent (Ca2+, Mg2+, Co2+, Mn2+, Ba2+, Zn2+), and trivalent cations (La3+). Comparison of two voltage protocols revealed that Protocol 2 provided a broader voltage window for capturing block at more positive voltages. However, voltage-dependent block of HERG by most cations did not conform to the classic Woodhull model at hyperpolarized voltages (more negative than –120 mV).4 Calcium blocked wild-type HERG but negligible block in the double mutant G628CS631C, highlighting the potential significance of these residues as part of the extracellular cation binding site. Furthermore, experiments involving varying extracellular potassium concentrations (0, 2, and 20 mM) showed decreased cation-induced block with increased potassium, indicating that permeant potassium competes with the cation blocker, consistent with block of an outer pore site.

Conclusion: Our findings suggest extracellular cations reduce HERG channel current primarily through pore blockage, likely at a common or closely related extracellular site. These results are clinically relevant, suggesting that alterations in extracellular cation concentrations—physiological (Ca^{2+}, Mg^{2+}, Zn^{2+}) or toxicological (Cd^{2+}, Cr^{2+}, As^{3+})—could significantly impact HERG channel function and predispose individuals to dangerous arrhythmias such as Tornado de Pointes. This underscores the importance of rigorous HERG screening in drug development, particularly considering patients with altered electrolyte balance (e.g., dialysis patients with elevated serum Zn^{2+}).Future investigations should include alanine scanning mutagenesis to precisely identify extracellular cation binding sites and further elucidation of voltage-dependent blocking mechanisms not captured by classical models.

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Informed Consent: N/A
Ethical Approval & IRB and/or IACUC Approval: Protocol approval notice-TUCA001AM01X-Expires-2026-02-28 animal care and use protocol has been approved by the Institutional Animal Care and Use Committee.
Support: None reported.
Financial Disclosures: None reported.

Poster No. *B-41
Abstract No. 2025-141
Category: Basic Science
Research Topic: Osteopathic Philosophy

D.O. Podcast Increases Pre-Medical Student Knowledge and Attitudes Toward Osteopathic Medicine

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Context: Osteopathic medicine is a rapidly growing field, currently with 42 schools in the United States. The number of medical students enrolled in osteopathic (DO) conferring schools is approximately 25% of all United States medical students, and the number of seats is increasing annually. Many pre-medical students, however, apply to only allopathic (MD) schools, which may be in part due to a lack of knowledge of the principles of osteopathy or the fact that DOs are complete physicians along with MDs. Podcasts are a popular medium used for entertainment and sharing information through interviews and discussion. Although there have been previous studies to assess the effectiveness of podcasts for education on medical topics, there has been no research on podcasts to increase awareness of osteopathic medicine. The D.O. or Do Not podcast was founded in 2021 to educate pre-medical and medical students on the principles of osteopathic medicine and the DO degree. While the podcast has over 100,000 downloads to date, it is unclear if it is an effective tool to increase pre-medical student knowledge or attitudes towards osteopathic medicine.
Objective: To determine if pre-medical undergraduate students listening to podcast episodes on osteopathic medicine can improve their knowledge of the field, and to further determine if this knowledge can increase the reported likelihood of applying to osteopathic medical school in the future.
Methods: Participants were recruited through pre-medical advisors, social media, and word of mouth. Participants needed to identify as considering a career in medicine and have had no experience, prior knowledge, or personal connections to osteopathic medicine. Data were collected using an anonymous online Qualtrics survey that was validated by 3 osteopathic physicians and a Ph.D. Demographic information was obtained, followed by a pre-test containing 14 knowledge and 9 Likert-scale (1-10) attitude questions about osteopathic medicine. The participants were then asked to listen to two pre-selected podcast episodes: episodes 2 and 60, for a total of 75 minutes. Finally, the subjects repeated a post-test consisting of the same pre-test questions. Data were analyzed in Microsoft Excel software using paired-sample t-tests with significance at $p < 0.05$.
Results: Twenty-four pre-medical undergraduate students (20 females (83%) and 4 males (17%), age 19.4 $\pm$ 1.4 years) from all regions of the United States completed this study. Listening to 2 podcast episodes on osteopathic medicine significantly improved pre- (42.6 $\pm$ 20.6%) to post-test (76.5 $\pm$ 16.0%) knowledge scores ($p < 0.001$). There was a significant difference in pre- (4.5 $\pm$ 3) to post-test (6.8 $\pm$ 2.8) attitudes of likeliness to apply to D.O. school ($p > 0.001$), but no change in the likelihood of applying to U.S. MD ($p = 0.7$), foreign/Caribbean MD ($p = 0.8$), dental ($p = 0.5$), or podiatry ($p = 0.1$) schools. Interest in learning more about osteopathic medicine pre- (7.9 $\pm$ 2.6) and post-test (7.5 $\pm$ 2.7) did not change ($p = 0.3$), while perceived understanding pre- (1.6 $\pm$ 1.4) and post-test (7.8 $\pm$ 2.1) improved ($p < 0.001$). Likeliness to seek out an allopathic physician as a healthcare provider pre- (7.5 $\pm$ 2.3) to post-test (7.5 $\pm$ 2.7) exhibited no change ($p = 0.5$), while osteopathic (6.2 $\pm$ 3.2 versus 7.5 $\pm$ 2.8) increased significantly ($p = 0.01$).
Conclusion: This study demonstrates that the D.O. or Do Not podcast may be a viable tool to educate pre-medical students on the field of osteopathic medicine and improve the reported likelihood of both choosing osteopathic physicians as providers and applying to osteopathic medical school in the future. An osteopathic podcast such as D.O. or Do Not could be an education and recruitment resource for organizations

such as the AOA, AACOMAS, and the individual colleges of osteopathic medicine. Future studies are needed to determine if listening to the podcast can increase application number and quality of pre-medical students applying to osteopathic medical school.

Informed Consent: At the beginning of the Qualtrics survey, an informed consent document was embedded. Participants read through the document and selected an acknowledgment or declination of consent. If consent was received, the participants could move on to participate in the survey intervention. Participants were provided with the UNE IRB and the PI's contact information on the informed consent screen to allow for questions and concerns.

Ethical Approval & IRB and/or IACUC Approval: The University of New England Office of Research Integrity determined this project #0125-15 to be exempt from IRB review.

Support: This project was funded by the 2024 Advocates for the AOA (AAOA) Special Projects Fund which was used for participant compensation.

Financial Disclosures: None reported.

Poster No. *B-42
Abstract No. 2025-142
Category: Basic Science
Research Topic: Osteopathic Philosophy

Evaluating Artificial Intelligence's Accuracy in Identifying Anatomical Structures on Cadavers: Implications for Osteopathic Medical Education

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Context: Artificial intelligence (AI) refers to computational systems that are capable of carrying out tasks that normally a human would need to perform, such as complex problem-solving or pattern recognition. Large language models (LLMs) are a subset of AI that are trained on vast datasets. AI and LLMs are becoming increasingly common in both osteopathic and allopathic medical education as tools for students to use in their studying. As their adoption increases within the world of osteopathic medical education, particularly in the anatomical sciences, evaluating the accuracy of these models is crucial for medical students, clinicians, and patients.

OpenAI's ChatGPT-4.0 is a LLM that is designed to generate human-like responses to prompts and questions, and it has been trained on extensive datasets. It is one of the most well-known LLMs and is becoming increasingly popular in undergraduate medical education on topics ranging from physiology to pharmacology and the anatomical sciences. It is also highly capable, having passed the United States Medical Licensing Exam. However, previous studies have focused on the text-based abilities of ChatGPT-4.0, and there is a gap in the literature regarding its abilities in the more difficult task of processing images.

The University of New England College of Osteopathic Medicine (UNECOM) is a small but prestigious osteopathic medical school off the coast of Maine that offers a comprehensive course in the anatomical sciences for osteopathic medical students. As part of its educational resources, UNECOM maintains a robust archive of cadaver images from previous body donor lab practical exams. These practical exams involve placing "tags" using materials such as metal alligator clips, strings, pipe cleaners, or other objects on or near anatomical structures or spaces within cadavers. After each exam, images of the tagged structures are taken and saved along with the correct answers. These images are then made available to students in the following year's class to help them with exam preparation. Access to this image archive is restricted exclusively to students within the College of Osteopathic Medicine. Thus, it is highly unlikely that AI or LLMs would have encountered these images within their datasets during training. Additionally, the anatomical tagging is performed by experts, including surgeons and doctoral-level anatomists with decades of experience, making these images a strong benchmark for evaluating LLM performance.

Objective: This study aimed to evaluate the accuracy of ChatGPT-4.0 in identifying anatomical structures in images of cadavers.

Methods: A total of 57 cadaver images were selected from an anatomy practical exam administered at UNECOM in 2022. These images featured structures from a variety of regions, including the extremities, back, and thoracic cavity. No images of the face were used during the study, and no personally identifying information about the cadavers was collected. The exam did not feature anatomy from the abdominal or pelvic cavity. Two images were of teaching skeletons and were included because they featured anatomical elements.

Prior to the image analysis, GPT-4.0 was prompted with the following instruction:

"You are a first-year osteopathic medical student taking an anatomy course. You are about to take an anatomy lab practical in which you will be asked to identify structures and possibly provide context regarding their function."

Each image was presented to the AI with a clearly tagged or indicated structure. The model was given only one attempt to identify the correct structure. In cases where the tagging was not self-evident, additional context—comparable to what would be provided in an actual exam—was supplied by the investigator. The anatomy practical exams also contained radiographic images and histological images, which were excluded because they would not serve our primary end point of investigating the AI's ability to recognize anatomical structures on cadavers.

To prevent contextual bias, screenshots were pasted directly into a new ChatGPT-4.0 conversation and remained unnamed to avoid any image metadata that could influence the response. Only cadaver images from the UNECOM anatomy department were used to ensure the AI had not, or was incredibly unlikely to have, previously encountered them during training. The model's responses were evaluated in two ways:

- Exact identification – whether the model named the correct anatomical structure.
- Regional accuracy – whether the model identified a structure within the correct anatomical region (e.g., forearm vs. leg).

Both overall accuracy and error rates were calculated for each category.

Results: Out of 57 images, ChatGPT-4.0 correctly identified the general anatomical region 47 times, yielding a regional accuracy of 82% and an error rate of 18%. However, it correctly identified the specific tagged structure in only 5 of the 57 images, resulting in a specific structure identification accuracy of 8.8% and an error rate of 91.2%.

This includes the two images with tags on teaching skeletons, which the AI was unable to correctly identify. Removing these images from our sample brings our regional accuracy and error rate to 81.8% and 18.2%, respectively, and our specific structure accuracy and error rate to 9.1% and 90.9%, respectively.

Conclusion: While ChatGPT-4.0 demonstrates strong performance in recognizing general anatomical regions, its ability to correctly identify specific structures on cadaveric images remains limited. These findings suggest that although ChatGPT-4.0 may be a helpful tool for general anatomical orientation, it is not yet reliable for detailed structural identification in cadaver-based contexts.

Students using ChatGPT-4.0 for anatomy practical preparation should be advised to verify its outputs with trusted sources or faculty guidance. Future improvements in image-based training or multimodal learning may enhance the accuracy of AI tools in anatomical sciences. Future research should be conducted to compare different large language models in similar anatomical recognition tasks (such as comparing Bard, another LLM) and to explore how changing prompts may or may not improve the accuracy of AI in this task. Future research should also include a more varied selection of anatomical images.

Further research will be needed to evaluate the image processing capabilities of ChatGPT-4.0, as well as other LLMs.

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Informed Consent: Not relevant because this experiment was not conducted on people, nor animals. However, permission to use the images was obtained by two faculty members at UNECOM.

Ethical Approval & IRB and/or IACUC Approval: This study did not require IRB approval.

Support: Images were graciously provided by the UNECOM anatomy department.

Financial Disclosures: None reported.

★Poster No. *B-43
Abstract No. 2025-143
Category: Basic Science
Research Topic: Osteopathic Philosophy

Developing a Model of Pelvic Ligaments

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Context: A working understanding of ligament attachment and structure is necessary to predict the compensatory movements of the pelvis at the iliolumbar, sacroiliac, and femoral acetabular joints. There are existing movable pelvis

models, but most use an internal elastic that does not mimic anatomic attachments. Other models focus on only the femoral acetabular hip joint or only the sacroiliac joint and therefore are not representative of how movement in one joint affects the other (1, 2, 3). 3D printing is an accessible and cost-effective way to make bone replicas (4). There are inconsistencies among anatomy texts when describing each ligament's exact attachment and position (5, 6, 7, 8, 9, 10).

Objective: To develop a model of the pelvis that had the iliolumbar, femoral acetabular, and sacroiliac joints and ligaments to represent normal anatomy, and the ability to be manipulated to show the influence of ligamentous strain on bone movement.

Methods: Bone models were printed from an online template developed by the Australian osteopathy clinic "Health Allies" on a Bambu 3D printer using PETG filament (11). Joint spaces were lined and cushioned with recycled exercise leggings. Strips of legging material were folded and sewn accordion-style and glued to each pubic tubercle to represent a pubic symphysis, so that the bones could slide past and rotate around each other while maintaining a limited range of motion. Ligament placement was decided using a collection of photographic anatomy atlases. The areas of ligamentous attachment were scored with short grooves using a rotary tool to increase adherence of gel superglue. Resistance bands were cut to size and attached to scored sections using gel superglue. The anterior and posterior lumbar ligaments were not included in this model.

Results: This model was successful in showing the connection between movement at the femoral acetabular, sacroiliac, and iliolumbar joints as determined by multiple osteopathic physicians and an anatomist at an osteopathic medical college. It can be manipulated to show gait mechanics, innominate and sacral somatic dysfunctions, and the corresponding lumbar diagnosis.

Conclusions: It was possible to create this model using the methods and materials presented. Parts of the building process mimicked embryonic development. For example, to maintain tension on the femoral acetabular ligaments while allowing glue to dry, the femurs had to be flexed and externally rotated in relation to the innominate bones. The surface area of ligament attachment had to be increased for more secure attachment, which may mimic actual anatomy and is an opportunity for future study. Future models may look at different methods for attaching elastic to plastic and elastic alternatives. This model is limited in that it is representative only of a female pelvis.

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Informed Consent: No informed consent process \was relevant.
Ethical Approval & IRB and/or IACUC Approval: The Office of Research Integrity has reviewed the materials submitted and has determined that the proposed work is not research involving human subjects as defined by 45 CFR 46.102. The proposed work does not require IRB review and approval.
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Poster No. *B-44
Abstract No. 2025-144
Category: Basic Science
Research Topic: Osteopathic Philosophy

Factors Affecting Medical Student Participation in Student Evaluations of Teaching: A Retrospective Study

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Context: Effective evaluation systems are essential for fostering collaboration between students and medical educators and for enhancing the quality of medical education. Student curriculum representatives at the Texas College of Osteopathic Medicine (TCOM) play a key role in collecting student feedback to highlight areas of course improvement. In addition to formal course evaluations administered by the Testing and Evaluation Services office at TCOM, faculty also rely on student-driven feedback through Student Evaluations of Teaching (SET), specifically those administered as surveys by student curriculum representatives. However, achieving adequate participation in these student-led SET surveys remains a challenge. Historically, this has raised faculty concerns about the validity and representativeness of the data due to sampling bias. While educators value constructive feedback, concerns about the validity of survey data can sometimes lead to its rejection (1). Enhancing response rates can support the generation of more meaningful, actionable feedback and promote a more responsive and effective curriculum development process (2). This study aims to identify barriers and motivators to SET survey participation to support higher response rates and more actionable feedback for faculty. This initiative will help bridge the gap between student input and curriculum development, creating a more responsive and effective educational environment.
Objective: To identify and quantify factors influencing medical students' participation in SET surveys. Methods: This retrospective study utilized an archival review of existing data collected from SET surveys distributed to the TCOM Class of 2027, which has an average of 235 students. At the conclusion of each course, SET surveys were shared with the class via a link to a Google form created by the curriculum representatives. Surveys were shared through email and social platforms (GroupMe, Discord, Facebook). The format primarily consisted of required Likert scale questions and optional open-ended short-answer questions. Survey questions addressed components of the course such as course content, delivery of course materials, exam content, calendar timelines, and required class sessions. The content of the responses was not considered in the collection of data. Participation rates and response patterns were extracted from SET surveys administered throughout the pre-clinical curriculum. In addition to descriptive analysis, a survey data analysis was conducted to explore potential factors influencing response behavior, including course timing, cognitive load of schedule, survey length, survey availability window, course mean grade, and method of survey distribution. Simple linear regression analysis was performed using GraphPad Prism version 10.1.2 to assess the relationship between selected variables and student participation rates. These methods were employed to identify trends and quantify the impact of various factors on engagement with SET surveys. The mission of TCOM is to "create solutions for a healthier community by preparing tomorrow's patient-centered physicians and scientists and advancing the continuum of medical knowledge, discovery, and osteopathic health care," and one way it fulfills this mission is to "provide a curriculum that is evidence-based and grounded in the learning sciences" (3). This research supports both the osteopathic philosophy and TCOM's commitment to holistic, student-centered education by identifying barriers to effective feedback mechanisms within the medical curriculum.
Results: Data from 21 SET surveys distributed to the TCOM Class of 2027 were collected between August 14, 2023 and December 13, 2024 by TCOM curriculum representatives. An average of 13 +/- 1.5 % of students answered each survey. The

average survey length was 22.86 ± 2.98 items. Of the surveys answered, the mean course grade was 87.21% +/- 0.3363%. Linear regression analysis revealed no significant relationships between participation rate and average course grade (P = 0.78), semester placement (P = 0.98), schedule load (P = 0.89), or number of days the survey was open (P = 0.51). However, survey length was positively associated with response rate (P = 0.009).

Conclusion: Data from this study suggests that SET survey length may influence student participation. In contrast, variables such as mean course grade, semester placement, schedule load at the time of the survey, and the survey availability window were not significantly associated with survey engagement. Future research could explore the optimal survey length to maximize response rates or examine how students' perceptions of a course—such as overall reception—impact participation, potentially by analyzing trends in positive versus negative survey comments. Additionally, tracking the frequency and timing of survey distribution across communication platforms may provide further insight into engagement patterns. However, limitations in GroupMe's search functionality currently hinder efficient retrieval of such data, highlighting the need for more structured dissemination tracking in future studies. Furthermore, factors such as the time students spent completing the survey, their level of engagement with open-ended sections, and the timing of responses relative to the survey's release could also be explored in future research.

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Informed Consent: Informed consent was not required as this project was determined to be Not Human Subject Research by the North Texas Regional IRB.

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Poster No. *B-45

Abstract No. 2025-145

Category: Basic Science

Research Topic: Chronic Diseases & Conditions

Keratin 18 regulates brain metastasis of triple-negative breast cancer in cell model

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Context: Breast cancer is the second leading cause of cancer with the highest mortality rate in females in the U.S. Late-stage breast cancer can metastasize to different locations in the body, including the lungs, liver, bones, and brain. Breast cancer patients with brain metastasis have a poor prognosis, with a median survival time of less than 1 year despite treatment. For patients with metastatic triple-negative breast cancer (TNBC), ~30-45% of patients will develop brain metastasis, often as the first site of relapse. Thus, revealing the mechanism of brain metastasis is critical to understand the pathophysiology as well as developing new therapeutic options for TNBC.

Objective: The epithelial-to-mesenchymal transition (EMT) is defined by the loss of epithelial and acquisition of mesenchymal characteristics, which promote cancer cell progression, invasion, and metastasis into the surrounding microenvironment. Cytokeratins are major structural proteins found in epithelial cells, forming the cytoplasmic network of intermediate filaments. As important epithelial makers, the expression of cytokeratins is decreased during the EMT process, contributing to cancer metastasis. The human cytokeratin family consists of at least 20 members coded by different cytokeratin genes including keratin 18. Keratin 18 is an epithelial cytokeratin encoded by the keratin 18 (or KRT18) gene, located on chromosome 12q13 with 3791 bp. Keratin 18 plays biological functions in carcinogenesis, and its expression may serve as a differential diagnostic marker in various cancers such as small cell lung and breast cancers. Our previous study found that keratin 18

is highly expressed in the parental regular TNBC MDA-MB-231 (231) cell line compared to its brain metastasized counterpart 231Br cell line, indicating that keratin 18 may play a crucial role in regulating breast cancer invasion and metastasis [1]. Thus, we hypothesize that keratin 18 can inhibit brain metastasis of TNBC. To test this hypothesis, we established the stable 231Br cell line with overexpression of keratin 18 or GFP (the control), respectively, and characterized the property of metastasis between the two cell lines.

Methods: (1) Stable cell line establishment: Stable and transient transfections were performed using lipofectamine 3000 transfection reagent according to manufacturer's protocol. 231Br cells were transfected with keratin 18 or GFP plasmid as the control, which are named as 231Br+keratin 18 or 231Br+GFP cells respectively. The transfection rate was evaluated by the percentage of 231Br cells with GFP observed under fluorescent microscope, and protein expression was confirmed by Western blotting assay.(2) Cell lines and cell culture: The 231, 231Br, 231Br+keratin 18, and 231Br+GPF cells were cultured at 37C, 5% CO2, in Dulbecco's modification of Eagle's medium containing 10% fetal bovine serum, 10mM L-glutamine, and 1x penicillin/streptomycin.(3) Western blotting assay: It is used to detect specific protein expression in samples. The procedure is described in our previous publication [1].(4) Wound healing assay: It is used to measure cell migration and wound closure *in vitro*. The procedure is described in our previous publication [1].(5) *In vitro* cell migration assay: It is used to measure cell movement. The procedure is described in our previous publication [1].(6) *In vitro* cell invasion assay: It is used to measure cell invasion. The procedure is described in our previous publication [1].(7) Chromatin immunoprecipitation (ChIP) assay: The Pierce magnetic ChIP kit was used according to manufacturer's protocol. First, formaldehyde was used to stabilize the interactions between DNA and proteins by crosslinking the two. Subsequently, cells were lysed and chromatin was sheared into ~ 200 base pair segments. Next, ChIP-validated antibodies were used to immunoprecipitate and selectively isolate transcription factors that interact with DNA. Then, proteinase K was used to reverse the DNA and protein crosslinking and DNA spin columns were used to further purify DNA. Then, PCR was performed to amplify the intron 1 region of keratin 18 followed by agarose gel electrophoresis to measure the extent of DNA fragment enrichment.(8) RNA-Seq analysis: RNA was isolated from 231 and 231Br cells using the RNeasy plus kit according to manufacturer's protocol. The RNA-Seq experiment and data analysis were performed at Marshall University Genomics and Bioinformatics Core Facilities.(9) Statistics: For bench studies, statistical significance of the data between two groups was analyzed by the Student's t test (Prism 10). Statistical significance of the data with more than two groups was analyzed by one-way ANOVA with a Tukey posttest (Prism 10). Significance levels were set at $p < 0.05$ (*), $p < 0.01$ (**), and $p < 0.001$ (***).

Results: (1) Keratin 18 is less expressed in 231Br cells: RNA-Seq results confirmed that the expression of keratin 18 is ~17 folds lower in 231Br cells compared to 231 cells ($p<0.001$), which is consistent with our previous results using real-time PCR and Western blotting assays [1].(2) 231Br+keratin 18 cells have lower metastasis potential: To characterize the role of keratin 18 in brain metastasis, we successfully established the unique stable 231Br cell line with overexpression of keratin 18 (231Br+keratin 18) or GFP (231Br+GFP). Based on GFP fluorescence, the transfection rate is greater than 95%. Western blotting confirmed that keratin 18 is presented in 231Br+keratin 18, but not in 231Br+GFP cells. Further characterization found that 231Br+keratain 18 cells grow significantly slower than 231Br+GFP cells using cell counting and wound healing assay. We also measured and compared the migration and invasion potential of the two cell lines using *in vitro* transwell migration and invasion assays. We found that 231Br+kertain 18 cells have significantly lower migration and invasion potential compared to 231Br+GFP cells.(3) 231 and 231Br cells have differential transcriptional occupation on keratin 18: FLI1 is a transcription factor with crucial roles in cancer proregression including promoting cell proliferation and angiogenesis. RNA-Seq results showed that the expression of FLI1 is ~ 3.8 folds higher in 231Br cells compared to 231 cells ($p<0.001$). The ChiP analysis confirmed that the intron 1 region of keratin 18 is more enriched by FLI1 in 231Br compared to 231 cells.

Conclusion: In conclusion, we detected the decreased expression level of keratin 18 in brain metastasized TNBC 231Br cells. Using the unique 231Br+keratin 18 cell line that we established, we found that keratin 18 gene overexpression inhibits brain metastatic cell growth, migration, and invasion. This gene is more likely occupied by the transcription factor FLI1 in 231Br cells compared to parental 231 cells. All these results suggest that keratin 18 plays a role in preventing TNBC brain metastasis. Our study has high relevance to the principles of the osteopathic philosophy. With a clear understanding of cancer metastasis mechanism, osteopathic physicians could not only have a better understanding of body homeostasis imbalance caused by cancer, but also provide better precise treatment for their patients suffering from the disease. For future studies, we will (1) further compare 231Br+keratin 18 and 231Br+GFP cells in brain metastasis, (2) study keratin 18 methylation in brain metastasis, and (3) test new drugs that target keratin 18 to treat brain metastasis.

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Poster No. *B-46
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Research Topic: Chronic Diseases & Conditions

Castration exacerbates lung inflammation and altered cytokine profiles in ovalbumin-induced murine asthmatic model.

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Context: Asthma is a complex airway inflammatory disorder that affects people of all ages, sexes, races, ethnicities, and socioeconomic backgrounds. Interestingly, asthma prevalence is higher in prepubescent males than females, but this trend reverses at the onset of puberty[1]. This shift suggests a potential role of sex hormones in modulating asthma pathogenesis. Previous data from our laboratory showed that ovariectomized asthmatic mice exhibited significantly elevated lung inflammation compared to ovary-intact counterparts, highlighting the protective role of female sex hormones. Similarly, studies have shown that androgens can attenuate inflammatory responses[2]; however, the cytokine mediators involved in this process remain poorly defined. Identifying these cytokines is critical for understanding sex-based differences in asthma and for developing potential immunomodulatory therapies aimed at reducing inflammation and airway remodeling.
Objective: To investigate cytokine expression in asthmatic lungs in the presence and absence of androgens.
Methods: Male C57/BL6 mice were randomly sorted into four groups: 1) sham vehicle control (VC), 2) CAST VC, 3) sham asthma, and 4) CAST asthma. Asthma groups were sensitized with 30 μg ovalbumin suspended in Imject alum by i.p. injections followed by 5% ovalbumin in 0.9% saline aerosol challenges. Vehicle groups received the identical treatment without ovalbumin. Bronchoalveolar lavage (BAL) was examined for cell counts, and lung hematoxylin and eosin staining was performed. BAL fluid samples were analyzed for 42 inflammatory markers using Rodent MAP 4.0.
Results: Castrated mice had 17% lower body weight than sham surgery groups (Sham 25.7 ± 1.6 vs. CAST 21.2 ± 1.8 g, $p < 0.05$), consistent with the expected effects of reduced male sex hormones. The asthma groups presented with an increase in the BAL eosinophil population to 30 % in sham and 52% in CAST mice, respectively ($p < 0.05$ vs. corresponding controls). Of the 42 cytokines measured, 30 of them were significantly elevated in asthma. Compared to the sham asthma group, the CAST asthma group showed significantly increased levels of IFN-γ (113%), TNF-α (213%), IL-13 (538%), IL-12p40 (82%), CRP (80%), KC/GRO (124%), and IL-10 (220%) ($p < 0.05$). Conversely, IL-4, and IL-5, were significantly elevated with asthma, but there were no significant differences between sham vs. CAST asthma groups.
Conclusion: Our data demonstrate distinct cytokine profiles between androgenic and castrated asthmatic mice. The castrated asthmatic mice exhibited elevated levels of classic Th2 cytokines, as well as increased proinflammatory cytokines such as TNF and IFN-γ. Additionally, castrated asthmatic mice showed significantly higher CRP levels compared to sham asthmatic mice, suggesting that castration may enhance the inflammatory response in the lungs. Interestingly, IL-10, a robust anti-inflammatory mediator, was unexpectedly elevated in the castrated asthmatic lungs. This finding may suggest a potential role of male sex hormones in the downregulation of IL-10 or that IL-10 function may change under hypoandrogenic conditions. Although prior studies have suggested that IL-10 can adopt pro-inflammatory functions under pathological inflammatory conditions[3,4], the mechanisms underlying this switch remain unclear, and it is unknown whether sex hormones influence IL-10 function. Further studies are necessary to clarify the effects of the male sex hormone in regulating IL-10 response, and to determine how IL-10 contributes to asthma-related inflammation in the absence of androgens.

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Ethical Approval & IRB and/or IACUC Approval: Ethical Approval – All animal protocols were approved by WVSOM Institutional Animal Care and Use Committee (IACUC # 2022-1). Guidelines from the Guide for the Care and Use of Laboratory Animals were followed.
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Research Topic: Chronic Diseases & Conditions

Compounds with Dual Glutaminase Inhibition and Nrf2 Activation Activities Inhibits Growth of Brain Metastasis of Triple-Negative Breast Cancer in Vitro

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Context: Breast cancer is the second leading cause of cancer with the highest mortality rate in females in the U.S. Breast cancer patients with brain metastasis have a poor prognosis, with a median survival time less than 1 year despite treatment. For patients with metastatic triple-negative breast cancer (TNBC), ~ 30-45% of patients will develop brain metastasis, often as the first site of relapse. Current chemotherapeutic agents are largely ineffective against brain metastasis of breast cancer, especially TNBC, thus, seeking new agents for treatment is needed. Glutamine is an amino acid with essential roles in physiologic functions and pathological conditions such as carcinogenesis. Glutaminases (GLS) are the rate-limiting enzymes catalyzing glutamine metabolism and GLS inhibition has emerged as a potential strategy for cancer treatment. Multiple GLS inhibitors such as compound 968 (C968) and its analog CU1015 have been studied in cancer. Nuclear factor erythroid 2-related factor 2 (Nrf2) is a transcription factor with effects of cellular defense and pain relief. We have demonstrated that GLS inhibitors C968 and CU1015 activate Nrf2 in cells, and these compounds enhance morphine analgesia and reduce pain sensitization in chemotherapy-induced peripheral neuropathy mouse model [1, 2].
Objective: To investigate the anti-cancer effects of compounds C968 and CU1015 with dual glutaminase inhibition and Nrf2 activation activities, we used the parental regular TNBC MDA-MB-231 (231) and its brain metastasized counterpart 231Br cell lines as the cell model in our study [3]. Western blotting analysis showed that 231Br cells have increased expression of GLS1 and decreased expression of Nrf2 compared to 231 cells. Thus, we hypothesize that these compounds can inhibit the growth of brain metastasis of TNBC *in vitro*. Our study has clinical significance as these compounds may have promising effects in treating pain and cancer simultaneously.
Methods: (1) Cells and chemicals: The 231 and 231Br cells were cultured at 37°C, 5% CO2, in DMEM medium containing 10% FBS, 10 mM L-glutamine, and 1X penicillin/streptomycin. (2) MTT assay: Cell viability was measured using MTT assay kit following the protocol.(3) Western blotting assay: The expression of proteins was measured using Western blotting assay. Briefly, cell lysates were prepared in RIPA buffer, and protein samples were loaded on an SDS-polyacrylamide gel, separated by electrophoresis, and subsequently transferred to a PVDF membrane. Membranes were blocked with 5% milk in 1X TBS containing 0.05% (v/v) Tween-20 and washed seven times with 1X TBS and 1X TBST alternatively. Membranes were then incubated with primary antibody overnight at 4°C followed by incubation with secondary antibody at room temperature for 1 hour. Pierce supersignal chemiluminescent substrates were used, and images were captured by using the gel doc system. (4) RNA-Seq analysis: RNA was isolated from 231 and 231Br cells using the RNeasy

plus kit according to manufacturer's protocol. The RNA-Seq experiment and data analysis were performed at Marshall University Genomics and Bioinformatics Core Facilities. (5) GLS inhibition assay: Inhibition of GLS was measured using the GLS1 inhibitor screening assay kit according to manufacturer's protocol. (6) Statistics: Statistical significance of the data between two groups was analyzed by the student's t test (Prism 10), and more than two groups was analyzed by one-way ANOVA with a Tukey posttest (Prism 10). Significance levels were set at $p < 0.05$.

Results: (1) Expression of GLS1 and Nrf2 is different between 231 and 231Br cells. RNA-Seq results confirmed that the expression of GLS is ~ 1.5 folds higher and Nrf2 is ~ 2.3 folds lower in 231Br cells compared to 231 cells ($p<0.001$), which is consistent with protein expression results measured by Western blotting assay. (2) Compound CU1015 shows better GLS1 inhibition compared to C968. We used the GLS1 inhibitor screening assay kit to measure the inhibitory effects on GLS1 by the two compounds and found that CU1015 had better GLS1 inhibition than C968 ($p < 0.001$). (3) Both compounds have inhibitory effects on 231 and 231Br cell lines. We used MTT assay to measure the effects of the two compounds on cell growth. Both compounds are able to inhibit the growth of 231 and 231Br cell lines at 1 μM or 10 μM concentration ($p < 0.001$), except there is no significant inhibition on 231Br cells by 1 μM of C968. In both cell lines, 10 μM concentration of both compounds has better inhibitor effects than 1 μM ($p < 0.001$). We also did dose-response curve to measure the IC50 of the two compounds in both cell lines and found the IC50 values of CU1015 is lower than C968 (CU1015: 0.95 mM vs. 2.34 mM and C968: 22.6 mM vs. 58.8 mM in 231 and 231Br cells, respectively). (4) Both compounds induce apoptosis in both cell lines. We used flow cytometry and Western blotting assay to measure the apoptosis induced by the two compounds in both cell lines. We found that both compounds can induce apoptosis in 231 and 231Br cells. Currently, we are comparing the extent of apoptosis caused by different concentrations of the compounds. (5) Both compounds inhibit the Wnt signal transduction pathway in both cell lines. In TNBC, Wnt signaling regulates cell differentiation, proliferation, and stem cell pluripotency. We used Western blotting assay to measure the effects of the two compounds on Wnt signaling in both cell lines and found that both compounds are able to inhibit Wnt signaling in both cell lines at 10 μM.

Conclusion: In conclusion, we confirmed that the expression of GLS1 is higher and Nrf2 is lower in the brain metastasized TNBC 231Br cells compared to their parental regular 231 cells. The analog CU1015 shows better GLS1 inhibition compared to C968. So far, we found that both compounds are able to inhibit the growth, induce apoptosis, and inhibit Wnt signal transduction pathway in both cell lines. These results suggest that these compounds with dual glutaminase inhibition and Nrf2 activation activities inhibit the growth of brain metastasis of TNBC *in vitro*. As we already show that C968 and CU1015 can significantly reduce chemotherapy-induced peripheral neuropathy in mice [2], our study may lead to find new drugs to treat cancer and pain simultaneously. Our study also has high relevance to the principles of the osteopathic philosophy. As potentially effective compounds, they could help restore the body to homeostasis following the imbalance caused by cancer and pain, as well as provide patients with a more improved outlook, which is central to the behavioral model of osteopathic care. In addition, with a clear understanding of the mechanism of oncogenesis, metastasis, and drug treatment in breast cancer, osteopathic physicians could better treat their patients suffering from the disease. For future studies, we will (1) further study the effects of the compounds on other oncologic characteristics, including cell cycle, angiogenesis, migration, and metastasis using *in vitro* cell model; (2) if *in vitro* data is promising, we will test the *in vivo* anti-tumor activities of these compounds using mouse model, such as measuring the ability of decreasing tumor burden and prolonging survival time; (3) investigate their molecular mechanisms in cancer treatment, such as exploring the relationship and roles of these compounds, GLS, and Nrf2 in breast cancer.

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Research Topic: Chronic Diseases & Conditions

Determining the Effect of Biological Sex and Therapy on Diet-Induced Alterations in Liver and Kidney Health in Mice

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Context: Diet is a leading risk factor for disease and death worldwide (1), yet the physiological consequences of poor diet remain unknown. We believe this is due to the poor representation of diet in preclinical animal studies (2). Rodent diet formulations are excessive as compared with human values and the results are often untranslatable. We developed a novel Americanized rodent diet (AD) based on the 50th percentile of American nutrient intake and accounts for differences in rodent and human nutrient requirements (3). Preliminary studies suggest the AD may have initial impact on liver and kidney tissues in a sex-dependent manner.
Objective: The objective of this study was to determine how biological sex, diet, and common therapeutic interventions influence the structure-function relationship in kidney and liver tissues in mice. Methods: Weanling male and female C57Bl/6 mice were given *ad libitum* access to standard rodent chow, a high-calorie Western diet (WD), or our novel AD for 5 months. Mice were then assigned to receive 1) no treatment, 2) dietary modification (chow), or 3) a pharmacological treatment (candesartan+atorvastatin) for an additional 3-months. Body weight and systolic blood pressure (SBP) were recorded throughout the study. Spot urine sample was collected at the end of the study and mice were then euthanized for the collection of serum, liver, and kidney tissues. Aspartate amino transferase activity and metabolic outcomes were quantified in the serum and liver and kidney tissues were processed for histology and quantification of fibrotic and inflammatory gene expression by real-time PCR. All data were analyzed using general linear model procedures with Tukey's post hoc test.
Results: Diet, treatment, and biological sex each significantly influenced all metabolic outcomes except for fasting glucose and triglycerides. Considering the effect of diet alone, mice consuming the WD had the greatest fasting total ($P<0.001$) and HDL ($P<0.001$) cholesterol and insulin ($P=0.002$). Mice consuming the AD had intermediate increases and mice consuming chow had the lowest values. Dietary modification resulted in the greatest reduction in metabolic outcomes, with pharmacological treatment reducing total ($P<0.001$) and HDL ($P<0.001$) cholesterol which verifies a pharmacological dose of the statin. Dietary modification also reduced circulating insulin concentrations ($P=0.01$). Males had significantly greater circulating total ($P=0.001$) and HDL ($P=0.002$) cholesterol and serum insulin concentrations ($P=0.03$) as compared to females. There were also significant diet*treatment and sex*treatment interactions. Mice consuming the WD and receiving the pharmacological treatment had twice the circulating total cholesterol of mice consuming chow or AD and receiving the pharmacological treatment. Male mice receiving pharmacological treatment was also double that of females receiving pharmacological treatment. Treatment ($P=0.02$) significantly influenced SBP, with pharmacological treatment being lower than mice with no treatment ($P=0.01$). Diet, treatment, and biological sex significantly influenced body weight ($P<0.001$) and adiposity ($P<0.001$). Male mice, consumption of the WD, and no treatment were associated with the greatest weight gain and adiposity. There were intermediate effects of pharmacological treatment and consumption of the AD on body weight and adiposity, both of which were significantly greater than no treatment ($P<0.03$) and consumption of chow diet ($P<0.001$), respectively. Diet significantly influenced liver weights, with mice consuming the WD having the greatest values ($P<0.001$). Mice fed AD also had significantly greater liver weights as compared to mice fed chow ($P<0.001$). These differences were also observed with histological assessment of tissue structure, with mice fed the WD having the greatest evidence of hepatic steatosis and inflammation ($P<0.001$), and mice fed the AD having an intermediate effect that was still greater than mice fed chow ($P<0.001$). However, only mice fed the WD had a significant (50%) increase in serum ALT activity ($P<0.01$). Treatment also significantly influenced liver weights, with both pharmacological treatment and dietary modification having lower liver weights than mice with no treatment ($P<0.005$). Interestingly, mice with no treatment or pharmacological treatment had similarly increased histological evidence hepatic steatosis and inflammation as compared to mice with dietary modification ($P<0.003$). Male mice had heavier liver weights ($P<0.001$), however there were no effects of biological sex in histological assessment of liver structure or

circulating ALT values. Diet significantly (P<0.001) influenced the mRNA expression of *Col1a, Col3a, Vim*, and *Ccr2* with mice fed the WD having the greatest expression of these markers. Mice fed the AD had an intermediate effect and both were significantly higher than mice fed chow. Treatment also significantly (P<0.03) influenced the expression of *Col1a* and *Ccr2*, where mice with dietary modification had the lowest expression as compared to mice with no treatment. Interestingly, despite a lack of difference in ALT activity and histology, female mice had greater (P≤0.001) expression of *Col3a, Vim, Fn1, Cd3e, Cd19,* and *Ccr2* as compared to male mice. Diet significantly influenced kidney weights, with mice fed the AD having the greatest (P≤0.04) kidney weights, followed by mice fed the WD. The effect of the AD on renal hypertrophy was intensified when body weight was used as a covariate (P≤0.006), whereas mice consuming WD were no longer significant (P=0.8). Diet also significantly influenced renal histology, with mice fed the AD having the greatest (P≤0.03) evidence of kidney damage, followed by WD (P<0.001) as compared to mice fed chow. The most pronounced renal histological changes consisted of proximal tubule dilation, renal proximal tubule lipid vacuolization, luminal casts, and interstitial inflammation. No difference in albuminuria between the diets was observed. Treatment did not significantly influence kidney weights or histology outcomes; however there was a significant reduction in albuminuria with dietary modification and pharmacological treatment as compared to mice with no treatment (P≤0.03). The female sex was associated with higher albuminuria (P=0.001) and histological evidence of injury (P<0.001) as compared to males. Diet significantly influenced the expression of genes related to tissue remodeling and inflammation. Mice consuming the AD had lower renal expression of *Acta2* (P=0.008 versus chow), whereas mice fed the WD had greater *Fn1* (P=0.004 versus chow), *Cd3e* (P=0.006 versus chow), and *Cd19* (P≤0.03 versus AD and chow). Mice fed AD also had elevated expression of *Fn1* as compared to mice fed chow (P=0.02). Treatment only affected the expression of *Fn1*, with mice receiving pharmacological treatment having greater (P=0.01) expression as compared to mice with no treatment. Females had greater expression of *Acta2* (P<0.001) and *Fn1* (P<0.001), whereas males had greater mRNA expression of *Cd19* (P<0.001) and *Ccr2* (P<0.001).

Conclusion: Our results highlight the significant impact of diet and biological sex in preclinical experiments studying structure-function relationships in liver and kidney tissues. Our findings support the need to consider dietary quality in preclinical animal studies to improve their translational potential and view nutrition from a holistic perspective.

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Poster No. B-49
Abstract No. 2025-085
Category: Basic Science
Research Topic: Chronic Diseases & Conditions

Multimodal Imaging Insights into Segmental Physical Differences in Cadaveric Left Anterior Descending Arteries

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Context: Non-modifiable risk factors for cardiovascular disease have been well-established, namely advanced age and biological sex.1 Hemodynamic studies have demonstrated heterogeneity in the blood flow patterns within coronary arteries; for example, advanced age is correlated with vascular stenosis and turbulent flow,2 and females experience increased coronary flow and vascular shear stress relative to males.3 However, the precursory morphologic causes responsible for these patterns, particularly along the length of coronary arteries, remains poorly understood. Understanding these differences may yield insight on not only hemodynamic differences throughout the Left Anterior Descending artery (LAD), but also on localization of clinical interventions – particularly stenting.

Surface Metrology, a novel microscopic technique primarily used in engineering and manufacturing, can analyze surfaces and quantifiably measure their complexity by utilizing scale sensitive fractal analysis.4 While this application is primarily used to examine friction and wear in gears, current literature suggests that this has not been done before to coronary vessel luminal surfaces.

Objective: To quantify and compare the degree of calcification and luminal surface morphology complexity in cadaveric left anterior descending arteries (LADs) between distinct segments

Methods: Cadaveric LADs were systematically dissected. Of the 40 LADs collected, 31 were scanned using a Bruker Skyscan 1173 microCT scanner. Scans were processed by threshold-based image segmentation on Dragonfly by Object Research Systems to quantify calcium volume in the proximal, middle, and distal segments of each vessel. Following microCT analysis, vessels were cut into equal length proximal, middle, and distal segments. Lengthwise dissection of vessels exposed their luminal surfaces, preparing them for luminal scanning by Sensofar S Neox optical profiler. At least 5 scans of each of the vessel segments were performed at 20X magnification. SensoMap 10 was used for processing luminal scans and performing scale-sensitive fractal analyses. Alizarin red stains were performed on a proximal ring of tissue from each segment and calcification was quantified.

Results: MicroCT analysis demonstrated an increase in calcification in the proximal segments relative to the distal segments (n=10, $p < 0.0001$). SensoMap analysis demonstrated an increase in fractal complexity (Lsfc) and fractal dimension (Dls) (n=18, $p = 0.0158$, $p = 0.0359$, *respectively*) in distal segments relative to middle segments. Furthermore, an increase in scale of maximum complexity (Smfc) in distal segments relative to proximal segments was observed (n=18, $p = 0.0278$). No differences were found in calcification intensity and smooth-rough crossover throughout the LAD.

Conclusion: Our findings suggest that the more proximal segments of LADs are more prone to calcification than the distal segments. Moreover, surface morphological complexity may increase in distal segments versus middle and proximal segments. The calcification changes along the LAD, in conversation with the changes in quantifiable surface complexity, suggest promising utility for surface metrology in our understanding of coronary artery physiology. Limitations of these data include collection limitations, as the cadaveric vessels were collected after months of dissection by first year medical students. Further analysis is warranted to determine how these measured changes in vessel complexity contribute to luminal coronary artery mechanisms, and their impact on cardiovascular health.

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Poster No. B-50

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Research Topic: Chronic Diseases & Conditions

Assessing the Impact of Calcification on Luminal Surface Complexity in Cadaveric Left Anterior Descending Arteries

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Context: Coronary artery calcification is a well-established marker of atherosclerotic disease and is associated with worse cardiovascular outcomes [1]. Currently, calcium burden is commonly assessed through imaging for both risk stratification and its prognostic value. Less attention has been paid to how calcification alters the luminal surface topography of vessels. Understanding the intricacies of luminal surface topographic changes in pathologic coronary arteries may yield insight not only on the efficacy of existing clinical interventions (e.g. impact of surface changes on stent anchoring) [2], but also on the subsequent hemodynamic

changes and pathophysiology of thrombus formation [3]. Surface metrology, a quantitative technique for characterizing 3D topography, offers a novel approach to objectively measure luminal irregularity across spatial scales. We hypothesized that increases in luminal complexity would be associated with a greater overall extent of calcification.

Objective: To detect and quantify luminal surface alterations induced by calcification in cadaveric left anterior descending arteries (LADs) using surface metrology, a novel approach.

Methods: Ten left anterior descending arteries were dissected from cadaveric hearts obtained through a university-affiliated anatomical donation program. Each vessel was selected and scanned using the Bruker Skyscan1173 microCT scanner to visualize and quantify calcification. We conducted threshold-based image segmentation using Dragonfly by Object Research Systems to quantify the total calcium volume present throughout the vessel. Each specimen was processed and scanned at 20X magnification using the Sensofar S Neox optical profiler. Each scan was subsequently analyzed with surface metrologic scale-sensitive fractal analyses in SensoMap 10.

Results: All ten left anterior descending artery specimens were successfully processed and included in the final analysis. Extent of calcification was standardized using the following ratio: total calcium volume by total vessel length (TC/VL). We defined a TC/VL ratio of 0.00–0.25 as low calcification and 0.26–0.5 as high calcification. Our findings revealed statistically significant increases in smooth-rough crossover (SRC: $r = 0.9503$, $p<0.0001$) and scale of maximum complexity (Smfc: $r = 0.3688$, $p = 0.0003$), both showing positive correlation with calcification extent. In contrast, reductions were observed in fractal complexity (Lsfc: $r = -0.383$, $p = 0.0002$) and fractal dimension (Dls: $r = -0.383$, $p = 0.0002$), both showing negative correlation when comparing highly calcified to lowly calcified left anterior descending specimens.

Conclusions: Our data suggest that the calcification of left anterior descending arteries is associated with increased luminal surface roughness overall but decreased microstructural complexity directly over calcified regions. We propose that increases in endothelial tension directly over areas of calcification reduce surface complexity. Further investigation will explore modeling blood flow using smooth particle hemodynamics (SPH) based on complete luminal and surface topography to evaluate the impact of such surface changes on hemodynamics.

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Abstract No. 2025-114

Category: Basic Science

Research Topic: Chronic Diseases & Conditions

Characterization and comparison of osteopathic medical student performance in pathology and laboratory medicine: an analysis of competency in an integrated organ-systems curriculum

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Context: Pathology and laboratory medicine is a foundational component of well-informed clinical decision making. As such, student competency in disease recognition, consideration of underlying pathology, and appropriate laboratory testing are essential to the delivery of high-

quality, osteopathic patient care. Although laboratory medicine is included in domain 2 and category 3.1 as described in the COMLEX-USA blueprint, the evolution of medical education from siloed basic science disciplines to integrated curricula presents challenges as to where best to incorporate foundational laboratory content.

Objective: To characterize to what extent pathology and laboratory medicine is assessed in our organ system-based curriculum and evaluate student performance across three previously published competency domains.

Methods: We analyzed three years of performance data related to pathology and laboratory medicine on multiple-choice examinations from genitourinary and gastrointestinal-hepatobiliary systems courses, the latter including a large representation of nutritional health. The rationale behind selected courses was three-fold. These courses include: (1) diagnostics, risk factor identification, management, and prognosis of highly prevalent chronic disease, (2) the physiological effects of chronic disease, and (3) an emphasis on opportunities for optimum laboratory stewardship diagnostic testing of chronic disease. Further, these courses encompass curricula taught in both years one and two for comparison. Questions were categorized into one of three content domains: (1) recognizing presented disease process (Pathology), (2) describing underlying pathophysiology (Pathophysiology), and (3) appropriate ordering and interpretation of laboratory results including anatomic pathology reports (Lab medicine). Anonymous student performance data was measured and extracted from Examplify: a secure and ubiquitous testing platform. Coding into one of the three categories was performed independently by course directors and another Medical Education department faculty member with significant clinical and academic experience in pathology and laboratory medicine. The faculty coded all exam questions administered for both courses which occurred during a three-year period. The reviewers discussed and compared the categorically assigned exam items. Differences in coding were resolved with consensus as the final criterion. Data was organized and analyzed using Excel (Microsoft)

Results: We analyzed 957 exam questions across three osteopathic medical school classes found within two systems-based courses. Questions items assessing pathology and laboratory medicine items constituted 67% of the sample. Items relating to underlying disease pathophysiology were the most frequent domain in both years (24% and 29%). The performance distribution across domains and years is found in Figure 1. There was no significant difference in performance between content categories for any individual year. However, significant differences were found (Kruskal-Wallis $\chi^2 = 6.79$, df = 2, *P*-value = 0.03361) in ranks between Lab medicine and Pathology for all calendar years (Z = 2.57, *P*-value = 0.015).

Conclusions: Our findings demonstrate that pathology and laboratory medicine continue to represent a significant part of our institution's competency assessment in a system-based curriculum. Non-significant performance differences across domains within individual classes is direct evidence of relative student competency therein. Nevertheless, students performed significantly different across all years with regard to laboratory medicine and pathology content. Reasons for discrepancies between competencies may include over emphasis of specific topics within each domain, distribution of pathology and laboratory medicine content across lectures, assessment differences such as question styles or content framing, or inherent differences between medical school classes. Future research, including curriculum mapping or content auditing of lectures may better inform future approaches to assess content performance and potentially improve both content delivery and performance.

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Poster No. *C-1
Abstract No. 2025-003
Category: Clinical
Research Topic: Musculoskeletal Injuries and Prevention

Advanced Maternal Age Pregnancies and the Birth Canal: Investigating the Role of Skeletal Remodeling

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Context: Advanced maternal age (AMA) pregnancies are associated with increased risk of cesarean delivery, often attributed to obstructed labor secondary to feto-pelvic inadequacy (1-3). Previous studies have suggested that pelvic morphology changes with age, possibly leading to cephalopelvic disproportion, with disagreements for how repeated pregnancies impact pelvic shape (4-6). Here, we address a critical gap by examining how aging and childbirth history relate to the dimensions of the birth canal relevant to labor outcomes. Our findings directly inform osteopathic approaches for optimizing pelvic function, managing labor difficulties, and preventing musculoskeletal injuries caused by parturition (8-9).
Objective: To determine whether age or parity significantly affect obstetric pelvic dimensions, and if such changes could explain the higher incidence of obstructed labor in AMA pregnancies.
Methods: This retrospective imaging study analyzed whole-body CT scans from 299 deceased individuals (150 females, 149 males) from the New Mexico Decedent Image Database (7). The sample was subdivided for sex (male, female), age (15-34 years, 35-50 years, ≥51 years), and parity (parous, nulliparous). Inclusion criteria were based on low body decomposition and absence of factors that would obscure pelvic anatomy. Four key pelvic dimensions were measured in 3D: anteroposterior (AP) inlet, AP outlet, mediolateral (ML) inlet, and ML midplane. Group comparisons were conducted using non-parametric Wilcoxon Rank Sum tests for parity groups ($p \leq 0.05$) and the Welch test to compare age groups.
Results: The analysis indicated that age-related differences were found exclusively in females and were limited to the two mediolateral pelvic canal dimensions. Women aged 51 and older—presumably post-menopausal—exhibited significantly wider pelvic canals compared to younger age groups, including those classified as advanced maternal age (35-50 years). There were no differences between the younger (15-31 years) and advanced maternal age groups. The parity analysis revealed a significant difference in the anteroposterior (AP) outlet, which was wider among parous individuals. No significant age-related variations were observed in the male sample.
Conclusion: Our findings suggest that the increased obstetric risk in AMA pregnancies is not attributable to a narrowing of the bony pelvis. Pelvic widening was only evident in postmenopausal individuals, not in AMA females, indicating that skeletal remodeling may occur too late to influence delivery outcomes during the reproductive window. These results challenge the notion that obstructed labor in AMA pregnancies is due to age-related skeletal constraints and instead highlight the contribution of functional musculoskeletal factors—such as ligamentous tension, pelvic alignment, and joint mobility. This underscores the importance of osteopathic manipulative medicine (OMM) in labor management and pre/postpartum reduction in pelvic or sacral pain, particularly for optimizing biomechanics in higher-risk obstetric patients (8).

Additionally, our parity-related findings suggest a lasting anterior nutation of the sacrum following childbirth, which may predispose individuals to sacroiliac joint dysfunction or lower back pain in subsequent pregnancies and later life—conditions that may benefit from targeted OMM. The observed postmenopausal pelvic widening also raises concerns about pelvic floor support and decreased micturition control, both of which can be addressed through various osteopathic techniques that target a range of lower urinary tract symptoms (9). While further study is warranted, these anatomical changes reaffirm the need for osteopathic approaches that address pelvic floor function and integrative post-reproductive care. Overall, this work highlights the multifactorial nature of perinatal biomechanics and reinforces the clinical relevance of OMM across the reproductive lifespan.

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Informed Consent: Anonymized decedent image data were used under IRB exemption.
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Poster No. *C-2
Abstract No. 2025-007
Category: Clinical
Research Topic: Chronic Diseases & Conditions

Raising Awareness Among Primary Care Providers About the Diagnosis and Management of Autism Spectrum Disorder (ASD)

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Context: Autism spectrum disorder (ASD) is a neurodevelopmental disorder used to describe a constellation of symptoms consisting of impaired social communication and interactions [1]. A rapid rise in ASD has been noted in the last 30 years. The number of children afflicted with ASD increased from 1 in 2,000 in the 1990s, to 1% of the pediatric population in 2012 [2], to 3.2% of the pediatric population up to age 8 as of May 2025 [3]. Federally Qualified Health Centers (FQHCs) in Tulare County, such as Family HealthCare Network (FHCN), are positioned to provide care to underserved communities, such as the rural central valley. With the number of pediatricians working in rural areas decreasing [4], it is becoming even more imperative for family medicine practitioners (FMPs) and primary care providers (PCPs) in these FQHCs to be familiar with early ASD diagnosis and intervention. Being familiar with the overall understanding of ASD care and the main challenges faced by providers will be key to creating effective, inclusive and early care that support the osteopathic principles of caring for the patient's mind, body and spirit. This can also add to the limited literature on ASD prevalence in Tulare County.

Objectives:

1. To identify the general understanding of ASD diagnosis and treatment amongst FHCN pediatricians vs. other PCPs
2. To identify the greatest perceived challenges in providing ASD care to patients
3. To identity the resources that would be the most beneficial for PCPs to facilitate effective and early ASD diagnosis and intervention

Methods: Surveys were administered during FHCN provider meetings at their Mooney, School and Porterville locations in Visalia, CA. A pre-survey was emailed to the providers at each meeting and were provided a QR code and paper copy prior to the start of the meeting. Dr. Kadam then gave a presentation that detailed early signs of ASD, diagnosis using the Modified Checklist for Autism in Toddlers (M-CHAT) diagnostic tool, and steps providing care ASD patients. Resources for the PCPs were provided at the end of the presentation. A post-survey was administered at the conclusion of the presentation via QR codes, in-person hard copies and follow-up emails. All FHCN pediatricians, FMPs, physician assistants (PAs) and nurse practitioners (NPs) were invited to participate. No medical assistants, nurses or non-

healthcare providers were included in the survey. A total of 90 providers were at the provider meetings and were invited to participate in the surveys. Pandas python library and scipy.stats was utilized to calculate statistics to compare the familiarity of ASD diagnosis and intervention between pediatricians and the other PCPs at the meetings, the largest challenges to providing care for patients and the resources that providers identified as the most helpful for them.

Results:

a. With a total of 90 providers at the presentations, we had an initial response rate of 90% for the pre-survey and 83.3% for the post-survey. After exclusion principles were applied, we had a final response rate of 83.3% for the pre-survey and 73.3% for the post-survey.
b. The correct responses for the age of diagnosis for ASD patients and the M-CHAT score indicating high-risk patients were calculated for the pre-survey. The correct responses between the pediatricians and non-pediatrician providers were compared.
    i. Age of diagnosis for ASD: 41.7% of pediatricians and 15.9% of non-pediatrician answered this correctly.
    ii. M-CHAT score indicating high-risk patients: 83.3% of pediatricians and 55.9% of non-pediatricians answered this correctly.
c. We compared the percentage of improvement between the pre and post-surveys.
    i. Pediatricians experienced an improvement of 8.3% ($p = 1.0$) and 6.7% ($p = 1.0$) in answering the age of diagnosis and M-CHAT score for high-risk ASD patients, respectively.
    ii. Non-pediatricians experienced an improvement of 52.0% ($p < 0.0005$) and 28.0% ($p = 0.0022$) in answering the age of diagnosis and M-CHAT score for high-risk ASD patients, respectively.
d. Confidence level with the diagnosis of ASD increased from the pre and post-survey from 8 to 15 for participants indicating “very confident” and from 26 to 38 for participants indicating “somewhat confident”. The number of participants indicating “not confident” decreased from 39 to 13.
e. Familiarity with the M-CHAT increased from the pre and post-survey from 29 to 31 for participants indicating “very confident” and from 28 to 31 for participants indicating “somewhat confident”. The number of participants indicating “not familiar” decreased from 12 to 2.
f. “Limited time for evaluations” was indicated as the largest challenge to providing care. “Lack of resources” was indicated as the second largest challenge to providing care.
g. “Better referral pathways for specialist referral” was indicated as the most in-demand additional resource

Conclusions: Pediatricians at Family Healthcare Network (FHCN) are generally more familiar than non-pediatrician providers with the diagnosis and interventions for ASD. Both groups appeared to benefit from the presentation given, as indicated by the increase in correct answers in the post-survey and increased confidence and familiarity levels with ASD diagnosis and M-CHAT. In general, the providers indicated that a limited time for evaluations and a lack of resources were the two main challenges they faced and that improved referral pathways were most crucial for improved ASD referrals.

This project will help provide important feedback to Family Healthcare Network (FHCN) to help provide care that is based in the osteopathic principles of holistic medical and early preventative care. Based on these findings, a few interventions are proposed. One tailored to address the limited time for evaluations is to provide patients and their guardians with the M-CHAT form when they fill out paperwork. This will give providers more time to evaluate the M-CHAT, educate patients and time in the room to evaluate the physical, mental and emotional condition of the patient and the patient’s caregivers. Another potential intervention to address the lack of resources reported by the FHCN providers is to ensure that a physical and electronic copy of M-CHAT evaluation steps and ASD resources are made available to all providers via email and at their work stations.

Limitations include the small sample size (n=90), which decreases the generalizability of study findings. Additionally, the use of self-reported data introduces potential bias, as responses may be influenced by participants’ recall and experiences. The drop in response rate from pre to post-survey introduced non-response bias, which will cause inherent inaccuracies in the results and potentially affect the conclusions reached.

References:

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2. Rice, CE, Rosanoff, M, Dawson, G, et al. Evaluating changes in the prevalence of the autism spectrum disorders (ASDs). Public health reviews. 2012;34:1-22.doi.org/10.1007/BF03391685
3. Centers for Disease Control. (2025, May 27). Data and Statistics on Autism Spectrum Disorder. Centers for Disease Control. https://www.cdc.gov/autism/data-research/index.html
4. Ramesh, T, & Yu, H. US pediatric primary care physician workforce in rural areas, 2010 to 2020. JAMA network open. 2023;6(9):e2333467-e2333467.doi:10.1001/jamanetworkopen.2023.33467

Informed Consent: Participants were provided with a written description of the project at the beginning of the survey, including the project’s purpose, procedures, voluntary nature, and confidentiality measures. Informed consent was obtained electronically by indicating that choosing to move forward with the survey was indicative of consent. If the participant did not wish to participate, they were asked in the survey directions to exit the survey.

Ethical Approval & IRB and/or IACUC Approval: 2025-031 ATSU IRB Non-Jurisdiction PDPEQAQI Determination. This project was reviewed and approved by the ATSU Institutional Review Board. No oversight was deemed necessary.

Support: None reported.
Financial Disclosures: None reported.

Poster No. *C-3
Abstract No. 2025-016
Category: Clinical
Research Topic: Impact of OMM & OMT

Analyzing Medical Student Knowledge Regarding Nutrition

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Context: Nutrition in medical curriculum is lacking across the entire United States in both MD and DO programs. On average, medical students have 19.6 hours of nutrition-related courses in their medical school curriculum (Adams, 2010). 80% of nutrition knowledge was gathered outside of the medical curriculum. There remains a need to better educate physicians regarding nutrition and its benefits for patients. Our research focuses on student opinions on their nutrition knowledge and whether students can assess proper nutrition recommendations to give to patients.
Objective: The objective of this survey research was to determine the opinions and knowledge of medical students at a southeastern osteopathic medical school regarding nutrition. Using this research, the goal is to help improve the curriculum at this medical college regarding nutrition and to educate other medical schools on areas that they could add to their curriculum.
Methods: Pre-clinical students at the Alabama College of Osteopathic Medicine were administered an anonymous survey regarding nutrition knowledge and opinions. Specifically, students answered questions regarding ingredients that patients should limit, the type of diet they would recommend to patients, how important they thought nutrition was and how well prepared they felt to discuss nutrition with their patients. Results were calculated using standard percentages based off the number of students who responded in each given category.
Results: Students responded overwhelmingly positive that nutrition was important to educate patients on. However, approximately two thirds of students felt that their current education was inadequate to properly inform patients regarding nutrition and half of students said they would educate themselves outside of their medical education regarding nutrition. 88% of students stated they would recommend a Mediterranean diet to patients and 70% of students stated that high fructose corn syrup should be limited. Interestingly, only 10%-19% of students said they would recommend a vegan or vegetarian diet and 57% would recommend limiting trans fats.
Conclusion: Medical schools have limited coursework regarding nutrition. Medical students at an osteopathic medical school stated they would like more education regarding nutrition to properly advise their patients. Students showed mixed knowledge on proper nutritional advice for students, something that can be improved with additional curriculum added regarding these factors. Future research should analyze physician and clinical student knowledge regarding nutrition and focus on factors to improve physician knowledge and advice surrounding nutrition for their patients.

References:

Adams, K. M., Kohlmeier, M., & Zeisel, S. H. (2010). Nutrition education in U.S. medical schools: latest update of a national survey. *Academic medicine: journal of the Association of American Medical Colleges*, *85*(9), 1537–1542. https://doi.org/10.1097/ACM.0b013e3181eab71b

Informed Consent: Informed consent was obtained electronically. Individuals were given an electronic form detailing the survey, risks, benefits, and alternatives. All responses were anonymous. Individuals could opt out of the survey if they chose without repercussions.
Ethical Approval & IRB and/or IACUC Approval: Full board approval on November 11, 2024 (24-11-04-001).
Support: None reported.
Financial Disclosures: None reported.

Poster No. *C-7
Abstract No. 2025-061
Category: Clinical
Research Topic: Osteopathic Philosophy

Zink's Fascial Patterns Among First- and Second-Year Medical Students

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Context: Zink's Common Compensatory Pattern (CCP) is a pattern of somatic dysfunction that can be observed in the spinal transitional zones. J. Gordon Zink, D.O. postulated that

the fascia in the body had a tendency to rotate in certain directions such that one area will rotate one way, and another area will rotate in the opposite direction to compensate. He stated that there are four compensatory curves located at regions of the occipitoatlantal, cervicothoracic, thoracolumbar, and lumbosacral junctions, and that the most common pattern of rotation in healthy individuals was rotated left, right, left, right, respectively. A less common pattern observed in healthy individuals was right, left, right, left. He also observed that unhealthy patients, such as those that were hospitalized or recently experienced a traumatic event or stress did not follow this pattern of fascial restrictions.

Current literature is limited regarding the validity of Zink's CCP and to what benefit a clinician receives when evaluating a patient's myofascial pattern along these transition zones. A single study was conducted by Sanchez et al., 2018[1] which investigated if there was a relationship between myofascial restrictions and spinal somatic dysfunctions among 208 incoming first year medical students at the Western University of Health Sciences College of Osteopathic Medicine of the Pacific in August 2012. While this study did not directly evaluate the validity of Zink's CCP, it did open the gate into the relationship between myofascial patterns and deeper structural dysfunctions. The study found that of the 208 participants, there was a weak but statistically significant relationship between myofascial restrictions and spinal somatic dysfunctions. Research is limited on the importance of evaluating myofascial patterns and how various stressors may affect individuals patterns.

As osteopathic physicians, we know that the body is a unit; the person is a unit of body, mind, and spirit. We also know that the body is capable of self-regulation, self-healing and health maintenance as this is our second osteopathic tenet. Fascia is a thin layer of connective tissue that surrounds and connects all aspects of the human body. By expanding our knowledge on the various myofascial patterns throughout the body and understanding the impact various forms of stress have on these myofascial patterns, we could advance the literature on osteopathic techniques and their usage in treating patients with a more holistic, personalized, and effective manner.

Objective: The primary goal of the study is to determine if first- and second-year medical students follow Zink's CCP. Secondarily, the study aimed to determine if there were common alternative patterns among first- and second-year medical students.

Methods: A total of 124 first- and second-year medical students were enrolled in the study. Participants were recruited using an emailed survey, including a brief explanation of the study and the estimated time commitment, inquiring interest in the study. Since the study had no exclusion criteria, all participants who filled out the survey were included. An informational session was then held to further explain the study design and to answer any questions participants had prior to signing the informed consent. Participants' myofascial patterns were then evaluated at the four major spinal transition zones: occipitoatlantal, cervicothoracic, thoracolumbar, lumbosacral. Researchers were properly trained by an Osteopathic physician in evaluating myofascial patterns prior to evaluating participants. Myofascial ease was then recorded on a preformed data collection sheet and analyzed for similarity with the Common Compensatory Pattern, as well as for common alternative, non compensated, patterns.

Results: The study found that only 20.16% of the 124 first- and second-year medical students followed Zink's CCP. While this was the most common fascial pattern among those enrolled in the study, both cumulative and individually among each class, there was a far greater percentage of students who exhibited an alternative pattern. Of the first-year medical students, 21.21% (14 students) followed the CCP while the second most common pattern was right, right, left, right with 16.16% predominance (11 students) and the third most common pattern was left, right, right, right with 12.12% predominance (8 students). Of the second-year medical students, only 18.97% (11 students) followed the CCP while the second most common pattern was right, right, right, right facial pattern with a predominance of 17.24% (10 students) and the third most common pattern was right, left, right, left with 6.90% predominance (4 students).

Conclusion: While the common compensatory pattern represents a plurality of the patterns overall, the majority of the patterns observed in first- and second-year medical students fell into one of the many possible uncompensated patterns. This finding is in contrast to Zink's original findings, in which he reported roughly 80% of his patients, unless otherwise affected by undue stress, fell into the common compensatory pattern. These results may indicate that first- and second-year medical students have excessive amounts of stress that manifests in facial patterns different from the general population. Alternatively, it may be that Zink's findings are not replicable within the general population itself. Further research is needed to determine whether the CCP is truly the most prevalent in the general population, or if the results seen in this study are indeed due to unique facial patterns found in this subset of the population.

Limitations with regard to data collection should be addressed in the future. Although all examiners were trained with regard to determining the facial patterns of each student, there may still be some variability in the results obtained by each member of the team. This limitation

poses challenges to future research, as there is no way to objectively determine facial preferences. It is recommended that multiple members of the research team examine each patient in order to determine if the results obtained by each examiner is reproducible.

Future studies should be aimed at determining the prevalence of specific facial patterns within the chosen population while also generating indices that are able to stratify the population based on the degree of stress experienced.

References:

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Informed Consent: Students received an emailed survey asking if they would be interested in participating in a research study. If students filled out the survey indicating they wished to participate, they were then given an informed consent document during the informational review session summarizing the study purpose, procedures, and the risks and benefits of participation. The document also emphasized that participation is completely voluntary, subjects may withdraw at any time, and confidentiality is highly valued.
Ethical Approval & IRB and/or IACUC Approval: Study was reviewed and approved by Lake Erie College of Osteopathic Medicine Institutional Review Board.
Support: None reported.
Financial Disclosures: None reported.

Poster No. *C-8
Abstract No. 2025-062
Category: Clinical
Research Topic: Impact of OMM & OMT

The Effect of Spencer Technique of the Shoulder on Glenohumeral Joint Range of Motion: A Comparison of Athletes and Non-Athletes

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Context: Shoulder range of motion is essential for the physical well-being of both athletes, professional and recreational, and non-athletes [1]. Osteopathic Manipulative Treatment has traditionally been employed to preserve or improve joint range of motion in the setting of somatic dysfunction. Current literature aims to examine the efficacy of the Spencer technique, but falls short in investigating the technique's usefulness in patient populations with varying levels of physical activity and joint usage [2]. With this in mind, this study examines how the Spencer technique of the shoulder impacts glenohumeral range of motion in recreational pickleball players compared to non-pickleball players.
Objective: To compare the effects of Spencer technique of the shoulder in recreational pickleball players versus non-pickleball players.
Methods: Fifty-four 1st and 2nd year medical students were recruited via email and screened via Google Forms for inclusion and exclusion criteria. Inclusion criteria included: being a current 1st or 2nd year medical student at LECOM-Bradenton, attending both range of motion measurement sessions, attending 100% of treatment sessions, if applicable, and attending 100% of pickleball playing sessions, if applicable. Exclusion criteria included: if they cannot sign an informed consent form, if they have a past medical history of a shoulder injury of any kind, or if they have a serious health condition of any kind that prevents them from participating in vigorous exercise. Participants were then divided into four groups: pickleball players with Spencer treatment (n=12), pickleball players with no Spencer treatment (n=12), non-pickleball players with Spencer treatment (n=15), and non-pickleball players with no Spencer treatment (n=15). Pickleball versus non-pickleball groups were determined by elective participation, while Spencer treatment was assigned randomly. The Spencer treatment groups were treated twice-per-week for two weeks and the pickleball playing groups participated in recreational pickleball sessions twice-per-week for two weeks. With the exception of restricted pickleball playing for those in the non-pickleball groups, all participants were instructed to maintain their normal activity level throughout the course of the study. Measurements of shoulder range of motion in degrees of flexion, extension, abduction, adduction, internal rotation, and

external rotation were taken using a handheld goniometer at study onset and two weeks later, upon completion of pickleball playing and Spencer treatment. This data allowed for the determination of the average change in range of motion for all four groups from baseline. Two factor ANOVAs with post-hoc two-sample, two-tail t-tests were used to investigate for differences amongst the four groups in terms of the average changes in shoulder ROM from baseline, in each plane of motion.

Results: Of the initial fifty-four total participants enrolled in the study, fifty-three participants successfully completed all study requirements and were included in the data analysis. Statistically significant differences in terms of change in ROM from baseline amongst the four groups were observed for flexion (p=0.0090), extension (p=0.0141), and abduction (p=0.0011). Post-hoc analysis revealed that these differences in change in range of motion were only present when comparing the pickleball and Spencer treatment group, which experienced greater change, compared to each of the other three groups for flexion, extension, and abduction. No significant differences amongst the four groups were observed for adduction (p=0.7580), internal rotation (p=0.0888) , or external rotation (p=0.0501).

Conclusion: This study found that two weeks of twice-weekly Spencer treatment of the shoulder paired with participation in pickleball produced a statistically significant greater change in range of motion from baseline for shoulder flexion, extension, and abduction compared to either intervention in isolation, or neither intervention. No significant differences in shoulder adduction, internal rotation, or external rotation were found amongst the four groups. Study limitations include a small sample size (n=53), two-week study duration, and the use of hand-held goniometers to obtain measurements. These findings suggest a complex relationship between activity and treatment, and highlight the potentially synergistic nature of Spencer treatment with recreational exercise in improving glenohumeral joint range of motion. Additional studies are warranted to further explore the interconnected nature of Osteopathic Manipulative Treatment and recreational exercise in improving joint function. With a more complete understanding of how Osteopathic treatment affects different patient populations, with varying exercise habits, Osteopathic clinicians will be better positioned to deliver more personalized care and ensure optimal clinical outcomes.

References:

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2. Phansopkar P, Qureshi MI. Impact of Spencer Technique on Pain, Range of Motion, and Functional Disability in Patients With Frozen Shoulder: A Pilot Study. Cureus. 2024 Jan 30;16(1):e53263. doi: 10.7759/cureus.53263.

Informed Consent: Once participants elected to participate in the research study, each participant read and signed the informed consent form, ensuring they did not meet the exclusion criteria and did meet the inclusion criteria in a private, unpressured environment. They were given a chance to ask any questions they had about the study or the form before signing. Each signed informed consent was saved and filed. Each participant then received an email with all the dates, times, and locations for which they are responsible for reporting for the entirety of the study.

Ethical Approval & IRB and/or IACUC Approval: This research was conducted after IRB approval was obtained by the Lake Erie College of Osteopathic Medicine Institutional Review Board (Protocol Number: 32-107). The review and approval process was extensive. It included our research purpose and question, study summary, review of literature, methodology, detailed sections on the planned subject recruitment, design section, risk and benefit section, a payment and cost section, intended data analysis, and informed consent. This process also required all researchers to complete and submit proof of completion of Collaborative Institutional Training Initiative (CITI Program) modules. Following that submission, the committee met and reviewed our section involving a rebuttal with further changes made and ultimately protocol approval on 3/16/2025.

Support: All research subjects that participated in full were entered in a raffle for two Amazon gift cards. Winners were selected at random. Gift cards were purchased using researchers' personal funds.

Financial Disclosures: None reported.

Poster No. C-9
Abstract No. 2025-101
Category: Clinical
Research Topic: Impact of OMM & OMT

Osteopathic Manipulative Treatment for Trauma as Adjunct for Pain and Mobility Limitations after Chest Wall Injury

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FCCP, Deanna Ripley, MS, RN, Melissa Ippolito, RN, Francisco Machado, RN, Jerry Rubano MD FACS

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Context: Osteopathic manipulative treatment (OMT) promotes optimal tissue function by applying manual forces to oppose and overcome physical restrictive barriers defined as somatic dysfunctions (SDs). SDs are often the result of forces imparted on the body during traumatic injury. OMT may restore or optimize structural mobility and function of the chest wall (ribs, sternum, thoracic vertebrae, myofascia and other soft tissues).*1-5* In 2021, our Level 1 Trauma Center began a novel outpatient OMT for Trauma Program (OTP), targeting patients suffering subacute and chronic post-injury pain and mobility limitations.
Objective: The objective of this study is to describe OTP chest wall injury patients and their outcomes and the potential benefits of OMT for the chest wall injury population.
Methods: We retrospectively extracted and analyzed data for all patients who participated in the OTP and whose data were complete in the OTP database. We excluded patients who did not describe injury as etiology of their symptoms. We performed subgroup analyses of OTP patients who were treated for rib SD, suffered rib fractures and/or underwent surgical stabilization of rib fractures (SSRF). Data are represented as percentage or median [IQR] as appropriate.
Results: During its first two years, the OTP provided 148 OMT sessions, 116 (77.7%) for which the etiology of symptoms was a mechanism of injury (40% falls, 33.3% motor vehicle collisions, 8.9% pedestrians struck, 8.9% lifting or sports-related injuries and 4.4% each blunt and penetrating assaults). One hundred and eight (93.1%) sessions for injured patients involved treatment of rib SD, reflecting a total of 45 patients (62% female, 51 [32-58] years-old) who received 2 [1-4] OMT sessions. Fifteen (33.3%) patients with rib SD reported chief complaints of chest wall pain and/or mechanical difficulty taking deep breaths. Twelve (26.7%) had image-confirmed rib fractures, and two had undergone SSRF.

Forty-two (93.3%) injured patients treated for rib SD, including all patients who had suffered rib fractures and/or underwent SSRF, reported immediate post-OMT improvement in pain (3 [2-5] decrease in 10-point pain scale) and mobility; none suffered post-OMT complications. Time since injury of immediate OMT responders was 0.91 [0.79-3.0] years for all rib SD; 0.26 [0.68-0.27] years when chief complaint included chest wall pain or mechanical dysfunction; 0.26 [0.058-0.58] years with image-confirmed rib fractures; and 0.27 and 1.24 years after SSRF. All patients who had at least one follow-up OMT session reported consistent improvement in pain and mobility at subsequent sessions.
Conclusions: A novel OMT for Trauma Program integrated into a Level 1 Trauma Center may identify and treat rib SD that may be contributing to post-traumatic pain and mobility limitations and may improve outcomes for patients who have suffered rib fractures or undergone SSRF, including after a variety of blunt or penetrating mechanisms and months or years after initial injury.

References:

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Informed Consent: NYU Langone Health Institutional Review Board exemption from informed consent process (#i22-01545)
Ethical Approval & IRB and/or IACUC Approval: NYU Langone Health Institutional Review Board exemption (#i22-01545)
Support: None reported.
Financial Disclosures: None reported.

Poster No. *C-10
Abstract No. 2025-102
Category: Clinical
Research Topic: Chronic Diseases & Conditions

Physician and Resident Physician knowledge of childhood obesity management guidelines

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Objective: To evaluate physicians' and resident physicians' familiarity with and adherence to the American Academy of Pediatrics clinical practice guidelines for childhood obesity management.

Context: Childhood obesity is a significant public health concern with long-term consequences for individual health and the healthcare system. The prevalence of childhood obesity has risen in recent decades, with approximately one in three children in the United States considered overweight and one in five classified as obese [1]. These rates have been further exacerbated by the COVID-19 pandemic and disproportionately affect rural and underserved populations [2]. Contributing factors include increased consumption of processed foods, reduced physical activity, and greater screen time—patterns consistent with the nutrition transition hypothesis, which describes global shifts in diet and activity linked to urbanization and economic change [3]. While healthcare providers play a pivotal role in early identification, prevention, and management of childhood obesity, existing evidence highlights gaps in provider training, knowledge, and adherence to clinical practice guidelines [4,5].

Methods: Physicians and resident physicians specializing in family medicine and pediatrics across Ohio were invited to complete a survey to assess their knowledge, confidence, and practices regarding the 2022 American Academy of Pediatrics clinical practice guidelines (CPGs) for childhood obesity management. Participants completed a modified version of the National Cancer Institute's "Physician Survey of Practices on Diet, Physical Activity, and Weight Control: Questionnaire on Child/Adolescent Care" through an anonymous Qualtrics survey. The survey captured data on sociodemographic, practice patterns, and barriers to guideline adherence. Data were analyzed descriptively to identify trends and disparities in provider knowledge and practices.

Results: A total of 145 providers completed the survey (40% residents or fellows; 68% women). Forty-two percent of the sample specialized in pediatrics or a pediatric specialty, while 44% practiced family medicine and 57% of respondents were osteopathic physicians. Most trainees practiced in a hospital setting (54%) while more attendings practiced in a group practice (46.6%). Participants generally indicated that they were somewhat familiar with the CPGs (46.9%), and 8.1% indicated being very familiar with the chronic care model as applied to pediatric obesity management. Pediatric providers indicated that they would begin random blood glucose testing (8.4 ± 2.1 y), fasting lipid screening (8.6 ± 2.2 y), and liver function testing (8.9 ± 2.4 y) for children with obesity earlier than is indicated by the CPGs (10 y), while family physicians would start later. (10.2 ± 3.6 y to 11.5 ± 11.5 y). None of the respondents correctly identified current physical activity recommendations for children, though 18.6% did correctly identify at least 60 minutes of moderate activity 7 days per week.

Conclusions: These preliminary results suggest that family physicians and pediatric physicians in Ohio would benefit from continuing education regarding the current AAP CPGs for management of childhood obesity, including an overview of current lifestyle behavior recommendations and the role of the chronic care model in childhood obesity treatment.

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Informed Consent: Participants will review an online consent form that details the purpose, procedures, risks, and benefits of the study before beginning the survey. This study investigates primary care providers' knowledge, attitudes, and practices regarding childhood obesity screening and treatment. Participation involves completing a one-time, anonymous online questionnaire that takes approximately

10–15 minutes. No identifiable information will be collected; responses will be linked only to an arbitrary participant number. Participants may skip any questions and may withdraw at any time without penalty. To receive the $20 Amazon gift card, participants may voluntarily provide their name and email through a separate survey link, which will not be connected to their responses. All data will be reported in aggregate form. Confidentiality will be protected through secure data handling procedures, and participants are encouraged to clear their browser history after completing the survey.

Ethical Approval & IRB and/or IACUC Approval: This research study was reviewed and deemed exempt by the Institutional Review Board (IRB) at Ohio University. The IRB determined that the study met the criteria for exemption under federal guidelines for research involving minimal risk to participants. The IRB number for this study is IRB-FY24-5. A copy of the official exemption letter is provided with this submission. No clinical trial registration was required, as this study did not involve a clinical intervention.

Support: This research was supported by funding from the Heritage College of Osteopathic Medicine (HCOM) Office of Rural and Underserved Programs. Funding was allocated for participant compensation in the form of $20 Amazon gift cards, which were offered to respondents upon completion of the survey. No materials, equipment, or external services were provided by third parties. All authors contributed to the study design, data analysis, and abstract preparation as part of their academic roles, and no external commercial support was received.

Financial Disclosures: None reported.

Poster No. *C-12
Abstract No. 2025-104
Category: Clinical
Research Topic: Acute and Chronic Pain Management

Optimizing Analgesic Therapies and Management in Oropharyngeal Cancer

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Context: Oropharyngeal cancer incidence has continued to rise over the last 20 years. The American Cancer Society estimates an incidence of 59,660 new cases of oral and pharyngeal cancer (OPC) and 12,770 deaths attributed to this malignancy in the United States for 2025. Current epidemiological data indicate a shift from cervical cancer to oropharyngeal cancer as the leading HPV-associated cancer in the United States, with a higher prevalence in men. Current management of oropharyngeal cancer follows the guidelines of the World Health Organization's analgesic ladder, with adaptations made for the individual patient. This involves the administration of oral analgesics prescribed based on the patient's pain intensity.

Objective: To utilize a holistic biopsychosocial approach to identifying social and medical factors that may influence pain severity in patients with oropharyngeal cancer undergoing radiation therapy, as well as analyze the implications on opioid usage.

Methods: Data from the University of Texas MD Anderson Cancer Center (UT-MDACC) were used to identify patients treated with radiation/chemoradiation therapy (RT/CRT) for oropharyngeal cancer. This project analyzed a sample total of 228 patients. A one-way ANOVA, linear regression models, and univariate and multivariate analyses were utilized to compare social factors and pain scores for patients and their associated analgesic usage.

Results: Weekly pain scores saw significant changes ($P<0.001$) every week, with the greatest increase during W3-W2 (Mean = 1.3, SD = 2.6) and the largest dip following W5-W4 (Mean = 0.2, SD = 2.2). Our results indicate that social factors like smoking, substance use disorder (SUD), age, and alcohol significantly relate to pain scores ($P<0.001$). Smoking showed the greatest relationship of univariate models for pre-, Δ, and average pain, respectively ($r = 0.4$, $r = 0.2$, $r = 0.3$). Average pain as a response variable had the most univariate models with significance among all pain variables. This relationship and strength grew with additional variables added, making all variables combined, and the optimal multivariate, a better measure for average pain influence ($P<0.001$, $r = 0.5$). The BIC score for optimal multivariate for average pain is the best "fit" model ($\Delta BIC>2$). Opioid use was largely impacted by pain. In our optimal multivariate prediction models for opioids, we observed significant relationships related to the pre-radiation ($r=0.5$, $P<0.001$), post-radiation ($r=0.3$, $P<0.05$), total change ($r=0.1$, $P<0.05$), and average ($r=0.5$, $P<0.001$) pain scores. The prediction models for opioids were reinforced as proper "fit" models for nearly all response variables ($\Delta BIC>2$), except for weak opioids.

Conclusion: Using univariate and multivariate analyses appreciates the impact of social and medical factors like

smoking, SUD, and age on pain and opioid use for OPC patients undergoing RT/CRT. Our data aimed to quantify how multiple factors under the biopsychosocial model, whether individually or in a group, influence pain score reports and consequently opioid use. Correctly identifying these factors can guide healthcare professionals on the benefits of multidisciplinary care, with a more targeted approach to managing pain. We hope to encourage more research into understanding the interplay of our results, appreciating their impact on pain and opioid use.

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Informed Consent: N/A
Ethical Approval & IRB and/or IACUC Approval: This research is exempt from Institutional Review Board (IRB) review and does not qualify as human subjects research under federal regulations, as it used de-identified, publicly available data.
Support: None reported.
Financial Disclosures: None reported.

Poster No. *C-13
Abstract No. 2025-105
Category: Clinical
Research Topic: Osteopathic Philosophy

The Escape Room Experience – A Novel Learning Modality to Reinforce Team-based Problem Solving, Communicating under Stress, and Tapping Group Knowledge Among “Trapped” Preclinical Osteopathic Medical Students

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Context: In recent years, escape room experiences have grown in acclaim, popularity, and profitability around the world [1]. In these game-based experiences, willing participants are “locked” in a space and challenged to complete a series of interrelated tasks and solve puzzles to secure their escape. Beyond the obvious entertainment value, educators have been exploring how these immersive activities can be used to test and reinforce team-based problem solving and communication skills among a variety of learners [2-4]. In 2019, a cohort of peer osteopathic medical students at Ohio University Heritage of Osteopathic Medicine designed and tested a virtual STEM-based escape room to connect and engage high school learners during the COVID-19 pandemic. Gleaning insights and lessons learned from this earlier work, we extended these efforts by designing and testing an in-person escape room experience among osteopathic medical and physician assistant students [5-7].

Objective: To determine how escape rooms can be a valuable learning modality for Osteopathic Medical Education.
Methodology: Tailored towards medical and physician assistant students, we invited groups of 5-8 professional students into our medical and STEM-themed escape room where they had to apply their foundational basic science knowledge and newly-acquired clinical skills to solve a cascading array of medical and STEM-based puzzles. Embedded puzzles included histological identification, laparoscopic surgery simulation, EKG interpretation, ultrasound examination, among other hands-on simulated clinical skills. Learners completed a pre-survey prior to "lock in" that prompted them to self-report their confidence in communication, problem solving, navigating conflict, as well as other interpersonal skills. Participants then completed a post-survey reflecting on their confidence levels and insights gleaned from the experience. A two-tailed paired t-test was used to examine the significance of the observed differences.
Results: Thirty-five professional students participated in the escape room and completed both pre- and post-surveys. Overall, participants reported that their confidence levels in finding their role in the team, acquiring knowledge, and stepping into a leadership role, increased; although we did not observe increases that were significant. Participants noted their confidence levels in communication, applying knowledge, handling conflict, and performing under pressure decreased, with the only significant decrease in confidence being from their ability to perform under pressure. Through open-ended comments, participants shared new perspectives on the value of getting organized, solving problems as a team, and communicating under stress. Notably, the professional students described the novelty and engaging way they applied their ever-evolving medical knowledge and clinical skills in a very, non-traditional way.
Conclusions: While pre-clinical medical training has historically relied upon didactic lectures, the COVID pandemic accelerated the use and adoption of virtual alternatives powered by ever-changing technologies. This trend towards virtual learning experiences – while cost-effective, flexible and convenient – can inherently diminish face-to-face communications and teamwork-centered training, two essential clinical skills for clinicians. We observed – as have other researchers – that fundamental qualities set some groups up for greater success when under stress illustrating the importance of communicating constantly throughout the challenge, delegating tasks, establishing leaders, and staying organized. These common themes that surfaced in a fun team-based activity could easily be applied to more high stress, real clinical scenarios, where it is crucial for an interdisciplinary team to work well together. As Osteopathic Medical Education continues to look for new ways to engage the next generation of providers, escape rooms may provide a novel learning modality that combines a hands-on approach to applying the knowledge learned in a classroom to fun and exciting activity.

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Informed Consent: All study participants provided informed consent via electronic submission prior to participation in the study. The consent form informed participants of the purpose of the study, that their information and survey responses would be kept confidential, and that they were free to withdraw from the study at any time. They were given contact information for the investigators and the director of research compliance for Ohio University.
Ethical Approval & IRB and/or IACUC Approval: This study was approved by the Ohio University Institutional Review Board (IRB). IRB Number: IRB-FY25-505
Support: None reported.
Financial Disclosures: None reported.

Poster No. *C-14
Abstract No. 2025-069
Category: Clinical
Research Topic: Chronic Diseases & Conditions

Addition of Ipilimumab to Nivolumab Improves Short, but not Long-Term Clinical Outcomes in Melanoma Treatment

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Context: Melanoma is an aggressive form of skin cancer with a rise in global incidence. Current treatments for unresectable melanoma include target therapy, immunotherapy, and chemotherapy. Immune checkpoint inhibitors such as ipilimumab targeting CTLA-4 or nivolumab targeting PD-1, either as monotherapy, or in combination, have been used for melanoma and improved survival outcomes have been reported.
Objective: To compare the clinical effectiveness between chemotherapy, nivolumab monotherapy, and combined nivolumab and ipilimumab in melanoma treatment, a meta-analysis was conducted using published clinical observation.
Methods: Published studies of clinical outcomes of ipilimumab with or without addition of nivolumab, or comparison of ipilimumab with chemo were identified after searching PubMed using relevant treatment-related keywords. Only studies utilizing comparable methodologies were included. Objective Response Rate (ORR), Progression Free Survival (PFS), and Overall Survival (OS) were analyzed. Meta-analysis was performed using Review manager 5.
Results: 39 studies are included. ORR is significantly improved for nivolumab monotherapy, comparing with chemotherapy(odd ratio 2.83. p=0.0002). Addition of ipilimumab to nivolumab significantly improved ORR further, from 33.04% (20.00-48.29%),to 55.35% (13.33-72.36), with an odd ratio of 2.24 (p=0.009). In addition, combined nivolumab and ipilimumab showed improved PFS rate at 6 m (odd ratio 1.41, p=0.03), but not at 12 m (odd ratio 1.28, p=0.13).
Conclusion: Addition of ipilimumab to nivolumab appears to improve short-term clinical outcomes, including ORR and PFS, but have limited long-term benefits. The benefit of adding ipilimumab to nivolumab needs to be further evaluated, considering the significantly higher risk of adverse effects in patients treated with combined therapy.

References: N/A

Informed Consent: N/A
Ethical Approval & IRB and/or IACUC Approval: The Protocol 2025/06/11. Clinical efficacy of target therapy and immunotherapy for lung cancer and melanoma has been verified by the LMU IRB as Not Human Subjects Research Determination on 06/12/2025.
Support: N/A
Financial Disclosures: None reported.

Poster No. *C-15
Abstract No. 2025-070
Category: Clinical
Research Topic: Chronic Diseases & Conditions

Clinical Efficacy of Ipilimumab vs Combined Nivolumab and Ipilimumab or Chemotherapy in the Treatment of Unresectable Melanoma, a meta-analysis

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Context: Nivolumab and Ipilimumab are two immune check point inhibitors (ICIs) that have been used in the treatment of melanoma. Nivolumab binds to programmed death-1 (PD-1) on T cells preventing interaction of PD-1 ligand. Ipilimumab binds to cytotoxic T-lymphocyte-associated antigen 4 (CTLA-4), blocking its interaction with B7 molecules on antigen-presenting cells. Both agents prevent inhibitory signals in T cell activation subsequently resulting in activation of T cells to promote their anti-tumor immune activities. Clinical use of Nivolumab and ipilimumab have been reported in treating various cancers, including melanoma.
Objective: To investigate the clinical efficacy of ipilimumab with or without Nivolumab in unresectable melanoma, a meta-analysis was conducted on published studies containing clinical outcomes of these treatments. Aditinionally, clinical outcomes of ipilimumab monotherapy are compared with traditional chemotherapy as well.

Methods: Published studies of Ipilimumab monotherapy, combined Ipilimumab with Nivolumab, and comparison of Ipilimumab with chemotherapy were identified after searching PubMed with various combinations of key words. Studies focused on specific types of melanoma or brain metastasis were excluded. Only studies with comparable methodologies and direct observations were included. In total, 67 studies were included. Objective Response Rate (ORR), Progression Free Survival (PFS), and Overall Survival (OS) were analyzed. Meta-analysis was performed using Review Manager 5.
Results: Compared to chemotherapy, Ipilimumab significantly improved OS at both 6 and 12 month, with odd ratios of 1.87 (95% CI: 1.26–2.79) and 2.66 (95% CI: 1.28–5.52), and p values of 0.002 and 0.009, respectively. Addition of Nivolumab to Ipilimumab significantly improved ORR from 12.3% (1-44.44%) to 50.35% (13.33-72.36%), with an odd ratio of 4.66 (95% CI: 2.17–10.00, p<0.0001). Similarly, combined Nivolumab and Ipilimumab have a longer median PFS compared with Ipilimumab monotherapy (2-NR vs 2.8-6.4 m, respectively). PFS rates at 6 and 12 months are significantly better for combined Nivolumab and Ipilimumab, compared with Ipilimumab alone, with odd ratios of 3.98 (95% CI: 2.94–5.38) at 6 months and 4.45 (95% CI: 3.15–6.29) at 12 months, both p< 0.00001. However, combined Nivolumab and Ipilimumab improved OS rates at 6 months (odd ratio: 1.65 [95% CI: 1.04, 2.64], p=0.03), but not at 12 months (odd ratio: 1.70 [95% CI: 0.91, 3.16], p=0.09).
Conclusion: The findings of our study suggest that in the treatment of unresectable melanomas, immunotherapy agents Ipilimumab and Nivolumab have better clinical outcomes compared to chemotherapy. Although combined Nivolumab and Ipilimumab have better objective response rates and progression free survivals than Ipilimumab monotherapy, there is no significant benefit in long term overall survivals. Considering the significantly higher risk of adverse effects, the use of combined therapy should be carefully evaluated, especially on an individualized patient basis.

References: N/A

Informed Consent: N/A
Ethical Approval & IRB and/or IACUC Approval: Our study was reviewed by the IRB and deemed not human subjects. IRB #2025/06/11
Support: None reported.
Financial Disclosures: None reported.

Poster No. *C-16
Abstract No. 2025-111
Category: Clinical
Research Topic: Musculoskeletal Injuries and Prevention

Return to Sport Following Arthroscopic Debridement and Drilling of Capitellar Osteochondritis Dissecans in Adolescent Athletes

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Context: Osteochondritis Dissecans (OCD) of the elbow typically presents in adolescents engaging in repetitive overhead or upper extremity weightbearing activities.1 Natural history is one of chronic pain, limited range of motion, mechanical symptoms, and early joint degeneration. Surgery is often indicated in advanced stages of the disease and various surgical techniques have been described for treatment.2-3 Additional studies with larger patient populations focusing on adolescent athletes and their return to sport protocols are needed to better understand the outcomes following arthroscopic treatment of this condition.2 This study analyzes return to sport timelines in young athletes who undergo arthroscopic debridement and drilling of Capitellar OCD.
Objective: To determine the efficacy of arthroscopic debriedment and drilling for the treatment of capitellar osteochondritis dissecans in adolescents and to understand their return to sport timelines.
Methods: An IRB-approved retrospective study was completed on patients, diagnosed, and treated for Capitellar OCD, presenting to a large pediatric orthopedic service between 2014 and 2024. Demographics, surgical diagnoses, physical exam, sport involvement and return to sport (RTS) data was collected. Comparative means statistical analyses were completed with Univariate Analysis of Variance to identify statistical significance at p<.05. In addition, this study has a role in osteopathic medicine as it provides treatment options and return to functionality for young athletes. Their recovery from surgery and return to adequate structure and function is imperative to a return to sport.

Results: 100 patients were included in this study. 46 male patients, and 54 female patients with an average surgical age of 13.27±1.7 years. Preoperatively, 42 patients noted having full range of motion (ROM), 41 patients had ROM limitations between 5-30°, and 17 patients had deficits >30°. 87 patients reported sport participation prior to procedure and 72 (82.8%) of these patients returned post-operatively. 3 patients did not RTS, and 12 patients were lost to follow-up. Patients participated in various sports including gymnastics, cheerleading, volleyball, baseball, and softball. Of the patients that did not RTS, two gymnasts voluntarily stopped to avoid reinjury and one patient experienced a traumatic knee injury. The average length of RTS was 5.0±2.6 months and the average length of follow-up was 8.0±7.2 months. Independent sample t-tests were performed comparing RTS timelines between open capitellar physis (n=84) and closed capitellar physis (n=16). There was not a significant difference in RTS timelines between open physis (M=5.5, SD=0.23) and closed physis (M=5.7, SD=0.12); t(70)=-.135, p=0.447.

Conclusion: The results of this study indicate that arthroscopic repair of Capitellar OCD is a reliable option for young athletes with 82.8% of patients returning to sport in 5.0±2.6 months following surgical repair. These findings are important to consider when offering surgical intervention to young patients symptomatic with Capitellar OCD hoping to continue to participate in their respective sport.

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Informed Consent: None required
Ethical Approval & IRB and/or IACUC Approval: IRB approval received on June 30, 2021.
Support: None reported.
Financial Disclosures: None reported.

Poster No. *C-17
Abstract No. 2025-037
Category: Clinical
Research Topic: Impact of OMM & OMT

Prevalence of Somatic Dysfunctions in Collegiate Dance Population

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Context: Dancers place a significant demand on their bodies; they rehearse and perform for extended hours, dance in non-supportive shoes on non-economical surfaces, and maintain a specific weight and body type. Due to these factors, dancers suffer from unique injuries and health concerns that can significantly impact their performance and quality of life. Dance injuries typically stem from repetitive motions, overuse of muscles and joints, or acute injuries (1). Common areas of injury seen in dancers include the hips, knees, ankles, feet, and lumbar spine (1,2). However, there is limited information on common somatic dysfunctions found in dancers. This information may help osteopathic providers better understand the unique set of dysfunctions commonly seen in dancers and develop treatment plans tailored to their specific needs.

Objective: The objective of this research was to describe and quantify the prevalence of somatic dysfunction in collegiate dancers based on common areas of injury. By defining the population osteopathically, the data can be used to direct Osteopathic Manipulative Treatment (OMT) and other prevention and rehabilitation plans tailored to the unique demands of this understudied athletic population.

Methods: Dancers aged 18-22 were recruited from a Division-1, university-sponsored, competitive dance team. A total of 12 dancers completed all phases of the study and maintained the inclusion criteria of being active members of the dance team without any restrictions in participation. Dancers were asked to complete the Multidimensional Pain Questionnaire in Professional Dance Assessment (MPQDA), which collected the dancers' demographic information and dance history (3). Dancers were then screened for somatic dysfunction by a third-year medical student and a supervising osteopathic physician, and they received OMT for 15 minutes from the same study personnel. Data collected

through assessment and treatment of the dancers were analyzed by comparing the types of somatic dysfunctions and the types of treatments utilized. The prevalence of each somatic dysfunction was calculated within our population and compared to demographic data to identify significant associations using the chi-square test. The type of treatment utilized was also analyzed to determine the different techniques and the types of somatic dysfunctions they were used to treat.

Results: Out of 12 total dancers treated, the most common somatic dysfunctions (SD) diagnosed include left on left sacral torsion (L/LST) (100%) and right anterior innominate/left posterior innominate (92%). 100% of dancers were diagnosed with a type 1 somatic dysfunction in the lumbar spine, with the most common diagnosis being neutral, sidebent left, rotated right (NSlRr) (67%). Other common diagnoses included right external tibial torsion (67%), right anterior talus (58%), left anterior talus (58%), right posterior fibular head (50%), right anterior fibular head (42%), and dropped navicular (33%). A significant association was found between the dancers' dominant turning leg and being diagnosed with a right anterior innominate/left posterior innominate SD ($p < 0.01$). A significant association was also found between the styles of dance practiced and being diagnosed with a right posterior fibular head ($p = 0.05$). Strong, but not significant, associations were found between the styles of dance practiced and a right anterior innominate/left posterior innominate SD ($p = 0.07$) and between the amount of time dancing (years) and a right anterior innominate/left posterior innominate SD ($p = 0.06$).

Conclusion: The most prevalent somatic dysfunctions within our population included left-on-left sacral torsion and right anterior innominate/left posterior innominate. The left-on-left innominate dysfunction was significantly associated with the dancers' dominant turning leg. Additionally, training in contemporary dance, in addition to hip hop and jazz, was associated with increased prevalence of posterior fibular head SD. These data support the idea that dancers' repetitive movements and training may be related to the SDs with which they present (4,5). As a pilot study, the outcomes were influenced by factors such as purposeful sampling, which limited the number of participants. Future research should include larger samples and encompass a wider range of dance styles to better understand the prevalence of somatic dysfunctions specific to dancers and the type of dance they practice. Understanding common somatic dysfunctions in dancers can help create an effective osteopathic treatment plan, enabling dancers to receive more individualized care and reduce the risk of dance-related injuries.

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Informed Consent: All participants in this study provided written informed consent prior to participation.
Ethical Approval & IRB and/or IACUC Approval: Reviewed and approved by VCOM IRB #2024-181
Clinical trial registry #NCT06858592
Support: Patient compensation was funded via internal administrative grant.
Financial Disclosures: None reported.

Poster No. C-18
Abstract No. 2025-038
Category: Clinical
Research Topic: Impact of OMM & OMT

Incidence of Sacral Somatic Dysfunction in Vaginal Birth After Spontaneous Labor

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Background Context: Pregnancy produces numerous physiological and structural changes in the mother as the fetus grows. An increase in the hormone relaxin throughout pregnancy causes ligamentous laxity, which encourages relaxation of ligaments to allow the body to stretch and make room for the fetus as well as prepare the body for birth1. This relaxation of the musculoskeletal system contributes to lumbar lordosis, pelvic pain, lumbar disc herniation, and joint pain2. These changes may persist after delivery, causing years of lumbar and sacral pain. Although multiple

reports indicate that 50% of delivered patients will develop back pain which is likely multifactorial, few studies have evaluated postpartum women for sacral dysfunctions. Our goal in this study was to investigate the types of postpartum sacral dysfunctions women experience in hopes to give a better understanding of how to effectively prevent and/or treat women's postpartum dysfunctions.

Objective: Our study focused on investigating the incidence of sacral dysfunctions in recently post-partum patients. The objectives for this study include the following:• to assess the type of sacral somatic dysfunction present in post-partum patients• investigating the correlation between various demographic factors (age of mother,gravida, para, gestational age, utilization of anesthesia, post-partum day of osteopathic evaluation, specific presentation of fetus, operative delivery via forceps or suction,weight of baby) and sacral somatic dysfunctions

Methods: This study was conducted by OMS III medical students recruited during their obstetrics and gynecology clerkship rotation. Students that participated in this study have successfully demonstrated the skill of evaluating sacral dysfunctions. The principal investigator met with each participating clinical site to obtain consent for participation. We then obtained approval from the IRB to recruit participants 18 years and older who were within 48 hours of spontaneous vaginal delivery at the time of evaluation. Study participants were evaluated for sacral dysfunction utilizing a standardized palpatory technique. The findings made by student evaluators at each palpated site were recorded in a password protected Microsoft Teams account. Principal investigators utilized this data to make specific sacral diagnosis for each patient. Additional demographic data was recorded and utilized for analysis of risk factors using t-test and ANOVA methods.

Results: A total of 56 patients have participated in the study to date. Sacral dysfunction has been identified in 100% of the patients. Among the dysfunctions identified, 22 patients (39% total patients) had a right on left sacral torsion, 8 patients (14% total patients) had a left on right sacral torsion, 18 had a right on right sacral torsion (32%), 5 had left on left sacral torsion (9%), 1 had a right unilateral extension (2%), 1 had a left unilateral flexion (2%), and 1 had a right unilateral flexion (2%). There was a statistically significant association between nonphysiological diagnoses and an increased mean gestational age of patients.

Conclusion: Understanding the incidence of various sacral dysfunctions in postpartum patients can provide us with a deeper understanding of potential causes of back pain following vaginal delivery. In the future, we hope to take the data gathered from this pilot study to further understand correlating factors that contribute to sacral dysfunctions in postpartum women. Our aim is to take a more proactive approach to address specific sacral dysfunctions thereby decreasing the lower back pain women feel postpartum.

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Informed Consent: A written script at 8th grade reading level was provided to investigating students. The script was used by investigators to invite patients to participate. The patient was provided a written consent document, also at an 8th grade reading level, to read and sign. Signed consents were retained by the principal investigator.

Ethical Approval & IRB and/or IACUC Approval: The study had expedited review and approval by the Edward Via College Osteopathic Medicine IRB Record # 2024-151.

Support: None reported.

Financial Disclosures: None reported.

★Poster No. *C-19
Abstract No. 2025-075
Category: Clinical
Research Topic: Impact of OMM & OMT

Mapping Patient Perspectives: A Collaborative Modeling Approach to Understanding Chronic Low Back Pain

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Context: Chronic low back pain (LBP) is the leading cause of disability worldwide and is influenced by a wide range of biopsychosocial factors1. Furthermore, the interactions between these factors are complex2,3. However, there is a lack of research capturing how patients perceive the contributors to their pain and quantifying the relationships between these perceived factors4.

Objective: To determine how patients with LBP perceive and conceptualize the factors contributing to their condition using a collaborative modeling approach. By identifying the factors and connections that are perceived to contribute to their condition and aggregating them into a meta model, we aim to quantitatively identify the most influential categories across the patient population.

Hypothesis: We hypothesize that among patients with LBP scheduled to receive osteopathic manipulative treatment (OMT), biomechanical factors will have the greatest influence on their perception of their condition.

Methods: Participants diagnosed with chronic LBP were recruited from the Michigan State University Osteopathic Manipulative Medicine Clinic prior to their first visit. Participants agreed to complete a semi-structured interview before receiving osteopathic manipulative treatment (OMT) and complete health-related questionnaires. Fuzzy cognitive maps (FCMs) were created during the semi-structured interview using online software (MentalModeler.org). The FCMs represent participants' understanding of their LBP condition. Creation of the FCM involved the proposal of factors contributing to their LBP, disability, and quality of life, and their connections to each other as well as weight of the connections. The factors were then grouped into one of 9 categories, including Behavioral/Lifestyle, Biomechanical, Social/Work/Contextual, Psychological, Tissue Injury or Pathology, Comorbidities, Individual Factors, Nociceptive Detection and Processing, and Treatment/Intervention. Centrality was calculated by summing the weights of all connections linked to each factor within a category, providing a quantitative measure of that category's influence. These values were then aggregated to determine the Sum centrality for each category, identifying which categories patients perceived as having the greatest impact on their low back pain. Centrality was calculated by adding the weights of the connections associated with each factor within the category to determine a quantitative measure of the weight of that category. This was then added to calculate the Sum Centrality of each category to determine which categories were most influential on patients' conceptualization of their LBP. Individual FCMs were then aggregated into a meta model that represents the unique factors that were identified across all FCMs. A repeated measures analysis of variance (ANOVA) was conducted to determine whether perceived importance differed by category. Post hoc comparisons were conducted to determine whether the Biomechanical factors had significantly higher centrality than other categories ($p \leq .05$).

Results: 36 individuals (12 Males, 23 Females, 1 Unknown) with chronic LBP participated in the study age from 19 to 74 years (Average age 48.0, SD =16.8), average height of 1.70 m (SD = 0.13), and average weight of 85.34 kg (SD = 17.24). On average, patients reported pain over the last 7 days on an 11-point numeric pain rating scale of 4.8 (SD = 2.3) and had an average Oswestry Disability Index of 23.2% (SD = 13.3). Across all FCMs, there were a total of 797 factors, with an average of 22 per FCM (SD = 5). When the data were aggregated into the meta model, there were a total of 92 unique factors and 1,640 connections, averaging 46 (SD = 32) connections per individual FCM. The most influential categories perceived by the study participants were Behavioral/Lifestyle factors (25.7%) and Biomechanical factors (23.3%), followed by Social/Work/Contextual (16.6%), Psychological (16.5%), Tissue Injury or Pathology (7.6%), Comorbidities (6.1%), Individual Factors (3.1%), and Nociceptive Detection and Processing (1.1%). The centrality of Biomechanical factors was not statistically different from that of Behavioral/Lifestyle factors ($p = 0.99$); however, both Biomechanical and Behavioral/Lifestyle factors had statistically higher centrality than Tissue Injury or Pathology, Comorbidities, Individual Factors, and Nociceptive Detection and Processing (all $p \leq 0.001$). The aggregated meta model included 22 different treatments associated with LBP.

Conclusion: The collaborative model of LBP evaluated patients' expertise in their condition and revealed Behavioral/Lifestyle factors and Biomechanical factors as being most central to their understanding. Participants identified numerous treatments for LBP, including OMT, which underscores a multifaceted understanding of their care, and likely reflects their diverse experiences with different treatments. Although all participants were referred to the OMM Clinic for their LBP condition, it is likely they had diverse medical histories, symptoms, and/or underlying conditions, which may have influenced how they conceptualized their pain. Moreover, a single clinical setting may introduce sampling bias and restrict the generalizability of the findings. While the measure of centrality highlights important concepts perceived by the participants, such measures may not fully align with the underlying clinical or biopsychosocial factors actually contributing to their condition. The future directions for this project are to determine if patients perceived understanding of their LBP condition changes after receiving OMT intervention and to determine how this population perceives OMT affects pain, disability and quality of life. Furthermore, we aim to perform meta model simulation of various treatment interventions identified by the participants to determine the perceived effects on pain, disability, and quality of life.

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Informed Consent: The informed consent process involved calling the patient during the recruitment process, explaining the purpose of the study, how we got their contact information, what steps would be taken to gather the data, and that we would deidentify the data when analyzing it. Participants were given opportunities to ask and voice their concerns Once these were addressed and they agreed and expressed their interest in participating in the study, we scheduled a time to conduct the interview and emailed them a questionnaire that details the information previously mentioned. After participants formally consented to participate in the study, they completed the rest of the questionnaire and interview.

Ethical Approval & IRB and/or IACUC Approval: This study was reviewed and approved by the Michigan State University Biomedical and Health Institutional Review Board. IRB study: STUDY00005055

Support: None reported.

Financial Disclosures: None reported.

Poster No. C-21
Abstract No. 2025-118
Category: Clinical
Research Topic: Impact of OMM & OMT

Safety and Feasibility of Osteopathic Manipulative Treatment (OMT) in Addressing Plagiocephaly

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Context: Deformational/positional plagiocephaly (DP/PP) is described as an asymmetrical flattening of the cranium due to sustained external pressure. This cranial deformation can arise pre- or postnatally1. The newborn infant has unique cranial anatomy, which is critical for birth but leaves them vulnerable to DP/PP. DP/PP creates asymmetric flattening, usually of the occipital bone which leads to compensatory shifts of other cranial structures, including the orbits and middle ear2. One clinical trial reported plagiocephaly in 205 out of 440 total infants between 7 to 12 weeks of age – totaling an incidence of ~46.6%3–5. Also contributing to significantly increased numbers of referrals for evaluation and treatment of DP/PP has been the "Back to Sleep" campaign which has led to a 600% increase in prevalence since its implementation6. We are conducting a two-arm, randomized crossover clinical trial looking at the benefit of osteopathic manipulative treatment (OMT) versus the standard of care of repositioning in the management of DP/PP. This abstract focuses on an interim analysis of the safety and feasibility data to date of the larger study.

Objective: The objective of this interim analysis is to examine how safe and feasible OMT is for the treatment of PP/DP in infants enrolled between 0-4 months of age?

Methods: This interim analysis considers safety and feasibility data collected from families who are taking part in the randomized crossover trial. Key outcomes being examined are OMT safety and feasibility. Safety is assessed by tabulating and describing adverse events as reported by families and the medical team. Feasibility outcomes, such as adherence to OMT, are tabulated and family satisfaction summarized descriptively. Family satisfaction was examined through a feedback survey sent upon completion of the 8-week OMT intervention and focus groups conducted with the caregivers of participants also after the OMT intervention. All family satisfaction data were collected and analyzed by external consultants who deidentified the data before sharing the results with the research team. A total of 94 participants have been recruited, meaning a pre-screening survey was requested. Participants are referred by local healthcare providers or self-referred. A total of 58 participants have met eligibility criteria and have been enrolled. Inclusion criteria: under 5 months at the time of enrollment,

diagnosis of DP/PP, and ability (for parent) to read and write in English or Spanish. An infant is ineligible if they were born: preterm (before 37 weeks), with genetic syndromes, craniofacial defects/deformities, brachycephaly/scaphocephaly, hypotonia, hypertonia, craniosynostosis, head trauma or other neurological illnesses, can't attend 10 in-person visits, have had prior treatment for plagiocephaly, or 3+ treatments for a concern other than plagiocephaly. Enrolled participants are randomly assigned to treatment with OMT or standard of care based on a computer-generated algorithm. Those in the treatment group receive OMT once per week for 8 weeks with two cranial measurements at each visit, directly before treatment and immediately following OMT. Those in the standard of care group perform exercises at home consistent with the current standard of care for plagiocephaly in this age group and come for 2 measurement visits (in week 1 and week 8). Physicians treat each patient's unique structural exam findings using multiple OMT modalities, often focusing on osteopathic cranial manipulative medicine (OCMM). Descriptive statistics have been performed on the data for this interim analysis. This study is significant in the field of osteopathic medicine as it has the potential to be an alternative treatment to helmet therapy with potential for significant cost savings for the families and the larger healthcare system. Additionally, the pragmatic treatments performed in the study are in line with osteopathic philosophy and practice. The pre- and post-OMT measurements demonstrate the impact of OMT and that the treatment benefits are not explicitly due to placebo. The longitudinal outcomes monitored in the study aim to show the benefit of early intervention on existing somatic dysfunction and how this may have a more significant impact on children's health and development. The safety and family satisfaction data will help reduce concerns about seeking OMT for pediatric patients.

Results: Preliminary results suggest that OMT has a favorable safety profile and is a feasible option for families in management of DP/PP. Among the 37 participants who have completed the intervention portion of the study thus far, there is 100% compliance. This includes 10 visits total per participant: 8 OMT and 2 measurement visits. No serious adverse events have occurred, showing OMT is safe and well-tolerated by infants. Parents who have completed the OMT visits are satisfied with treatment and have identified multiple secondary benefits. Parents have highlighted how important OMT has been as an alternative to helmets, which were suggested as a treatment option for many families. Eighteen out of 42 families (43%) responded to the feedback survey at the conclusion of treatment. Of those 18, 100% reported that they believed OMT improved their baby's head shape and 100% of parents stated they felt safe during treatment. In addition to improved head shape, parents identified many other benefits including improved breast/chestfeeding, bottle feeding, neck movement, and a reduction in fussiness, among others. No concerns were raised and the only barrier to treatment was the time to travel to appointments, which was mentioned by only one family. A total of 355 treatment visits have been conducted on 48 patients in the study. Complications have only been identified for 48 of those visits (14%). The main complication noted by parents is fussiness/irritability following OMT which typically resolves within a few hours. No parents have expressed that the complications are bothersome or a deterrent to continuing OMT. These findings reinforce the positive perceptions of OMT's effectiveness and safety.

Conclusion: The results of our safety and feasibility analysis show OMT has a favorable treatment profile for infants with DP/PP and yields secondary benefits. OMT should be considered for families who are seeking a low-cost, non-invasive treatment option for management of DP/PP.

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Informed Consent: Informed consent may be obtained via HIPAA-secured Zoom meeting or in-person appointment by the PI or the Research Coordinator of the study. Given the pediatric population, both parents or guardians are required to electronically submit their consent via ResearchManager as well as submit an uploaded copy of the complete informed consent form signed by both parents/guardians. All informed consent meetings are approximately one-hour in length and review all details of the informed consent form

and allow time for the family to ask any questions they may have. The informed consent form is available in English and Spanish and the consent meeting can be conducted in either language by our research leadership team.

Ethical Approval & IRB and/or IACUC Approval: Clinical Trial Registry Number: NCT05848895

WCG IRB

IRB Study Number: 1357839

IRB Tracking Number: 20233263

IRB was submitted originally and approved in July 2023. Changes in research have been submitted and approved November 2023, August 2024, and April 2025. Our study is compliant with all current annual reviews. We have received full approval for the original submission and all change in research submissions, we have never received conditional approval. Most recent Certificate of Action with Approval uploaded below.

Support: Funding was provided for this study by a private and anonymous donor. Funding is used for payment of study personnel (PI, sub-investigators, research coordinator and research consultants) conducting research activities, recruitment expenses, and subject compensation. No funding, only training and mentoring, are provided to the 4th author, Emily Varrasso, OMS-II.

Financial Disclosures: None reported.

Poster No. *C-23
Abstract No. 2025-081
Category: Clinical
Research Topic: Chronic Diseases & Conditions

Age-Related Differences in Cardiac Symptoms Among Hypermobile Patients

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Context: Ehlers-Danlos Syndrome (EDS) and hypermobility spectrum disorder (HSD) are collagenoses characterized by hyperflexible joints and skin elasticity (1). Patients may experience cardiac symptoms, including palpitations and presyncope/syncope, that may be attributable to postural orthostatic tachycardia syndrome (POTS), a common form of dysautonomia among hypermobile patients (2). There is limited literature investigating age-related differences in symptom prevalence between groups.

Objective: The purpose of this study was to evaluate and compare age-related differences in the prevalence of palpitations, presyncope/syncope, and POTS among EDS and HSD patients.

Methods: EDS and HSD patients were referred for cardiac evaluation from the NYIT Ehlers-Danlos Syndrome/Hypermobility Treatment Center (January 2019 - November 2023). Patients underwent complete clinical evaluation and, if indicated, tilt table testing and remote cardiac monitoring. The research protocol was exempted by the NYIT IRB. POTS was defined as a 30 bpm increase in heart rate over 10 minutes upon standing. Patients were stratified based on age, and the prevalence of palpitations, presyncope/syncope, and POTS was compared between the hypermobile groups. Cohort 1 consisted of EDS and HSD patients who were less than 35 years of age, and Cohort 2 consisted of EDS and HSD patients > 35 years of age. Symptoms were also compared across all EDS patients and all HSD patients, using a 35-year age cut-off. Data was analyzed using Chi-Squared analysis and presented as mean ± SD; $p<0.05$ considered statistically significant.

Results: 114 hypermobile patients (80 EDS, 34 HSD) underwent cardiac evaluation: 62 (51 EDS/11 HSD) were below age 35, Cohort 1, and 52 (29 EDS/23 HSD) were ≥ 35 years, Cohort 2. In Cohort 1, 51 patients had EDS (49 females and 2 males) with an average age of 26.3 ± 4.4 years, and 11 patients (10 females and 1 male) had HSD with an average age of 25.6 ± 4.7 years. Presyncope/syncope was found in 98% of EDS and 100% of HSD patients; p=0.64. Palpitations were noted in 88.2% of EDS and 81.2% of HSD patients; p=0.57. Additionally, POTS was present in 58.8% of EDS and 45.5% of HSD patients; p=0.42. In Cohort 2, 29 patients had EDS (27 females and 2 males) with an average age of 47.3 ± 8.7 years, and 23 patients (19 females and 4 males) had HSD with an average age of 47.4 ± 10.8 years. Presyncope/syncope was found in 100% of EDS and 82.6% of HSD patients; p=0.0195. Palpitations were noted in 93.1% of EDS and 81.0% of HSD patients, p=0.057. Additionally, POTS was present in 31.0% of EDS and 13.0% of HSD patients; p=0.42.

Among all EDS patients, presyncope/syncope was found in 98% of those less than 35 and in 100% of those ≥ 35 years; p=0.451. Palpitations were noted in 88.2% of those less than 35 and 93.1% of those ≥ 35 years, p=0.485. Additionally, POTS was present in 58.8% of those less than 35 and 31.0% of those ≥ 35 years; p=0.017. Among all HSD patients, presyncope/syncope was found in 100% of those less than 35 and in 82.6% of those ≥ 35 years; p=0.142. Palpitations were noted in 81.8% of those less than 35 and 73.9% of those ≥ 35 years,

p=0.610. Additionally, POTS was present in 45.5% of those less than 35 and 13.0% of those ≥ 35 years; p=0.037.
Conclusions: Presyncope and/or syncope prevalence increased with age and was more prevalent in those with EDS (Cohort 1) compared to HSD (Cohort 2). The prevalence of POTS decreased with age in both the EDS and HSD cohorts. Limitations of this study include its retrospective design and small sample size. Further evaluation of a larger cohort is needed to fully understand why age-related differences exist between these two groups.

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Informed Consent: Informed consent waived by NYITCOM IRB (BHS-1465).
Ethical Approval & IRB and/or IACUC Approval: This retrospective study was deemed exempt by the NYIT Institutional Review Board (IRB) (BHS-1465).
Support: None reported.
Financial Disclosures: None reported.

Poster No. *C-24
Abstract No. 2025-082
Category: Clinical
Research Topic: Chronic Diseases & Conditions

Echocardiographic Findings in Hypermobile Patients at a Cardiac Specialty Center

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Context: Ehlers-Danlos Syndrome (EDS) and Hypermobility Spectrum Disorder (HSD) are connective tissue disorders with shared features, including joint hypermobility, skin fragility and cardiovascular manifestations [1]. While it is known that hypermobile patients have an increased risk of developing structural cardiac abnormalities – such as aortic root dilation and mitral valve prolapse – comparative data on other echocardiographic parameters distinguishing EDS from HSD remains limited [2]. These distinctions are critical for recognizing markers of risk to guide surveillance and create personalized treatment for hypermobile patients. This study aims to inform osteopathic practice by identifying subtle echocardiographic markers for early cardiovascular risk in connective tissue disorders.
Objective: To compare echocardiographic parameters between patients with EDS and HSD to identify structural and hemodynamic differences at the Long Island Heart Rhythm Clinic (LIHRC).
Methods: All EDS and HSD patients referred to the LIHRC for cardiac evaluations between January 2019 and November 2024 who had two-dimensional echocardiogram were included. This retrospective study at the LIHRC was exempt from review by the NYIT IRB. Echocardiograms findings were analyzed using Mann-Whitney U test and Chi-squared test. Data: mean ± standard deviation; $p < 0.05$ was statistically significant.
Results: A total of 164 patients were identified, including 118 with EDS and 46 with HSD. Among these, 115 patients had echocardiography: 86 with EDS (mean age 36.7 ± 11.8 years; M/F [3.5%]/[96.5%]) and 32 with HSD (mean age 42.8 ± 14.8 years; M/F [12.5%]/[87.5%]). EDS patients had significantly elevated aortic valve maximum ($p = 0.038$) and mean pressure gradients ($p = 0.005$) compared to HSD patients. No significant difference was observed in aortic root diameter between EDS (2.96 ± 2.15 cm) and HSD (2.80 ± 0.36 cm) patients. Similarly, no significant differences were found between the two groups in the prevalence of tricuspid, pulmonic, mitral, or aortic regurgitation, nor in the prevalence of mitral valve prolapse (MVP). MVP was observed in 18.6% (n = 16) of EDS patients and 12.5% (n = 4) of HSD patients who underwent echocardiography ($p = 0.584$).
Conclusion: EDS patients demonstrated higher aortic valve pressure gradients compared to HSD patients. These findings suggest structural and hemodynamic differences between these hypermobile conditions, emphasizing the need for early and routine echocardiographic surveillance for personalized risk stratified and targeted management. Study limitations include a retrospective design and small sample size. Larger prospective studies are needed to better delineate cardiovascular risk profiles in patients with EDS and HSD.

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Informed Consent: Informed consent waived by NYITCOM IRB (BHS-1465).
Ethical Approval & IRB and/or IACUC Approval: BHS-1465 Cohen Exemption Approval

The research protocol was exempt by the NYIT IRB retrospective Long Island Heart Rhythm Center study.
Support: None reported.
Financial Disclosures: None reported.

Poster No. *C-29
Abstract No. 2025-088
Category: Clinical
Research Topic: Chronic Diseases & Conditions

Hematologic and Oncologic Comorbidities in Ehlers-Danlos Syndrome and Hypermobility Spectrum Disorder: A Retrospective Review

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Context: Ehlers-Danlos Syndromes (EDS) and Hypermobility Spectrum Disorder (HSD) are both heritable connective tissue disorders associated with joint hypermobility, skin elasticity and fragility. Typically, patients with these connective tissue disorders also will have other common manifestations such as orthostatic intolerance, palpitations or structural cardiac defects like aortic root dilation or mitral valve prolapse [1]. In contrast, there are only isolated reports of hematologic and oncologic conditions in patients with EDS and HSD; however, not enough evidence is available to understand the potential association between these conditions [2]. This study aims to advance osteopathic medical practice and improve patient outcomes via identifying the burden of hematologic and oncologic diagnoses in patients with connective tissue disorders.
Objective: To establish the prevalence and association between hematologic and oncologic conditions among patients diagnosed with connective tissue disorders.
Methods: A retrospective chart review of the Long Island Heart Rhythm Center (LIHRC) Electronic Medical Record (EMR) was performed. 164 patients were initially filtered based on diagnosis of EDS or HSD. Hematologic and oncologic diagnoses were identified by a keyword search including “anemia,” “thrombocytopenia,” “neutropenia”, “thrombosis,” “coagulopathy,” and “cancer.” EDS and HSD patients were then age and sex-matched to controls in the LIHRC. We compared the frequency of diagnoses between groups using Fisher’s Exact Test. Data is reported as mean + standard deviation, $p<0.05$ is considered statistical significance.
Results: Of the patient population, 164 patients had a diagnosis of either EDS/HSD, of which 118 patients had EDS: age 36.3 ± 12.2 years; M/F [6.8%]/[93.2%] and 46 patients had HSD: age 40.7 ± 13.9 years; M/F [15.2%]/[84.8%]. The control cohort had an equal number of patients to the combined EDS/HSD cohort (164 patients). No significant difference was found in the burden of hematologic diagnosis between the EDS and HSD cohorts, with 19 EDS patients compared to 7 HSD patients (p=.0.819). Similarly, no significant difference was found in the burden of oncologic diagnoses between the EDS and HSD cohorts, with 7 EDS patients compared to 2 HSD patients, (p=1.000). There was a significantly elevated burden of hematologic diagnoses among the combined EDS/HSD population when compared to the control cohort, with 26 EDS/HSD patients compared to 7 controls, (p=0.0007). Iron deficiency anemia was the most common hematologic diagnosis amongst all groups, with a significantly elevated burden in the EDS/HSD cohort compared to controls, with 16 EDS/HSD patients compared to 5 controls, (p=0.022). A comparison of oncologic diagnoses within the EDS/HSD cohort compared to controls yielded a trend towards significance, with 9 EDS/HSD patients compared to 2 controls, (p=0.061).
Conclusion: This study demonstrated that EDS and HSD patients have higher rates of hematologic diagnosis compared to age and sex-matched controls, specifically regarding iron deficiency anemia. The root cause of these differences maybe related to associated comorbidities and

require further investigation. Study limitations include retrospective design and small sample size.

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Informed Consent: Informed consent was waived by NYITCOM IRB (BHS-1465).
Ethical Approval & IRB and/or IACUC Approval: The research protocol was exempt by the NYIT IRB (BHS-1465) retrospective Long Island Heart Rhythm Center study.
Support: None reported.
Financial Disclosures: None reported.

Poster No. *C-32
Abstract No. 2025-091
Category: Clinical
Research Topic: Chronic Diseases & Conditions

Non-tobacco Nicotine Dependence Worsen the Outcomes of Stereotactic Radiosurgery

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Tobacco use has been shown to negatively affect post-operative outcomes and increase the risk of perioperative complications. As the popularity of non-tobacco-related nicotine products, such as vapes and nicotine pouches, continue to rise, it raises the question of whether these products follow the same negative trend. Stereotactic radiosurgery (SRS) is an emerging non-invasive treatment option to manage simple and complex cranial lesions. Therefore, the objective of this study is to evaluate the impact of non-tobacco-related nicotine dependence (NTRND) on post-operative outcomes following SRS compared to patients without nicotine dependence.

A retrospective database analysis was conducted using the multi-institutional database TriNetX on the Research Network, comparing two cohorts: patients with NTRND (Cohort 1) versus patients with no history of nicotine dependence (Cohort 2). Adult patients (≥18 years old) undergoing stereotactic radiosurgery (SRS) for both simple and complex cranial lesions were included. Propensity score matching was performed to balance demographic and clinical characteristics, resulting in 4,602 patients in each cohort (post-match). Outcomes included mortality and neurological deficits, hemorrhage, repeat interventions, functional outcomes, radiation-induced complications, infections, vascular complications, and patient-reported symptoms. Risk ratios (RRs), hazard ratios (HRs), and statistical significance ($p < 0.05$) were calculated.

Patients with NTRND exhibited a higher 2-year mortality rate (RR: 1.34; $p < 0.05$) and increased rates of neurological deficits (RR: 1.22; $p < 0.01$). Repeat interventions were more frequent in Cohort 1 (RR: 1.18; $p < 0.05$), along with higher incidences of radiation-induced edema (RR: 1.27; $p < 0.01$) and chronic radiation necrosis (RR: 1.15; $p = 0.03$). Functional outcomes and patient-reported symptoms, such as headaches and scalp discomfort, were comparable between the groups. Hemorrhage, infections, and vascular complications showed trends but did not reach statistical significance.

Higher mortality and increased complications, including neurological deficits, radiation-induced edema, and chronic radiation necrosis were associated with NTRND following SRS for simple and complex cranial lesions. These findings suggest that NTRND may exacerbate post-SRS risks, highlighting the need for surgeons to be aware of these trends as it may influence their clinical decision making and perioperative management.

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Informed Consent: Yes, I, Sarah Lateef, hereby gave my consent.
Ethical Approval & IRB and/or IACUC Approval: Letter dated January 31, 2025, states that this project is exempt from informed consent because no protected health information is provided.

Support: None reported.
Financial Disclosures: None reported.

Poster No. *C-33
Abstract No. 2025-092
Category: Clinical
Research Topic: Chronic Diseases & Conditions

Modeling Pediatric Ejection Fraction: Real-World Applications and Clinical Integration

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Context: Ejection fraction (EF) is a core metric for cardiac function assessment, yet current pediatric reference standards are extrapolated from adult populations, leading to clinical ambiguity in younger patients. Pediatric EF data remain fragmented, with inconsistent thresholds despite high variability in physiology and pathology. This gap limits diagnostic precision and standardized care in pediatric cardiology.
Objective: To develop age- and sex-specific reference standards for pediatric EF using a large-scale echocardiographic dataset and translate findings into a clinical application for EF visualization and longitudinal tracking.
Methods: This retrospective modeling study analyzed 7,810 pediatric echocardiograms from the Stanford EchoNet Ped dataset, including patient age, sex, height, weight, and EF. Patients with missing or implausible values were excluded. Descriptive statistics were computed and stratified by sex. Mann-Whitney U tests evaluated sex-based differences. Correlations were explored via a matrix analysis. EF was modeled using quantile linear regression across 5th–95th percentiles to construct age- and sex-specific reference grids. A z-score approximation using interquartile-based SD and a Gaussian-weighted empirical cumulative distribution (ECDF) were implemented. All models were integrated into an interactive Shiny application for clinical use. Osteopathic significance lies in providing a cost-free, noninvasive, and demographically calibrated EF assessment tool aligned with whole-person care and prevention.
Results: Significant sex-based differences were identified in EF ($p < 0.001$), along with robust age-related trends. Younger patients demonstrated higher EF variability than older cohorts. The conventional 55–70% EF standard captured only 70.0% of the youngest patients and 76.5% of the oldest, underscoring its poor fit for pediatric populations. The developed models generated percentile charts and visual EF trajectories with contextual red-flagging of outliers via the clinical application.
Conclusion: Our study establishes age- and sex-specific pediatric EF reference ranges and delivers a clinical decision support tool to enhance individualized, longitudinal cardiac care. The conventional EF threshold lacks sensitivity across the pediatric age spectrum, reinforcing the need for stratified norms. Our modeling framework offers scalable, accessible clinical integration and lays groundwork for future pathology-specific EF standards.

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Informed Consent: This study utilized a de-identified, publicly available dataset (Stanford EchoNet Ped), and therefore did not involve direct patient contact or the collection of identifiable personal information. As such, formal informed consent was not required. The original dataset was collected with institutional review board (IRB) approval and appropriate ethical oversight.
Ethical Approval & IRB and/or IACUC Approval: This study qualified for IRB exemption at our institution on 5/20/2025
Support: None reported.
Financial Disclosuses: None reported.

★Poster No. *C-38
Abstract No. 2025-138
Category: Clinical
Research Topic: Chronic Diseases & Conditions

Revisiting the Glucose Paradox: Impact of Fructose on the Indirect and Direct Pathway of Glycogen Synthesis in Healthy and Insulin-Resistant Populations

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Context: The metabolism of the dietary simple sugars, glucose and fructose, which are consumed together, have distinct metabolic fates. Where glucose can be metabolized by all cells, fructose metabolism is limited mostly to the liver and small intestine. One metabolic fate of glucose is hepatic glycogen storage. Interestingly, hepatic glycogen can be made directly from glucose or indirectly, where glucose is metabolized by peripheral tissues into gluconeogenic substrates, such as lactate, which can be taken up by the liver, enter gluconeogenesis and subsequently, glycogenesis. Previous studies have shown that hepatic glycogen stores are replenished predominantly via the indirect pathway, a nonintuitive observation defined as the glucose paradox. On the other hand, hepatic fructose is quickly metabolized into triose phosphate intermediates, which can be incorporated into glycogen stores via the indirect pathway. The impact of dietary sugar loads, such as glucose and fructose, on the direct and indirect glycogen storage pathways are unknown. Further, glycogen metabolism in people with hepatic insulin resistance (IR) is altered compared to controls, evident by a reduction in glycogenesis. Taken together, the goal of this study is to better understand the glucose paradox in the context of varying ratios of fructose and glucose loads on glycogen synthesis via the two pathways and provide insight on how these interrelated processes might contribute to the development of metabolic disorders such as IR, type 2 diabetes, metabolic-associated fatty liver disease (MAFLD), and cardiovascular disease.
Objective: The impact of dietary fructose on the direct and indirect pathways of glycogen storage remains poorly understood. Moreover, since individuals with IR have altered glycogen metabolism compared to controls, dietary sugar and composition may affect the relative contribution of the two pathways between these populations. The objective of this pilot project is to investigate the impact of various glucose loads, with and without fructose, on both the direct and indirect glycogen storage pathways, in people with IR versus controls.
Methods: Five participants were selected for this study based on the following criteria. They were between 29-55 years, had a BMI between 23 to 35 kg/m2, and were characterized as insulin sensitive(IS), fasting insulin <10μIU/mL, <100 mg/dL and HbA1 < 5.7%, or insulin resistant/non-diabetic (IR), fasting insulin ≥12μIU/mL, <125 mg/dL and HbA1 < 6.5%. Exclusion criteria included: pregnancy or lactation within the past six months; type 1 or 2 diabetes mellitus (fasting glucose ≥126 mg/dL, HbA1c ≥6.5%); history of liver disease or AST and ALT above the upper limit of normal (ULN); fasting triglyceride or total cholesterol levels above ULN; use of any anti-diabetic medications or hypolipidemic agents in the past six months; self-reported change in body weight greater than 5% in the past six months; history of other conditions known to affect insulin sensitivity and lipid metabolism, known intolerance to components of test meals; or any other condition that would put the participant at risk. A total of 5 subjects were enrolled in the study: 2–IS subjects (2 males) and 3–IR subjects (2 females and 1 male) were enrolled in a controlled metabolic study consisting of four 6-hour study days, each separated by a one-week washout period. After an overnight fast, during each visit, subjects were administered one of the following oral test meals: 1) a high glucose meal (175g glucose), 2) a high mixed-carbohydrate meal (114g glucose + 61g fructose), 3) a moderate glucose meal (114g glucose), and 4) a moderate mixed-carbohydrate meal (55g glucose + 59g fructose), where the order of test meal administration was randomized. To measure the direct and indirect glycogen synthesis pathways, U-13C-glucose, a stable isotope tracer, was added

to the oral test meals, as 1% of glucose load, and D-1-galactose was administered intravenously. Acetaminophen was also administered intravenously, resulting in the hepatic acetaminophen-glucuronide conjugate. This is a conjugate of UDP-glucose, the direct precursor of glycogen, and acetaminophen, which is excreted in urine. Excreted acetaminophen-glucuronide was collected at baseline and at hourly intervals throughout the study day. Acetaminophen – glucuronide was isolated by solid-phase extraction and derivatized to saccharic acid tetraacetate and methylglucuronic acid tetraacetate. Derivatized samples were analyzed by Gas Chromatography–Mass Spectrometry. M1, M2, and M3 enrichment data were used to calculate the contribution of the direct and indirect pathways. All values are reported as the mean ± SEM, a paired t-test determined statistical significance. We calculated the relative percentage increase of the indirect pathway of test meals with fructose versus those without fructose. This study emphasizes the integrative relationship between metabolism and health. Understanding glucose and fructose metabolism, with respect to hepatic glycogen storage, supports the osteopathic principle that structure and function are reciprocally interrelated. Further, by recognizing that the metabolic fate of dietary sugars play a role in chronic disease, rational treatments can be prescribed to address the current epidemic.

Results: All enrolled subjects successfully completed all study visits. The total incorporation of dietary glucose into hepatic glycogen, via both direct and indirect pathways, with the high glucose load composed exclusively of 175g glucose, was significantly lower (8.9% ± 1.5% of the glucose load) compared to the high mixed-carbohydrate (CHO) load containing 114g glucose + 61g fructose, which resulted in 12.9% ± 0.9% incorporation ($n = 5$, $P < 0.05$). This indicates that the presence of dietary fructose significantly enhances the incorporation of dietary glucose into hepatic glycogen. This effect appears to be primarily driven by the direct pathway of glucose conversion to hepatic glycogen (6.2% ± 1.4% with glucose-only vs. 9.5% ± 0.8% with the mixed load, $n = 5$, $P < 0.05$). A similar trend was observed with the moderate glucose versus a moderate mixed-carbohydrate meal (114 g glucose vs. 55g glucose + 59g fructose), where the addition of fructose appeared to increase the combined direct and indirect incorporation of glucose into hepatic glycogen (10.4%±1.7% vs. 14.0%±1.6%, respectively), although the difference between the pathways did not reach statistical significance ($n=5$, $P < 0.08$). Although the sample size is too small for definitive comparisons between IS (n=2) and IR (n=3) participants, a trend was noted insulin-resistant individuals appeared to store a greater proportion of dietary glucose directly as hepatic glycogen (7.6%±1.6% vs 4.1%±1.8% high CHO glucose test meals; 10.1%±1.3% vs. 8.6%±0.1% high CHO mixed glucose and fructose test meals), while indirect incorporation was comparable between the two groups (2.7%±0.6% vs. 2.6%±0.1).

Conclusion: These findings highlight a synergistic role of dietary fructose in promoting hepatic glucose storage, particularly via the direct pathway. They also suggest that insulin resistance may influence the partitioning of glucose toward this pathway. Future studies with larger cohorts will be essential to confirm these observations and to further elucidate the metabolic implications of dietary carbohydrate composition, especially in insulin-resistant individuals.

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Informed Consent: All participants provided written informed consent in accordance with the Touro University's Institutional Review Board, which requires that research subjects be fully informed of their rights, the purpose of the study, all procedures involved, and any associated risks or benefits. Participants also read and signed a detailed written consent form outlining the study's goals, methods (including pre-test day dietary protocols, screening visits, test day procedures, blood draws, tracer infusions, urine samples), possible side effects, compensation, and confidentiality measures. The consent form was reviewed with each participant in person, and all questions were addressed before consent was obtained. Participants were told that participation was voluntary and could be withdrawn at any time without penalty or impact on care. Each participant received a signed copy of the consent form for their records.

Ethical Approval & IRB and/or IACUC Approval: This study was reviewed and approved. IRB Number: M-1724

Support: Touro University California Internal Research Award Proposal For Student Research (IRAP-SR) Grant, Touro University System Student Research Fellowship Grant

Financial Disclosures: None reported.

Poster No. *C-39
Abstract No. 2025-015
Category: Clinical
Research Topic: Impact of OMM & OMT

Utilizing Osteopathic Manipulative Technique to Alleviate Restriction at the Hip from the Tibio-Fibular Joint

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Context: This study aims to analyze the correlation of hip joint ROM associated with a finding of an ipsilateral tibio-fibular joint restriction. The study will assess an innovative manual technique of correcting the tibio-fibular joint restriction to facilitate a simultaneous improvement of restricted hip internal and external rotation.
Objective: A dysfunctional joint in the lower extremity, the tibio-fibular joint with resulting restricted range of motion, may directly cause a restricted range of motion of its more proximal ipsilateral hip joint. Utilizing a manual retraction technique, this study will assess whether the corrective alignment of this tibio-fibular joint also provides a corrective restoration of the ipsilateral hip joint range of motion.
Methods: A group of 20 healthy adult volunteers (10 male and 10 female) were selected based on the exclusion criteria of being over 65 years of age without previous surgical hip or knee procedures. They were recruited either in person, over institutional email or through their class group-me. Inclusion criteria included range of motion restriction that was lacking in hip flexion, determined as less than 90 degrees in passive range of motion. In the first phase of the study, a goniometer (GM) was used to measure the passive range of motion (ROM) of the internal and external hip joint, followed by an assessment of the ipsilateral tibio-fibular joint. The participants that were found to have a tibio-fibular shift with associated loss of lower leg and ankle range of motion were provided the manual technique after their consent. The manual treatment performed in this study was the controlled lower leg thrust with the participant placed in a supine position. This manual method consisted of securing the lateral and medial malleolus and applying a brief, forceful retraction release to the subtalar complex and calcaneus while having the participant perform an extended exhalation. This manual release method was performed in three precise positions: neutral extension, 30-degree lower limb abduction, and 15-degree lower limb adduction.
Results: All results were found to be clinically significant regardless of gender or age using a standard p-value of $P<0.05$, with the significance in this study $p<0.00001$. In hip flexion, male participants improved a mean of 12.1 degrees, while female participants improved a mean of 18.2 degrees following the technique completion. A paired samples t-test was used through Microsoft excel using an alpha value of 0.05 to determine significance.
Conclusion: The results found that an ipsilateral manual retraction of the lower leg technique significantly improved tibio-fibular joint mobility, which, in turn, contributed to improved ipsilateral hip joint ROM.

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Informed Consent: Prior to the conduction of the study, participants were screened verbally for any exclusion criteria and were provided with an informed consent form. The informed consent form detailed the risks, benefits, and alternatives to participation and all participants signed the form with a wet ink signature in the presence of a study team member. They were given opportunities to ask questions and a copy of their informed consent was emailed to them.
Ethical Approval & IRB and/or IACUC Approval: Full board approval on August 14, 2024 (24-02-05-003).
Support: None reported.
Financial Disclosures: None reported.

Poster No. *C-40
Abstract No. 2025-018
Category: Clinical
Research Topic: Health Disparities/Social Determinants of Health

Explicit Language Exposure and Verbal Aggression in Future Healthcare Providers: A Survey-Based Study

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Context: Aggression and unprofessional communication among healthcare professionals can impact patient safety and team functioning. Although aggression in healthcare environments has been studied broadly, few investigations have examined the role of frequent exposure to explicit language, commonly encountered in media, music, and peer interactions, on the development of verbal aggression in students preparing for careers in medicine. Understanding whether language exposure influences behavioral tendencies could offer valuable insights into preclinical professionalism and communication training.

Objective: To assess whether frequent exposure to explicit language is correlated with verbal aggression scores in undergraduate students pursuing healthcare careers.

Methods: This cross-sectional study surveyed 66 undergraduate pre-medical students enrolled at a U.S. university. Participants completed two instruments: the Buss-Perry Aggression Questionnaire, a validated self-report tool measuring components of aggression including verbal aggression; and a custom-developed Exposure to Explicit Language Questionnaire, which assessed the frequency of exposure to profane or aggressive language across music, media, peer conversations, and academic settings. Participants were recruited via university email and responses were collected anonymously and de-identified. Pearson's correlation was used to examine the relationship between explicit language exposure and verbal aggression. Statistical analysis was performed using SPSS. This project explored behavioral constructs relevant to medical professionalism and interprofessional communication, which are central to osteopathic values of holistic, person-centered care.

Results: A statistically significant positive correlation was found between explicit language exposure and verbal aggression scores ($r = 0.611$, $p < .001$). Students with higher exposure across domains, particularly in music and peer conversations, demonstrated greater levels of verbal aggression. No significant variation was found based on academic year or gender. The final sample included 66 participants after excluding incomplete responses.

Conclusion: Students preparing for careers in healthcare who report frequent exposure to explicit language may demonstrate elevated levels of verbal aggression, even before formal clinical training. While this study does not imply causation, the results suggest that media and language environments may shape communication styles with potential downstream effects on patient-provider interaction and professionalism. These findings are especially relevant to osteopathic education, which emphasizes empathy, interpersonal connection, and the integration of mind, body, and spirit. Further studies using larger sample sizes and validated language exposure instruments are warranted to explore causality and long-term behavioral trends.

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Informed Consent: All participants provided electronic consent prior to participation. Survey responses were anonymous and no identifying information was collected.

Ethical Approval & IRB and/or IACUC Approval: This project was completed as part of academic coursework at Thomas Jefferson University. All data was collected anonymously, fully de-identified, and used solely for educational purposes. No identifying information was recorded. The study was reviewed by faculty at Burrell College of Osteopathic Medicine and deemed appropriate for academic presentation. Therefore, no IRB documentation is required.

Support: None reported.

Financial Disclosures: None reported.

Poster No. *C-41

Abstract No. 2025-096

Category: Clinical

Research Topic: Osteopathic Philosophy

Investigating the cardiotoxic properties of medications used for the treatment of COVID-19 infection by utilizing the FDA adverse event reporting system

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Context: In 2020, the world was racing to find new medications to mitigate the progression of SARS-CoV-2 infections. Many drugs were evaluated in an attempt to save as many lives as possible. There are many adverse effects of the drugs used to treat COVID-19, with some being better reported than others. Based on case reports and literature reviews of Remdesivir's and Hydroxychloroquine's cardiotoxic effects, we sought to investigate this further using the FDA Adverse Event Reporting System (FAERS).1,2 [IB1]

Objective: Our goal was to investigate the cardiotoxic properties of commonly prescribed COVID-19 medications by utilizing information obtained from the FAERS database from 2020-2024.

Osteopathic Significance: Our study demonstrates the cardiotoxic properties of drugs utilized for COVID-19. The serious adverse effects discovered raise attention towards how osteopathic manipulative treatment (OMT) should be evaluated as an adjunct to conventional SARS-CoV-2 treatment. Two studies investigating OMT's use on patients with SARS-CoV-2 have proven that it can shorten hospital stay and improve patient symptoms.3,4 Using OMT as an adjunct is likely to reduce the need to rely on cardiotoxic medications when treating SARS-CoV-2-infected patients.

Methods: FAERS quarterly data from 2020 to 2024 was extracted and analyzed via a custom Python script by obtaining primary IDs pertaining to pharmaceutical treatment being indicated for COVID-19 (INDI file). Using these primary IDs, drug (DRUG file), reaction (REAC file), and outcome (OUTC file) data from the COVID-19 patient pool (171,136 cases) was extracted and analyzed to evaluate the adverse events associated with Remdesivir, Paxlovid, Molnupiravir, and Hydroxychloroquine. For each drug, frequencies of adverse reactions were documented. A reporting odds ratio analysis comparing each drug against the other three was obtained for adverse cardiovascular events (arrhythmia, atrial fibrillation, hypertension, hypotension, cardiac arrest, tachycardia, and bradycardia). Additionally, information regarding the suspected role of each drug was obtained and documented under the classifications of primary suspect (PS), secondary suspect (SS), concomitant (C), or interacting. Lastly, adverse outcomes for each drug were obtained and reclassified as "death" for an outcome of death and "serious" for all other non-death outcomes.

Results: Results indicated significantly higher instances of cardiovascular adverse events for Remdesivir and hydroxychloroquine. Common reactions for Remdesivir included bradycardia (1.4%), Cardiac arrest (.9%), hypotension (.6%), QT prolongation (.5%), and Torsades de pointes (.4%). Likewise, Hydroxychloroquine was associated with Qt prolongation (4.4%), hypotension (0.7%), cardiac arrest (0.7%), Torsades de pointes (0.5%), atrial fibrillation (0.5%), and tachycardia (0.4%). Reporting odds ratio (ROR, 95% CI) analysis further strengthened these findings by demonstrating significant values for atrial fibrillation (1.97; 1.25-3.11), hypertension (1.05; 0.74-1.49), hypotension (2.28; 1.7-3.07), cardiac arrest (8.02; 6.07-10.61), tachycardia (2.11 ;1.51-2.94), and bradycardia (8.37; 6.83-10.27) for Remdesivir, and significant values for bradycardia (1.61; 1.25-2.07), tachycardia (7.11; 5.67-8.92), cardiac arrest (7.26; 5.54-9.5), hypotension (3.2; 2.56-4.01), atrial fibrillation (5.25; 3.86-7.13), and arrhythmia (6.92: 4.79-10.0) for hydroxychloroquine. Analysis of suspected roles revealed Molnupiravir and Paxlovid were predominantly classified as primary suspects with relative designations of 84% and 95% respectively, while Hydroxychloroquine and Remdesivir were predominantly designated as a secondary suspect (41%) and concomitant (48%) respectively. Remdesivir and Hydroxychloroquine were associated with the proportions of death with values of 25% and 20% respectively.

Conclusion: With the data collected and analyzed, we have concluded that Hydroxychloroquine and Remdesivir may have more cardiotoxic adverse effects when compared to other medications used to treat COVID-19. Hydroxychloroquine is no longer used to treat COVID-19, but it emphasizes the need for heightened vigilance when giving these drugs to patients with other comorbidities. Furthermore, as osteopathic medical students, our study provides preliminary data to support future investigations of the use of OMT further as an addition to safe COVID-19 treatment instead of using medications only that can be cardiotoxic.

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Informed Consent: Not relevant
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Support: None reported.
Financial Disclosures: None reported.

Poster No. *C-42
Abstract No. 2025-097
Category: Clinical
Research Topic: Chronic Diseases & Conditions

Integration of Pharmacovigilance, Pharmacodynamics, and Pharmacogenetics to Prevent Drug-Induced Movement Disorders

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Context: Antipsychotic-induced movement disorders (AIMDs), such as tardive dyskinesia and antipsychotic-induced parkinsonism (AIP), significantly compromise treatment adherence and quality of life in patients receiving antipsychotic therapy. While previous studies have individually explored pharmacovigilance, pharmacodynamics, or pharmacogenetics to understand these adverse effects, current clinical practices lack a unified, predictive model incorporating all three methodologies. This gap hinders the ability to personalize treatment strategies and mitigate movement disorder risk in vulnerable populations.
Objective: To evaluate whether the integration of pharmacovigilance, pharmacodynamic receptor-binding profiles, and pharmacogenetic data can improve the identification of patients at risk for AIMDs and support the development of predictive, individualized antipsychotic treatment strategies.
Methods: A multidisciplinary, retrospective integrative review was conducted utilizing existing data from the WHO's VigiBase pharmacovigilance database, receptor-binding affinities sourced from the IUPHAR/BPS Guide to Pharmacology, and peer-reviewed pharmacogenetic studies. Receptor occupancy of dopamine D2, serotonergic 5-HT2A, and muscarinic M1 receptors was analyzed in relation to AIMD frequency. Genetic variants affecting dopaminergic pathways (e.g., DRD2 polymorphisms) were reviewed for their impact on AIP susceptibility. Statistical modeling techniques were explored to assess correlations between receptor profiles, adverse drug event frequency, and genetic susceptibility. The osteopathic significance of this study lies in its systems-based approach to improving patient outcomes by anticipating and minimizing medication-related harm through whole-person, individualized care.
Results: Data analysis revealed that antipsychotics with higher antagonistic activity at 5-HT2A and M1 receptors were associated with significantly fewer reported AIMDs compared to those primarily targeting D2 receptors (e.g., drugs with >60% 5-HT2A occupancy had a 35% lower reporting rate of AIP; $p<0.05$). Additionally, DRD2 polymorphisms previously associated with Parkinson's disease susceptibility were found to overlap with AIP risk loci, supporting a potential "double-hit" model of dopaminergic vulnerability. No original participants were recruited; results are based on secondary data analysis. These findings support a layered approach to treatment planning based on receptor profile and genetic makeup.
Conclusion: The integration of pharmacovigilance, pharmacodynamics, and pharmacogenetics offers a promising framework for predicting and reducing antipsychotic-induced movement disorders. This approach supports the development of personalized psychiatric care models, where medication regimens are tailored to receptor interaction profiles and individual genetic vulnerabilities. Future research should focus on validating these findings through prospective, patient-level studies incorporating genetic screening and receptor occupancy testing in diverse clinical populations.

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Ethical Approval & IRB and/or IACUC Approval: N/A
Support: None reported.
Financial Disclosures: None reported.

Poster No. C-43
Abstract No. 2025-026
Category: Clinical
Research Topic: Chronic Diseases & Conditions

Within-Pair Association Between Central Obesity and the Onset of General Obesity Over 17 Years Among Male Twins Discordant for Incident Obesity: Implications for Osteopathic Manipulative Treatment in Obesity Management

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Context: In U.S. clinical practice, a body mass index (BMI) ≥ 30 kg/m2 is typically used to classify adult general obesity. However, it has been shown that adult central obesity, defined as a waist circumference ≥ 102 cm, is a better biomarker of metabolic health (1). Additionally, measuring waist circumference in addition to BMI in clinical practice has been shown to provide additional insight into health than measuring BMI alone (1). Increased waist circumference, along with metabolic health, can also be used to predict a number of musculoskeletal strains on the human body: previous studies have demonstrated that waist circumference is positively correlated with low back pain intensity in obese patients (2), and that an increased waist-hip ratio and obesity are positively correlated with an increased lumbosacral angle, lumbar lordosis angle, sacral inclination angle, and lumbosacral disc angle (3). These findings highlight the structural dysfunctions that obesity, both general and central, can exert on patients, and these dysfunctions can strongly benefit from osteopathic manipulative treatment (OMT). For instance, OMT can increase the thoracic range of motion, as well as decrease pain and disability from chronic low back pain (4). A previous Australian study found that over twelve years, the incidence of central obesity defined by waist circumference (31.8%) was significantly high compared to general obesity defined with BMI (15.0%) (5); however, it remains unclear if central obesity and waist circumference were associated with the later onset of general obesity when controlling for familial influences that includes genetic impact. Therefore, we aimed to address this unclear research issue in a prospective study of twins discordant for incident general obesity. The insights from our study could guide osteopathic physicians in integrating targeted OMT to address abdominal fat-induced structural dysfunctions as part of a holistic approach to obesity management.

Objective: To evaluate the prospective association of central obesity with the later onset of general obesity among Caucasian adult men independent of familial factors.

Methods: Twelve monozygotic (MZ) and fourteen dizygotic (DZ) pairs of Caucasian adult male twins discordant for incident general obesity, defined as BMI ≥ 30 kg/m2, were included from the U.S. National Heart, Lung, and Blood Institute Twin Study if discordance occurred after exam 3 in the mid-1980s through 2003, and data on both waist circumference and DNA samples at exam 3 were available. Weight and height were measured at each exam of six exams to calculate BMI: exam 1 (1969-1973), exam 2 (1981–1982), exam 3 (1986–1987), exam 4 (1995–1997), exam 5 (1999–2001), and exam 6 (2001-2003). Adult central obesity was defined as a waist circumference ≥ 102 cm. This discordant twin study design was a specific nested 1:1 matched case-control study. The exact conditional logistic regression model was performed to evaluate the association of central obesity and a continuous waist circumference at exam 3 with incident obesity developed after exams 3 through 6. The statistical significance level was set at $\alpha = 0.20$ to minimize false negative tests resulting from the small sample size. The R version 4.5.0 software was used to perform all statistical analyses.

Results: Among 26 combined MZ and DZ twin pairs, co-twins who were centrally obese at exam 3 had 9 times as fast to develop general obesity over the following 17 years compared to their co-twin brothers without central obesity [hazard ratio (HR) 9 (80% CI 2.33 – 34.8)], independent of familial factors. Additionally, the HR for each 1-cm increase

in waist circumference was 1.22 (80% CI 1.11 –1.35) for developing general obesity, independent of familial factors. **Conclusion:** Central obesity and a higher continuous waist circumference are associated with a higher 17-year risk for incident general obesity, respectively, independent of familial factors. Our findings support the importance of considering central obesity, even in patients who are not generally considered obese in osteopathic practice, and also reinforce the tenet of osteopathic medicine that the body is a unit. Our findings warrant further investigation into the effectiveness of OMT as part of holistic obesity management that includes targeted OMT to address the biomechanical consequences of abdominal fators.

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Informed Consent: N/A.
Ethical Approval & IRB and/or IACUC Approval: IRB exempted on November 25, 2020.
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Poster No. *C-44
Abstract No. 2025-150
Category: Clinical
Research Topic: Acute and Chronic Pain Management

Hands-On Relief: A Pilot Study on the Use of Osteopathic Manipulative Treatment for Tension-Type Headaches

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Context: Tension-type headaches (TTH) are the most common form of primary headache, accounting for up to 78% of cases [1]. TTH can impair physical, social, and emotional functioning, contributing to reduced productivity and diminished quality of life. Pharmacologic therapies, such as over-the-counter analgesics, are limited by side effects and lack long-term efficacy [2]. The pathophysiology of TTH is multifactorial, involving both central and peripheral mechanisms. Somatic dysfunction–particularly in the cervical and upper thoracic musculature–is commonly observed in patients with TTH, contributing to muscle hypertonicity, tissue texture abnormalities, and nociceptive signaling [3]. Osteopathic manipulative treatment (OMT) addresses somatic dysfunction through a range of manual techniques and offers a promising non-pharmacologic alternative for TTH. However, few studies have assessed the clinical impact of OMT on TTH.
Objective: To evaluate the immediate effectiveness of osteopathic manipulative treatment (OMT) in reducing headache severity in patients with tension-type headaches (TTH).
Methods: This randomized, controlled pilot study was conducted from February 2023 to April 2025 and approved by the Institutional Review Board at Western University of Health Sciences (IRB Protocol #1880862). Participants were recruited based on diagnostic criteria outlined in the International Classification of Headache Disorders, 3rd edition (ICHD-3) [4], for TTH. Exclusion criteria included current headaches that were not TTH (e.g., migraine, cluster headache), recent head or neck trauma, or the use of prescription or over-the-counter medications for headache management on the day of the OMT session. Participants were randomly assigned to one of two groups: an immediate-treatment group or a delayed-treatment control group. All sessions were conducted in an osteopathic manipulative medicine

(OMM) laboratory under the supervision of a board-certified physician in neuromusculoskeletal medicine and osteopathic manipulative medicine (NMM/OMM). The immediate-treatment group received a 20-minute OMT session targeting somatic dysfunctions in the cervical, thoracic, and rib regions. Treatment modalities included soft tissue, articulatory, myofascial release, muscle energy, Still techniques, and high-velocity, low-amplitude (HVLA). No medications or adjunct therapies were used. The delayed-treatment control group remained seated in a quiet setting for 20 minutes without therapeutic intervention, which served as the study's control condition. Participants in this group then completed a post-wait survey before crossing over to receive the same OMT session as the immediate-treatment group. Headache severity was assessed using the 11-point numeric rating scale, ranging from 0 (no pain) to 10 (worst pain), immediately before and after each condition. Statistical analysis was performed using GraphPad Prism (version 10.5.0), with significance set at $p<0.05$. The Wilcoxon matched-pairs signed-rank test was used to assess within-group changes in headache severity. The Mann-Whitney U test was used to evaluate absolute changes in headache severity between the OMT and control conditions.

Results: A total of 28 OMT sessions were conducted. All participants (ages 23-56; 89.3% female) exhibited palpable somatic dysfunction in the cervical and/or upper thoracic regions. In the immediate-treatment group ($n=19$), mean headache severity decreased from 3.63 ± 1.11 to 0.39 ± 0.66 following OMT ($p<0.0001$), with an average change of 3.24 ± 1.22. In the control group ($n=9$), mean headache severity changed from 4.44 ± 2.06 to 4.11 ± 1.76 after 20 minutes of sitting ($p=0.50$), with an average change of 0.33 ± 0.87. After OMT was provided to the control group, mean headache severity decreased to 1.06 ± 0.95 ($p=0.0039$), with an average change of 3.06 ± 1.13. Comparison of the absolute change in headache severity between groups revealed a statistically significant difference favoring OMT ($p<0.0001$). A subgroup analysis showed that participants with a history of migraines ($n=8$) responded similarly to those without ($n=20$), with an average pain reduction of 3.19 ± 1.00 in those with a history of migraines, compared to 3.18 ± 1.26 in those without. However, the difference between these subgroups was not significant ($p<0.84$). Notably, the average pain reduction following OMT exceeded the 2-point threshold on the numeric rating scale that is considered clinically meaningful in pain research [5]. No adverse events were reported, and all participants tolerated the intervention well.

Conclusion: OMT was associated with a statistically and clinically significant immediate reduction in headache severity among patients with TTH. These findings support the potential of OMT as a safe, well-tolerated, and non-pharmacologic intervention for managing TTH. Although ambient lighting and noise levels in the treatment environment were not standardized, no significant impact on outcomes was observed. Future studies should control for environmental conditions, include a larger, more diverse sample, and assess long-term treatment effects.

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Informed Consent: All participants signed a consent form prior to their involvement, which included the study purpose and design; risks, benefits, and voluntary nature of participation; and statement of confidentiality.

Ethical Approval & IRB and/or IACUC Approval: This study was reviewed and approved by the Institutional Review Board at Western University of Health Sciences (IRB Protocol #1880862; Ref. #P23/IRB/003), ensuring compliance with all ethical standards for research involving human participants. The study adhered to the principles outlined in the Declaration of Helsinki and applicable institutional guidelines.

Support: None reported.

Financial Disclosures: None reported.

Poster No. *C-45

Abstract No. 2025-064

Category: Clinical

Research Topic: Impact of OMM & OMT

Immediate Impact of Muscle Energy on Hamstring in Comparison to Static Stretching

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Context: Hamstring hypertonicity may lead to injuries in the form of strains and tears, especially in cases of heavy usage in athletes [1]. Improving range of motion and flexibility of the hamstrings can reduce the incidence of hamstring injury during physical activity, as these injuries typically are caused by excessive strain during eccentric contraction [2,3]. Reducing hamstring hypertonicity may restore normal hip joint range of motion, alleviate muscle tension, and improve physical performance [4]. Certain sedentary populations, such as students, may be predisposed to hamstring hypertonicity due to postural effects, such as slouching or poor ergonomics [3].

Objective: To evaluate the immediate impact of a single session of muscle energy technique (MET) versus static stretching on range of motion (ROM) in healthy individuals.

Methods: To assess hamstring hypertonicity among Lake Erie College of Osteopathic Medicine (LECOM) Bradenton faculty and students, 60 participants were recruited, and through a randomized single blinded control study design, 30 of the participants were placed in the control group of static stretching, and the remaining 30 participants were placed in the experimental group of MET [2,5,6]. Second year osteopathic medical students conducted both static stretching and MET. The initial assessment, treatment, and reassessment for each participant was conducted on the same day for each participant. The study took place over the course of a week in LECOM Bradenton's osteopathic manipulative techniques lab, where treatment tables were available. Prior to MET or Static Stretch, subjects filled out a survey with questions related to subjective hamstring tightness, and then these same surveys were taken again after treatment. Initially, participants performed a v-sit and reach test following standard procedure or a static stretch, and their pretreatment reach distance was measured to establish baseline flexibility [5,7]. The participants then had their hamstring range of motion measured by a goniometer. The normal range of motion for the hamstring muscles at the hip, as assessed by passive straight leg raise (SLR), is typically 80–90 degrees of hip flexion in healthy adults [8]. 4 participants who had a SLR greater than 100 degrees were excluded from the study, 3 from the MET group, and 1 from the static stretch group. These participants proved to not have hypertonic hamstring muscles and would not benefit from treatment. After eligible participants had undergone treatment, their v-sit and reach test reach distance was remeasured following the same procedure. Their hamstring range of motion was also remeasured with the goniometer. Investigators that collected hamstring ROM measurements were blinded from the participants' treatment group, preventing experimental bias in the data collection. The pre- and post-intervention data gathered from the v-sit and reach tests, and the goniometer measurements were compared via utilization of paired T-tests. T-tests compared the change in ROM of the same leg before and after their respective treatment.

Results: After utilization of paired T-tests, participants treated with MET demonstrated statistically significant improvements in both right ($p = 0.022$) and left ($p = 0.041$) hamstring ROM compared to those who received static stretching. No significant difference was observed between MET and static stretching in V-sit and reach outcomes ($p = 0.976$). MET saw an average improvement in ROM of 11.52 degrees in the right leg and 11.89 degrees in the left leg, compared to an improvement in ROM of 8.52 degrees in the right leg and 8.83 degrees in the left leg seen in the static stretching group.

Conclusion: A single session of MET produced greater immediate improvements in hamstring ROM than static stretching. We hypothesize that there was a greater response to treatment in the right leg due to the handedness of the participants, as the right leg may be more hypertonic in a predominantly right-handed society. The V-sit and reach technique may not isolate the hamstring muscle, rather involving the muscles and structures of the lower back and may not be as useful of a method of evaluating hamstring ROM. These findings support the clinical utility of MET as a time-efficient osteopathic approach to enhance musculoskeletal function and injury prevention. Further research should assess long-term outcomes and applications in athletic and rehabilitative populations.

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Informed Consent: Each participant, upon initial recruitment, was given the opportunity to contact a member of the research team to have any questions answered regarding the screening process, inclusion/exclusion criteria, or general procedure of the study. Once participants were deemed appropriate for the study, they were given the informed consent document on the day of data collection to review and ask further questions about the research procedure before signing of the informed consent and for voluntary participation in the study.
Ethical Approval & IRB and/or IACUC Approval: This project was granted full approval by the Lake Erie College of Osteopathic IRB on 02/24/2025 as protocol 32-096.
Support: None reported.
Financial Disclosures: None reported.

Poster No. *C-46
Abstract No. 2025-027
Category: Clinical
Research Topic: Acute and Chronic Pain Management

Cormack-Lehane View Agreement Between First and Second Emergency Department Intubation Attempts

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Context: The Cormack-Lehane (CL) classification is used to grade the laryngoscopic view during tracheal intubation (Grades I-IV). It communicates the difficulty of laryngoscopy encountered, also alerting future clinicians of difficult laryngoscopy who may need to intubate the patient.1 This communication is critical in the emergency department (ED), where first-attempt success is associated with fewer complications.2,3 But, prior works on the reliability of the CL classification are limited to studies using still images or recorded video clips with heterogeneous methods.2 The reliability of the CL classification within and between intubating clinicians in the ED is unknown.
Objective: The primary objective was to estimate the inter- and intra-rater reliability of the CL classification between first and second intubation attempts on ED patients who had multiple intubation attempts. To better understand the difference between the inter- and intra-rater reliability, the secondary objective was to estimate the association between changing intubators and second attempt CL grade interacted by the first attempt CL grade.
Methods: This is a retrospective, cross-sectional study using the National Emergency Airway Registry (NEAR) from 2016-2018. NEAR sites include academic and community EDs. Data on each intubation encounter was recorded into a standardized online form by the intubating clinician after each procedure. Site investigators ensured that data for ≥90% of intubations were collected for their site's data to be included in the registry. Patients aged ≥14 years undergoing ED orotracheal intubation with either direct or video laryngoscopy were included if they received at least two intubation attempts using the same laryngoscope type (direct or video), the same position (supine vs. non-supine), and consistent use of or no use of external laryngeal manipulation (ELM) in both attempts. We excluded encounters without consistent use of these modalities for both attempts, since they are known to affect laryngeal views and would confound the reliability estimates. Encounters with incomplete CL view data were also excluded. The primary outcome was reliability, estimated using the weighted kappa statistic with 95% confidence intervals (CI), of the CL grades between the first and second attempts. Using mixed-effects ordinal regression, we modeled the association between no change in intubating clinician after the first attempt and the second attempt CL grade, with and without interaction terms for the first attempt CL grade. Fixed effects included laryngoscope type, patient positioning, use of ELM, and objective difficult airway findings (obesity, airway obstruction, reduced neck

mobility, facial trauma, and blood in airway) as well as a random effect for site.

Results: Of 19,071 encounters in the registry, 736 from 24 sites met the study criteria—219 in the inter-rater cohort and 504 in the intra-rater cohort. The median difference in CL grades between first and second attempts was 0 (IQR 0 to 1) for both cohorts. The inter-rater reliability was fair (κ = 0.34; 95% CI, 0.22–0.44), whereas the intra-rater reliability was moderate (κ = 0.60; 95% CI, 0.45–0.61). No change in intubator vs. change in intubator after the first attempt was associated with a worse or higher CL grade on the second attempt, adjusted odds ratio (aOR) 1.73 (95% CI 1.17-2.57). Compared to not changing the intubating clinician after the first attempt with a Grade I first attempt CL view, the adjusted odds of higher or worse second attempt CL grades with no change of intubating clinician were not significant for Grades II and III, but not for Grade IV (aOR = 4.18; 95% CI 1.01-17.36).

Conclusion: Among ED intubations with multiple attempts, the CL classification demonstrated fair inter-rater and moderate intra-rater reliability. When the same laryngoscope type and adjuncts are used between attempts, changing intubators after the failed first attempt may improve second-attempt laryngeal views. These results inform the value of the CL view and its reliability within and between intubating clinicians. However, given that intubating clinicians reported the data after each procedure, not after each attempt, these results are susceptible to recall bias. Future research may better address this by having independent research personnel record CL grades at the time of each attempt.

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Informed Consent: Informed Consent: The Saint Vincent Health Center Institutional Review Board (IRB) reviewed the study protocol and determined that the study is exempt from Human Research under 45 CFR 46.101(b)(4). Therefore, the study was exempt from obtaining informed consent from subjects.

Ethical Approval & IRB and/or IACUC Approval: IRB approval received December 1, 2013, and considered to be exempt from human Research under 45 CFR 43.101 (b)(4).

Support: None reported.

Financial Disclosures: None reported.

Poster No. *C-47
Abstract No. 2025-067
Category: Clinical
Research Topic: Chronic Diseases & Conditions

Crizotinib Improves Objective Response Rate and Progression-Free Survival but Not Overall Survival in ALK-Positive Non–Small Cell Lung Cancer

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Context: Non–small cell lung cancer (NSCLC) is a leading cause of cancer-related mortality (1). Targeted therapies have been developed to treat patients based on molecular subtypes. In particular, rearrangement of the anaplastic lymphoma kinase (ALK) gene has been identified as an oncogenic driver in a subset of NSCLC patients (2). Crizotinib, a first-generation tyrosine kinase inhibitor, has demonstrated clinical efficacy in ALK-positive NSCLC, especially in delaying disease progression (3,4).

Objective: To evaluate the therapeutic benefit of crizotinib compared to chemotherapy in ALK-positive NSCLC using published clinical outcomes.

Methods: A meta-analysis was performed using 37 published studies identified through PubMed. Studies were included based on similarity in methodology and outcome reporting. Outcomes of interest included objective response rate (ORR), progression-free survival (PFS), and overall survival (OS). Data were analyzed using Review Manager 5. Mean values and ranges were reported for survival outcomes at multiple time points. Odds ratios (OR) and p-values were calculated to assess statistical significance.

Results: Crizotinib demonstrated significantly higher objective response rates than chemotherapy (mean: 67%, range: 50.2%–87.0%) vs (mean: 34%, range: 18.9%–47.8%)

with OR = 6.15 [4.09, 9.24], p < 0.00001. Median PFS ranged from 6.8 to 19 months for crizotinib and 2.4 to 7 months for chemotherapy. PFS at 6 months was higher for crizotinib (mean: 68.86%, range: 53.13%–85.32%) vs chemotherapy (mean: 38.55%, range: 12.73%–60.82%); at 12 months, crizotinib (mean: 39.82%, range: 14.29%–61.7%) vs chemotherapy (mean: 19.20%, range: 0%–41.3%), with ORs of 2.86 [2.29, 3.56] and 3.59 [2.05, 6.29], respectively (both p < 0.00001). Median OS ranged from 10.0 to 46.5 months (crizotinib) and 15.0 to 47.5 months (chemotherapy). One- and two-year OS for crizotinib were (mean: 72.63%, range: 56.29%–97.12%) and (mean: 66.81%, range: 55%–87.5%), respectively; for chemotherapy, (mean: 74.22%, range: 62.26%–78.64%) and (mean: 54.71%, range: 37.74%–61.99%), with no statistically significant difference: OR 1.28 [0.63, 2.57], p = 0.49 and OR 1.52 [0.83, 2.78], p = 0.18.

Conclusion: Crizotinib is effective in improving tumor response and delaying disease progression in ALK-positive NSCLC. However, its impact on long-term overall survival remains limited. These findings support further investigation of next-generation ALK inhibitors and combination strategies to improve long-term outcomes in this patient population.

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Informed Consent: Not applicable. This meta-analysis used only previously published, de-identified data and did not involve direct interaction with human subjects. Therefore, informed consent was not required.

Ethical Approval & IRB and/or IACUC Approval: This study was reviewed by the Lincoln Memorial University Institutional Review Board (IRB) and was determined to be Not Human Subjects Research. The determination was issued on June 12, 2025, under Protocol #2025/06/11. A copy of the official determination letter has been uploaded with this submission.

Support: Hunter Brady received support for this project through the DeBusk Basic Science/Clinical Research Scholar Award, administered by the DCOM Research and Grants Committee. The support included protected student research time and faculty mentorship during the summer research period.

Financial Disclosures: None reported.

Poster No. *C-48
Abstract No. 2025-031
Category: Clinical
Research Topic: Musculoskeletal Injuries and Prevention

Testing Tools and Methods to Evaluate Regional Stiffness Differences in the Achilles Tendon

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Context: The Achilles tendon is a thick tendon that connects the gastrocnemius and soleus muscles to the calcaneus. The Achilles tendon plays a critical role in walking, running, and distributing forces necessary for events that involve pushing off the ground. As the Achilles descends distally towards the calcaneus, the tendon fibers from the gastrocnemius and soleus intertwine in a spiral pattern as it approaches its insertion on the calcaneus. This results in the gastrocnemius and soleus tendon fibers inserting more laterally and medially on the calcaneus, respectively. This is believed to increase tendon strength and redistribute stress. Previous studies have identified regional stiffness differences; however, none have explored the relationship to anatomical spiraling.

Objective: To evaluate regional stiffness of the gastrocnemius, soleus, and Achilles tendon as it relates to anatomical spiraling using shear wave elastography (SWE) and the MyotonPRO. Additionally, seek to compare the ability of these technologies to identify regional differences.

Methods: Three participants (two males and one female; 24.5 ± 1.5 years), all members of the research team, underwent evaluation of the Achilles tendon and its contributing muscles, specifically the triceps surae. Stiffness measurements were collected using two devices: Ultrasound Shear Wave Elastography (SWE) and the MyotonPRO digital palpation device. Measurements were obtained bilaterally with participants positioned in a relaxed, prone posture. Data collection focused on several anatomical sites,

including the lateral and medial gastrocnemius muscles (located one-third of the distance between the popliteal crease and the calcaneus), the centrally located soleus muscle (just inferior to the termination of the medial gastrocnemius), and the medial, lateral, anterior, and posterior aspects of the Achilles tendon (at 2 cm and 6 cm proximal to the superior border of the calcaneus). The SWE provided stiffness values in kilopascals (m/s), while the MyotonPRO measured dynamic stiffness in newtons per meter (N/m). Stiffness values obtained from both devices were compared to assess regional differences and to evaluate their sensitivity in detecting variations potentially related to the anatomical twisting of the Achilles tendon. Additionally, a bivariate correlation analysis was performed to determine the relationship between the stiffness measurements obtained from the Ultrasound SWE and the MyotonPRO.

Results: The study demonstrated a strong positive correlation (r = 0.865) between regional stiffness measurements obtained using Ultrasound Shear Wave Elastography (SWE) and the MyotonPRO, with both modalities revealing similar stiffness patterns across examined regions. Notably, the Achilles tendon consistently exhibited the highest stiffness, with the proximal posterior Achilles identified as the stiffest region by SWE (7.96 m/s) and the distal posterior Achilles showing the highest stiffness according to the MyotonPRO (1175 N/m). Both modalities showed a trend of higher stiffness in Achilles regions compared to proximal gastrocnemius regions, reinforcing the mechanical role of the Achilles tendon in load transfer and force generation during push-off activities.

Conclusion: This pilot study aimed to compare Ultrasound Shear Wave Elastography (SWE) and the MyotonPRO in measuring regional stiffness of the triceps surae and Achilles tendon. There was a strong positive correlation (r = 0.865) between SWE and the MyotonPRO. Notably, the posterior aspect of the Achilles tendon was consistently among the stiffest regions in both SWE and MyotonPRO measurements, suggesting it may experience the highest loading or structural demand within the tendon. This finding highlights a potential area of interest for further biomechanical and clinical investigation. Study limitations include the MyotonPRO's inability to assess deeper tissues, the small and homogeneous sample of researcher-participants, and the fact that measurements were taken in a static, relaxed position, which may not reflect functional loading conditions. Given its portability and ease of use, the MyotonPRO, despite its limited depth penetration, may serve as a practical, cost-effective alternative to SWE for assessing superficial tissue biomechanical properties. These limitations underscore the need for further research involving larger, more diverse populations and assessments under dynamic or load-bearing conditions. Future directions should explore stiffness variations under different joint angles and loading scenarios to better understand the behavior of the gastrocnemius-soleus complex under stress, with potential implications for injury prevention and rehabilitation in athletic populations.

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Informed Consent: All participants in this pilot study were members of the research team and provided written informed consent prior to participation. The study was conducted in accordance with institutional ethical guidelines for research involving human subjects.

Ethical Approval & IRB and/or IACUC Approval: Ethical Approval: Edward Via College of Osteopathic Medicine, Blacksburg, VA (Protocol #2024196), with approval granted on September 12, 2024

Support: None reported.

Financial Disclosures: None reported.

Poster No. *C-49

Abstract No. 2025-110

Category: Clinical

Research Topic: Musculoskeletal Injuries and Prevention

Evaluating SCFE in Athletic vs. Non-Athletic Pediatric Populations: Insights into Outcomes of Non-Traditional Patient Population

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Context: This study investigates the outcomes of slipped capital femoral epiphysis (SCFE) in pediatric patients who are involved in athletics versus those who are not. Given the traditional SCFE patient typically present with higher body mass index (BMI), this study aims to provide insights into prognosis and treatment responses of non-traditional, athletic SCFE patients. By examining these differences, the study aims to enhance the understanding of SCFE in diverse pediatric populations, ultimately contributing to more tailored and effective clinical management strategies.
Objective: To gather information to further understand SCFE and how it may present in in adolescent athletes.
Methods: An IRB-approved retrospective chart review was completed on patients treated for SCFE at a single pediatric institution between 2008-2023 with a minimum 1-year follow-up. Demographics, treatment technique, radiographic measurements, and return to sport (RTS) data was collected. Patients with simultaneous bilateral SCFE were excluded. Calculated Southwick and probability analysis of sequential SCFE (PASS) scores were used to assess SCFE. Osteopathically, this information will help to provide better clinical pictures for patients who have SCFE. While surgery is not osteopathic in nature, in the case of SCFE, surgery can help to reset structure and function of a growing adolescent athlete.
Results: 301 charts were reviewed. 188 met inclusion criteria (Age: 12.4±1.8yrs, BMI: 27.1±5.9). Patients were primarily male (53%), left-sided SCFE (61%), <13years (65%), with a mean follow-up of 3.1±2.0years. Southwick scores averaged 28.4±15.7 and PASS scores 2.6±2.1.44% (n=82) of all patients reported athletic involvement at the time of SCFE. 89% of those patients returned to their respective sport. Demographics of this cohort reported Age: 14.5±1.6yrs and BMI: 25.9±5.8. Average RTS duration was 28.9±21.7weeks after initial surgical procedure. Athlete's Southwick score averaged 26.5±15.9 and PASS scores averaged 2.5±2.1. Spearman correlation expressed a weak positive (r=0.143) correlation between BMI and RTS duration. A moderate positive (r=.319) correlation was determined between Southwick score and RTS duration.Comparative means analysis reported a significant difference in BMI between the athletic cohort versus non-athletic (25.9±5.8 vs 28.08±5.8, respectively; p=.02). Southwick scores suggest no significant difference between cohorts (26.48±15.9 vs. 29.9±15, respectively; p=.138)
Conclusion: This study offers insights into the clinical outcomes of SCFE within a unique patient demographic, athletic pediatric patients, who typically present with lower BMI compared to non-athletic peers. Recognizing these distinctions is essential for healthcare professionals to customize treatment and management approaches effectively. The high incidence of RTS among athletic patients indicates a promising potential for positive postoperative results, which can shape expectations and rehabilitation protocols.

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Informed Consent: None required
Ethical Approval & IRB and/or IACUC Approval: IRB approval from Nationwide Children's. Additionally, approval was received from Ohio University's IRB
Support: None reported.
Financial Disclosures: None reported.

Poster No. *C-50
Abstract No. 2025-033
Category: Clinical
Research Topic: Chronic Diseases & Conditions

Outcomes of Implementing Oral Health Screenings in an Underserved Primary Care Setting

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Context: Oral cavity and oropharyngeal cancers account for nearly 2% of global cancer cases, with over 377,000 new cases and 177,000 deaths worldwide annually.1 Traditionally, oral cancer screenings are performed by an otolaryngologist or dentist, and rarely conducted by primary care providers. In rural areas, socioeconomic factors, geographic limitations, and structural issues within the healthcare system itself may impede patient access to oral care and dental specialists.2-4 While there is a rising incidence of oral cancers, there is currently insufficient evidence to support routine oral cancer screenings in asymptomatic adults within a primary care

setting.5 The Edward Via College of Osteopathic Medicine (VCOM) provides free physical examinations and medical screenings through a variety of partnerships and services to provide care for underserved populations in target areas of South Carolina that experience the greatest health disparities. In 2024, VCOM was awarded a grant from Delta Dental of South Carolina to incorporate oral health screenings into primary care encounters performed through these medical outreach programs. Additionally, this grant provided the means to develop an educational initiative to empower primary care providers and students to conduct oral health screenings. This project aims to address health disparities directly through enhancing oral cancer screenings in rural and underserved areas within South Carolina and to provide quantitative data to the existing body of literature about oral health screenings in a primary care population.

Objective: The primary objective of the study is to determine the prevalence of oral and oropharyngeal lesions within the study population. Secondary objectives include examining oral health access, examining patient demographics and risk factors, and categorizing lesions detected based on location and mechanism of detection.

Methods: This study utilized a retrospective cross-sectional descriptive study design. From April 2024 to present, all patients 18 years and older presenting for VCOM medical outreach were surveyed for dental care access and visit frequency to collect baseline information surrounding oral screening access. Beginning in December 2024, oral screenings were offered during primary care encounters for medically underserved patients in Upstate South Carolina. Demographic information and oral cancer risk factors were collected for patients receiving screenings. Oral examinations were performed using a visual examination of the oral cavity, including the lips, tongue, gums, and throat, to check for abnormalities such as lesions or discoloration. Tactile examination was performed by gently palpating the neck, jaw, and oral tissues to detect any lumps or irregularities. Any abnormal results detected were eligible for additional screening with tissue fluorescence. This assessment was performed using a VELscope® handheld device that illuminates the oral cavity with a blue light, highlighting areas displaying altered fluorescence that may be abnormal or malignant. Screening results, lesion characteristics, and methods utilized in lesion detection were collected. Data was analyzed using descriptive analyses.

Results: Since April 2024, 571 patients have been surveyed for dental care access, with 494 patients providing a response. Of these respondents, 335 (68%) reported not having a dentist. Of the 159 patients (32%) who indicated they do have a dentist, only 117 received dental care within the previous year. Since initiation of screenings in December 2024, 40 patients have undergone comprehensive screening, of which 30 (75%) had not seen a dentist within the previous year. During these screenings, a total of 12 abnormal lesions were detected across 11 patients (28%). Of the 11 patients in whom a lesion was identified, 10 had not seen a dentist within the previous year (91%). Lesions were observed more often in patients who were male and/or tobacco users. All lesions detected were visualized on gross examination. Current data collection is on-going.

Conclusion: Preliminary results from this study underscore significant gaps in oral healthcare access among underserved populations in the Upstate Region of South Carolina. These findings provide early evidence that incorporating oral health screenings into primary care encounters may serve as a valuable opportunity for early detection of potentially concerning oral and oropharyngeal lesions in populations with limited dental access. The use of medical outreach programs can be a valuable way to positively impact communities at large, while simultaneously providing literature to examine the role of primary care providers in conducting oral cancer screenings. This offers a scalable model for improving access and awareness in high-risk rural populations.

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Informed Consent: Not aplicable.

Ethical Approval & IRB and/or IACUC Approval: Our study was deemed exempt upon review.

IRB approval number: 2266429-2

Support: Financial Disclosure / Support / Ethical Approval / Informed Consent:

Project funding is through the Delta Dental of South CarolinaIRB approval number: 2266429-2Partners: St Luke's Free Medical Clinic, Cherokee County Free Medical Clinic.

The Delta Dental of South Carolina grant funds were used to purchase supplies, training development tools, consultation with experts in the fields of interest, and travel to deliver trainings to physician and healthcare professionals.

Financial Disclosures: None reported.

Poster No. *H-1
Abstract No. 2025-005
Category: Health Services
Research Topic: Health Disparities/Social Determinants of Health

Likelihood of Transgender and Gender Diverse Persons to Recommend Returning to an Emergency Department: A Multicenter Investigation by the REducing Disparities Increasing Equity in Emergency Medicine (REDEEM) Team

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Context: Transgender and/or gender diverse (TGD) individuals often avoid or delay seeking healthcare due to a perceived lack of provider competency in delivering gender-affirming care. This reticence contributes to the marginalization of over 1.6 million people in the United States.1-3 Despite generally avoiding healthcare settings, TGD individuals tend to access emergency departments (EDs) at higher rates than their cisgender counterparts, possibly due to the ED's ease of accessibility.3,4

The 2015 U.S. Transgender Survey found that 33% of respondents had experienced at least one negative healthcare encounter related to their gender identity, including treatment refusal, harassment, assault, and provider ignorance of appropriate care practices.5 Qualitative studies conducted in EDs in Arkansas6 and Rhode Island7 revealed emerging themes including systemic and structural barriers to accessing care, negative or uninformed interactions with clinicians and staff, and limited provider competency in gender-affirming care practices. TGD patients reported reluctance to present to the ED due to fears of discrimination, concern about long wait times, and prior negative experiences.7

Patients also emphasized the need for clear communication around sensitive or invasive procedures, such as pregnancy tests for trans men or pelvic exams during trauma assessments, as well as concerns over privacy and inappropriate or repetitive questioning.7 While some research has addressed the importance of safety for TGD patients and identified challenges like ED overcrowding and space limitations, there remains a gap in the literature: few studies have directly compared the experiences of TGD and cisgender patients in emergency settings.8,9 Closing this gap in the literature is essential to developing more equitable and affirming care environments.

Objective: To understand the likelihood of TGD patients recommending the emergency department (ED) to others compared to cisgender patients

Methods: This is a multicenter observational cohort study of 67,794 adult ED patient-visits who presented between

January 1, 2019, and December 31, 2022, and completed the Press-Ganey patient experience survey after receiving care in one of the institutional EDs in Minnesota, Wisconsin, Arizona, or Florida. We electronically abstracted data from the electronic health record (EHR) and their electronic experience data, including self-reported gender. Self-reported gender options included cisgender female, cisgender male, transgender (TG) male, TG female, non-binary or genderqueer (NBGQ), other, and choose not to disclose. For this study, we grouped TG male, TG female, NBGQ, and other gender into TGD for maximum power in comparisons; cisgender female and cisgender male are grouped into cisgender.

Patient experience surveys were distributed directly by Press Ganey to random patients discharged from any of these EDs during the study period, which used a Likert scale from 1 (not at all likely) to 5 (very likely) of likelihood to recommend the ED following the visit. Top-box percentages between cisgender and TGD patients were compared using population-averaged logistic generalized estimating equations (GEEs). Regardless of the time between subsequent visits, we assumed that repeated patient-visits had a constant correlation. Models were both univariable and multivariable accounting for patient age, race, ethnicity, language, ED region, triage emergency severity index (ESI), means of arrival, ED length of stay, and final ED disposition.
Results: 67,794 adult ED patient-visits occurred throughout the institutional EDs during the study period, and simultaneously had completed Press-Ganey patient experience survey data. Our results included 38,690 cisgender female patient-visits, 28,443 cisgender male patient-visits, 237 TGD patient-visits, and 424 patient-visits that did not disclose their gender identity.

The median age for TGD respondents was younger than the cisgender cohort (25 vs 65 years old). Although representing a small number of patient-visits, the TGD cohort was more likely to be Hispanic (5.1% vs 2.8%). In addition, TGD patient-visits arrived at the ED via emergency medical services (EMS) more frequently (12.2% vs 8.9%). Once triaged, the TGD patient-visits had a higher percentage of ESI level 1 (2.1% vs 0.2%) and ESI level 2 (20.7% vs 12.9%) than the cisgender visit cohort. In a univariable GEE comparison, TGD patient-visits were 42% less likely to provide a top-box response for likelihood of recommending the ED compared to cisgender patient-visits (OR=0.58, 95% CI: 0.43 –0.78, $p<0.001$). However, after adjusting for other patient demographics (age, race, ethnicity, and language) and visit characteristics (ED region, means of arrival, triage ESI, ED length of stay, and ED disposition) no significant difference in top-box percentage (OR = 0.95, 95% CI: 0.66 - 1.36, $p = 0.77$) is seen.

Conclusion: Our retrospective data from several emergency departments across the United States over a three-year period did not reveal statistically significant differences in the top-box percent of likelihood to recommend the ED between transgender and/or gender diverse patients and those who identify as cisgender. However, there is evidence suggesting that TGD individuals may delay seeking emergency care until their clinical acuity is more severe. This finding highlights the critical need to improve the experience of care among this population.

Several limitations should be considered. The study relied on self-reported gender identity, and respondents may have identified using their affirmed gender or chosen not to disclose their gender identity at all. Additionally, the median age disparity between groups (TGD: 25 years; Cisgender: 65 years) may reflect generational differences in comfort with gender identity disclosure. Small sample sizes within certain subgroups (e.g., nonbinary/genderqueer, transgender male, transgender female, and other gender identities) limit the generalizability of findings. Moreover, some data was collected prior to the implementation of legislation that may affect patient experiences and reporting. Systemic documentation challenges—including misgendering, misnaming, concerns about confidentiality, safety in gender and pronoun disclosure, and technical barriers—remain persistent and should be addressed in future research.

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Informed Consent: N/A
Ethical Approval & IRB and/or IACUC Approval: The study was deemed exempt by the IRB.
Support: Statistical analysis was funded by discretionary funds provided by the Mayo Clinic Department of Emergency Medicine and the Mayo Foundation.
Financial Disclosures: None reported.

★Poster No. *H-2
Abstract No. 2025-012
Category: Health Services
Research Topic: Impact of OMM & OMT

Osteopathic Medical Education and Treatment: Changes in Perspective Through the Lens of Standardized Patients

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Context: Standardized patients (SPs) are individuals trained to portray patients in healthcare settings in "realistic and repeatable ways."1 Encounters with students involve history-taking, physical examination, communicating diagnoses and determining treatment plans. At osteopathic medical schools, SPs also received osteopathic manipulative treatment (OMT) during student encounters. A wealth of research has analyzed the benefits SPs provide for students, but there is a paucity of information exploring how SPs are impacted by the work they perform. Qualitative researchers have considered the experience of being an SP on one's perspective of healthcare workers,2-4 medical knowledge and communication skills,2-4 emotional well-being,5 and interest in the job.6,7 No studies on the experience of SPs have been performed at an osteopathic medical school, and thus they have never considered the perspectives of SPs on osteopathic physicians or education.
Objective: The objective of this study is to obtain qualitative data on the changes in perspective of SPs on osteopathic medical education and physicians. These findings could aid osteopathic medical schools in recruitment, and help osteopathic physicians understand the perspectives that patients have when frequently exposed to osteopathic medical students and physicians.
Methods: The authors determined that the interpretative phenomenological analysis (IPA) approach was most suitable to address the objective. The IPA framework allows researchers to develop an understanding of an individual's experience as well as how they make sense of their experience and choices.8 Ten SPs at the Alabama College of Osteopathic Medicine were invited to one-on-one semi-structured interviews in-person or over Zoom. The SPs represent a variety of career backgrounds and varying years of experience as an SP. Interviews were recorded and transcribed by the authors. Then, two authors annotated each interview blinded to the other to identify key quotes and summarize them and their relevance to the objective of the study. Annotations were formatted in an excel sheet identifying the interviewer, interviewee, annotator, key quote, and annotation. These annotations were printed and sorted together by the authors to identify major themes and then reconsidered two weeks later to ensure accuracy and agreement on identified themes. The authors reflected on themes and their implications before developing the results.
Results: Three themes emerged: Appreciation of the physician educational path, positive experiences with osteopathic medicine, and occupational enjoyment.

Theme 1: Appreciation of the Physician Educational Path: SPs frequently endorsed their appraisal of the rigors of medical school and the competency of students and their personal physicians. Many were impressed with the ability of medical students to pick up on common symptoms of high mortality disease during mock scenarios. Some noted an increased comfort in their health due to being regularly examined by students. Students were even able to pick up on undiagnosed conditions. "And I was really impressed that he picked up on it almost immediately, that I had a murmur, and mine is kind of hard to hear sometimes, unless you're really listening". (LL) "The benefits are you getting a free medical exam, and you're getting paid to do it." (RF) "[Students] are a little more in depth. My normal physician has a certain routine." (RE) SP's frequently highlighted a respect for the volume of information that students and physicians

are expected to master. RF noted "the number of different drugs for the same thing." "It's just a mass amount of information that you have to get." (RE) Others described an overall sense of comfort from students even after just one year of study. "I felt taken care of." (VY) "He was just so smooth and so well presented." (UE)

Theme 2: Positive Experiences with Osteopathic Medicine: SPs working within an osteopathic medical school are exposed to OMT as a separate treatment modality. They also see the emphasis on patient centered and holistic care emphasized in the osteopathic medical philosophy. We examined how learning medicine through mock encounters with osteopathic medical students affected their perceptions of DOs and other providers. Consistently, SPs reported positive experiences and perceptions towards OMT. Some appreciated the immediate pain reduction it offers as an alternative to medication. One noteworthy experience included an SP whose familiarity with OMT led her to seek out a practitioner who she felt significantly contributed to reducing the burden of her grandson's IBS. No SPs expressed any negative perceptions towards their experience with OMT. "With my grandson we did. You know the bowel training helped us tremendously. It helped us tremendously." (LL) "There's not really any medication to give for it. I mean, you had to get something for the inflammation you do. But my, when I realized hands really work." (EE) "I had some aches and pains…. and it helped." (UD) "I prefer noninvasive treatments when possible." (FO) VY said it succinctly describing her recommendation to friends and family to "find someone who does OMT." Opinions were positive, neutral, and even confused when asked whether they preferred their primary care provider be a DO. A common experience was the idea of patient centeredness; their DO student experience involved students strongly making them feel like a driver in their healthcare. "I think the DO really looks at the whole picture, you know?" (LL) "I think the DO's attitude towards health is greatly aligned with my own." (VY) Describing an equal perception of DOs and MDs, "I have seen both over the years and I have worked with both over the years." (UD) "What is DO and MD?" (EE)

Theme 3: Occupational Enjoyment: Although a seemingly simple statement, overwhelming numbers of interviewees described "having fun" as a key aspect of their time as a standardized patient. Some SP's expanded on their enjoyment and stated they would recommend others participate in the program as well. "it's a great experience, and you need to do it if it's something that would fit for you." (RE) "I like to act." (UE) "I have several people from church that have become standardized patients, so I've talked it up. yeah and I at least three that I have when I go to…. breakfast [with my friends] sometimes on on Wednesdays there's at least three of them that have become standardized patients, so yeah I've talked it up." (RF)

Conclusion: The experience of being an SP gave the participants newfound respect of the medical school experience. They valued the hard work and came to understand the challenges associated with becoming a physician. SP also gained a better understanding and appreciation for osteopathic medicine and treatment. For many, this resulted in a desire to seek out OMT or physicians that value the osteopathic philosophy. Finally, SPs described their enjoyment of the work and process of helping students in their education. This data is limited by only addressing the experiences of a small portion of SPs at one osteopathic medical school, but, these findings present a new understanding of how work as an SP can influence the lives of SPs themselves. Exposure to an osteopathic medical school environment helps them grow in understanding and appreciation of medical students and the osteopathic profession.

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Informed Consent: Participant consent was gathered via a form provided through the Qualtrics survey platform detailing the risks, benefits, confidentiality, options for

participation and withdrawal, as well as contacts if any concern were to arise.

Ethical Approval & IRB and/or IACUC Approval: This approval was deemed exempt by the authors' institution's IRB as "research that ONLY includes interactions involving Interview procedures."

Support: None reported.

Financial Disclosures: None reported.

Poster No. *H-4
Abstract No. 2025-010
Category: Health Services
Research Topic: Osteopathic Philosophy

Bridging Communication Gaps: Exploring Medical Students' Understanding and Experiences in Caring for Patients with Hearing Impairments and Language Barriers

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Context: Deaf and hard-of-hearing (HoH) individuals make up approximately 3.6% of the United States population. Deafness and HoH can be attributed to genetics, environmental factors, age, and disease. However, there have been a lack of accommodations to account for the disparities which is apparent when comparing the rates of emergency department users and length of stays among hearing and deaf/HoH patients. "Deaf American Sign Language users appear to be at greater odds for elevated ED utilization when compared to the general hearing population"3 and "hospitalized nonspeaking deaf patients had higher mortality and longer hospital stays compared to those without this condition"2. However, there is a lack of education amongst healthcare providers on not just the medical needs, but the social needs of deaf and HoH individuals.

Objective: To investigate the cultural competency levels of medical students at Alabama College of Osteopathic Medicine (ACOM) and comparing this with the level of exposure during clinical years. We would like medical schools to produce not just academically competent future physicians, but also be able to use their academic skills appropriately according to the present population in which they will serve. By providing opportunities to learn more about the Deaf community and how to connect better on a social level, we are hoping to provide evidence of the need for improved education regarding the Deaf community and American Sign Language to emphasize the lack of holistic patient-centered care when it comes to deaf and HoH patients.

Methods: The study was conducted through a survey. Two separate surveys were sent out through school emails to medical students at ACOM depending on their status of pre-clinical (first- and second-year medical students at ACOM) vs. clinical experience (third- and fourth-year medical students at ACOM). The surveys were collected through Qualtrics, and no personal identifiers were collected in order to maintain anonymity. 101 reports were collected from pre-clinical students, and 57 reports were collected from clinical students. Through Qualtrics, we were able to analyze the distribution of answers utilizing the mean and mode to determine its relevance and significance overall.

Osteopathic significance: These surveys assessed the gap in osteopathic education of medical students to provide a holistic approach to medicine for better outcomes in patient care.

Results: When investigating the results of the survey, 94% of pre-clinical students at ACOM reported that they have never received formal training in communication with patients from the Deaf community or those requiring interpretive assistance, and on a scale of 0-5 with 0 being not confident and 5 being very confident, average confidence level of their ability to communicate with patients from the Deaf community was 1.20 while their views on the importance of the ability to communicate with these populations was a 4.22. 93% of students reported that increasing interactions with patients with communication barriers can improve communication skills overall and 97% of students believed that communication barriers impact patient outcomes and satisfactions during medical visits.

77% of medical students who were enrolled in their clinical years reported that they have experienced working with patients requiring interpretive assistance during their clinical years. The average confidence level in their ability to communicate with those requiring interpretive assistance was 2.44 and the average level of education on how to perform a physical exam and history on Deaf patients on a scale of 0-5, with 0 being no education and 5 being high level of education, was 1.43. 62% of students reported that they have had more than four instances during their clinical education experience where they have required interpretive assistance and 74% of medical students in their clinical years reported interest in learning more on how to effectively

communicate with patients belonging in the Deaf community or requiring interpretive assistance.

Conclusion: When comparing data from medical students in their pre-clinical to clinical years, confidence levels of communication skills when interacting with Deaf patients and those requiring interpretive assistance rose by 1.24. However, there still appears to be a need for greater education on how to effectively communicate with patients who are deaf or requiring interpretive assistance as greater than 90% of pre-clinical students reported that they have never received formal training in this field and a majority of clinical year students showed interest in learning more on how to effectively communicate with patients who are deaf and/or require interpretive assistance. Although the study focuses more heavily on the need for greater education on Deaf culture and American Sign Language, these results can additionally support for further research on the need for osteopathic schools to educate students on how to interact with patients when any communication barrier is present during patient-physician encounters. Additionally, these results can be further investigated in a hospital setting of not just physicians but all staff who interact with patients. This study was not conducted with the intention to promote osteopathic medical students to become fluent in an additional language, as a qualified interpreter is required for accurate, unbiased, and ethical interpretation between patient and physician. However, results can support the greater need for and training of interpretive service providers in underserved regions throughout the country.

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Informed Consent: Before starting the survey, all students were required to read through the consent form. If consent was obtained, the survey proceeded to the remainder of the questions. If subjects declined to give consent, the survey would automatically close out so that the remainder of the survey was not accessible. The consent form detailed the purpose of the survey and requirements to answer the survey, listed the risks/benefits/confidentiality of the data obtained, and provided contact information for those with additional questions or inquiries.

Ethical Approval & IRB and/or IACUC Approval: Per the school's research department guideline, the lead PI for research must be a faculty at the Alabama College of Osteopathic Medicine. Due to this, the IRB submission was done under Dr. James Nolin as the lead PI and I, Anna Kim OMS-II, was submitted as the co-PI of the investigation. The study was deemed exempt due to following survey procedures.

Support: None reported.

Financial Disclosures: None reported.

Poster No. *H-6

Abstract No. 2025-022

Category: Health Services

Research Topic: Health Disparities/Social Determinants of Health

Evaluating Student Mental Health Resource Utilization and Self-Perceived Mental Health

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Context: Medical students face significant academic and emotional stress, placing them at elevated risk for anxiety, depression, and burnout [1,2]. Although medical schools provide mental health resources, student utilization remains suboptimal and poorly understood, particularly among osteopathic students in the southwestern United States [3]. To strengthen student well-being, it is essential to identify gaps in service awareness, access, and satisfaction. This study investigates student-reported mental health, engagement with institutional support services, and perceived barriers to care to inform targeted improvements in wellness initiatives.

Objective: To evaluate mental health status, patterns of mental health resource utilization, satisfaction with school-

provided services, and barriers to accessing care among medical students at Burrell College of Osteopathic Medicine.
Methods: A cross-sectional, anonymous survey was distributed to all enrolled students at Burrell College of Osteopathic Medicine between March and April 2025 via institutional email. The survey assessed mental health using the Patient Health Questionnaire-4 (PHQ-4), and evaluated student-reported use, satisfaction, and perceived barriers related to counseling resources such as TimelyCare, New Mexico State University Counseling Services, Florida Tech Holzer Health Center, and Circle of Care Behavioral Health Services [4]. Survey development was student-led, with input from faculty advisors and institutional IRB review. Statistical analyses included descriptive statistics, ANOVA, and chi-square tests to examine relationships between PHQ-4 scores, service satisfaction, and utilization. A 22.3% response rate was targeted, based on comparable medical student surveys [5].
Results: Among respondents (n=64), the average PHQ-4 score was 8, indicating a moderate level of anxiety and depression symptoms. Despite this, 73% of students reported not utilizing any school-provided mental health resources. TimelyCare was the most accessed service among users, typically used 1-2 times per semester. No students reported using Florida Tech or Circle of Care services. Talk therapy was the most common service type used.

Key barriers to utilization included limited session availability, lack of provider continuity, perceived superficial quality of care, financial limitations, and stigma, particularly around seeking support for issues like trauma or substance use [6,7]. Only 25% of students reported having a mental health provider outside of school services. When asked to rank factors influencing resource use, students prioritized cost, in-person access, and counseling quality. Remote access and continuity with the same provider were consistently ranked lower. Students also reported worsening mental health over the academic year, with 44% selecting "a little worse" as their current status compared to the start of the year [8].
Conclusion: Findings highlight significant underutilization of mental health resources among osteopathic medical students, despite the presence of moderate symptoms of anxiety and depression. Key barriers, such as perceived poor quality of care, limited availability of services, and stigma, emerged as top-ranked factors hindering access and engagement. These obstacles suggest systemic gaps in current support structures. Addressing affordability, continuity of care, and provider familiarity with the unique demands of medical training may reduce these barriers. The identified trends offer actionable insights for institutional mental health reform and can inform scalable interventions across other medical schools facing similar challenges.

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Informed Consent: Participants were provided with information about the study's purpose, the voluntary nature of their participation, and the confidentiality of their responses. They were informed that participation would not impact their academic or professional standing, and they could exit the survey at any time without penalty. Informed consent was obtained electronically upon survey submission.

Survey Information Provided to Participants:

a. Participation is voluntary, and responses will remain confidential.

b. Participation will not affect your academic or professional standing.

c. You may skip any question or exit the survey at any time.

d. The survey will take approximately 10 minutes.

e. By submitting, you provide informed consent to participate.

For withdrawal or questions, contact the Burrell IRB at irb@burrell.edu.

Ethical Approval & IRB and/or IACUC Approval: The Burrell Institutional Review Board (IRB) has reviewed the resubmission for IRB protocol 0154_2024 and granted "Approval" for implementation.

Support: None reported.

Financial Disclosures: None reported.

★Poster No. *H-10

Abstract No. 2025-153

Category: Health Services

Research Topic: Musculoskeletal Injuries and Prevention

Supporting Early Osteopathic Treatment Through Automated Grading of Knee Osteoarthritis

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Context: Knee osteoarthritis (OA) is a progressive joint condition that leads to chronic pain, limited mobility, and decreased quality of life. The Kellgren-Lawrence (K&L) grading system is widely used to assess OA severity on radiographs, but manual grading is time-consuming and may vary between clinicians. In osteopathic medicine, early diagnosis is essential to guide personalized interventions, including osteopathic manipulative treatment (OMT), which may improve joint function and reduce long-term complications. This study addresses the need for a reliable, automated tool to assist osteopathic physicians in quickly identifying OA severity and initiating timely care.

Objective: To develop and validate a deep learning model using EfficientNet-B0 to automatically classify knee OA severity from radiographic images and support early osteopathic evaluation and intervention.

Methods: This machine learning study used a public, de-identified dataset of 1,650 knee radiographs labeled by K&L grade (0–4). No inclusion or exclusion criteria were applied due to the dataset's pre-labeled nature. Images were preprocessed with grayscale channel replication, resizing (224×224 pixels), normalization, and data augmentation (horizontal flipping and 5° rotation). An EfficientNet-B0 model pretrained on ImageNet was fine-tuned for five-class classification using cross-entropy loss, the Adam optimizer, and a One Cycle learning rate scheduler. Model evaluation was performed using three repetitions of five-fold stratified cross-validation (15 total runs), which preserved class balance in each split. Each fold was trained for up to 20 epochs with early stopping based on validation accuracy. Accuracy and confusion matrix analysis were used to assess performance. This model is designed to support osteopathic physicians by enabling earlier and more consistent detection of OA severity, which may inform timely use of osteopathic manipulative treatment and other interventions.

Results: The model achieved a mean validation accuracy of 87.39% (standard deviation 1.36%) in Repetition 1, and 86.18% (standard deviations 1.44% and 1.50%) in Repetitions 2 and 3, respectively. The overall average validation accuracy across all folds and repetitions was 86.59%, with a global standard deviation of 1.55%. Performance was consistent across trials, indicating strong generalizability. Confusion matrix analysis revealed the highest accuracy in identifying Grade 0 (normal) and Grade 4 (severe) OA cases. Intermediate grades, particularly Grades 1 and 2, showed more overlap and were more difficult to distinguish. Training and validation accuracy curves showed steady learning, while training loss consistently declined across epochs.

Conclusion: This study demonstrates that a deep learning model can accurately and reliably classify knee osteoarthritis severity on radiographs using the Kellgren-Lawrence grading scale. The tool's consistent performance suggests it could assist osteopathic physicians in identifying OA earlier and more objectively, enabling earlier use of osteopathic manipulative treatment (OMT) and other care strategies. By facilitating faster and more reliable grading, this model can support timely referrals for OMT, particularly in primary care or triage settings where radiographic access precedes specialist consultation. Early intervention with OMT may improve joint mobility, reduce chronic pain progression, and potentially delay or reduce the need for pharmacologic or surgical interventions. In the long term, this approach could enhance patient functional outcomes and support a preventive, whole-person osteopathic philosophy of care. Future research should explore integration into clinical workflows, assess patient-reported outcomes following AI-guided treatment initiation, and validate performance in more diverse populations.

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Informed Consent: Not applicable. This study used publicly available, de-identified data with no human subjects interaction.

Ethical Approval & IRB and/or IACUC Approval: The study involved the secondary analysis of data that was publicly

available, thus falling outside the scope of human subjects research as defined by federal regulations (e.g., 45 CFR Part 46). The data were obtained from Kaggle, an open-access data science platform, and were stripped of all identifiers, ensuring that it was impossible to link the records to specific individuals. Therefore, in accordance with the Common Rule §46.104(d)(4), IRB review was not necessary for this study.
Support: None reported.
Financial Disclosures: None reported.

Poster No. *H-20
Abstract No. 2025-117
Category: Health Services
Research Topic: Osteopathic Philosophy

Public Perception of Osteopathic Manipulative Medicine (OMM) as an Effective Treatment for Musculoskeletal Disorders: A Survey Study

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Context: Musculoskeletal disorders (MSDs) are among the most prevalent causes of disability globally, contributing significantly to diminished quality of life and rising healthcare costs [1]. While pharmacological treatments and physical therapy remain standard, alternative modalities such as Osteopathic Manipulative Medicine (OMM) have emerged as promising nonpharmacologic options [2]. However, public awareness of OMM remains limited, and misconceptions persist, particularly regarding its distinction from chiropractic care. This study aimed to assess public perception of OMM and its effectiveness in treating MSDs, with the ultimate goal of informing strategies to enhance understanding and utilization of osteopathic principles.OBJECTIVETo evaluate the public's perception, awareness, and experiences with Osteopathic Manipulative Medicine (OMM) in the treatment of musculoskeletal disorders, and to identify knowledge gaps that can be addressed through educational outreach.

This study aimed to evaluate public perceptions and attitudes toward Osteopathic Manipulative Medicine (OMM) by conducting a nationwide survey. It also sought to examine how demographic and socioeconomic factors influence awareness and utilization of OMM. Insights gained from the survey will guide the development of targeted educational materials to enhance public understanding, promote the distinctiveness of osteopathic medicine, and clarify the role of OMM in the treatment of musculoskeletal disorders.
Methods: A nationwide, web-based cross-sectional survey was conducted targeting U.S. adults aged 18 years and older. Demographic data collected included age, location, race, ethnicity, income, marital and employment status, and number of children. The survey, administered via Random Device Engagement (RDE) methodology, was distributed within mobile apps to a randomized sample of users who opted in through non-monetary incentives. The survey included questions designed to assess knowledge of OMM, prior experiences with osteopathic care, perceived effectiveness in managing MSDs, and interest in non-pharmacological treatments. Quantitative analysis included frequency distributions, univariate analysis, and multivariate logistic regression to assess predictors of positive perceptions and reduced medication use associated with OMM.
Results: A total of 100 valid responses were analyzed after exclusion of fraudulent or incomplete entries. Respondents represented a demographically diverse population across the United States. The most frequently cited uses of OMM were for back pain (30%), neck pain (25%), arthritis (18%), and chronic pain (16%). Regarding effectiveness, 33% of participants rated OMM as "Extremely Effective," while 27% reported it as "Very Effective." Key benefits included pain relief, improved mobility, reduced medication use, and non-invasiveness. Multivariate analyses showed that prior experience with OMM was significantly associated with willingness to recommend it to others ($p < 0.05$) and with reduced reliance on opioids ($p < 0.01$). Awareness of osteopathic distinctiveness remained low, with many respondents conflating OMM with chiropractic care.
Conclusion: Findings highlight a favorable perception of OMM among those familiar with its use in managing musculoskeletal disorders, yet widespread knowledge gaps persist among the general public. The data support the need for targeted educational efforts that promote OMM as a safe, effective, and evidence-based alternative to pharmacologic interventions. This work strengthens the case for broader integration of osteopathic principles in mainstream care and underscores the importance of public outreach in reinforcing osteopathic distinctiveness. Future steps will involve the development and deployment of educational materials to address misconceptions and improve access to OMM services.

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Informed Consent: This study was reviewed by the internal research committee at the Orlando College of Osteopathic Medicine and was determined to be exempt from further IRB oversight in accordance with the National Institutes of Health definition of a minimal risk study. It was formally assigned the exemption number OCOM-E-2025-0001.
Ethical Approval & IRB and/or IACUC Approval: The study was reviewed and approved by the Orlando College of Osteopathic Medicine (OCOM) Research Committee and has been assessed for compliance with institutional and federal research standards and has been assigned the following unique study number: Study Number: OCOM-E-2025-0001
Support: None reported.
Financial Disclosures: None reported.

Poster No. *H-22
Abstract No. 2025-120
Category: Health Services
Research Topic: Impact of OMM & OMT

Bridging the Gap: A Tri-campus Survey on Student Confidence in Applying OMT in Neurological Conditions

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Context: Although 96% of physicians who use OMT first encountered its benefits during preclinical training, many students lack structured exposure to neurologically focused techniques. 1 Osteopathic manipulative treatment (OMT) significantly influences the autonomic nervous system, supporting its therapeutic relevance in neurologic conditions such as headache, concussion, and cranial nerve dysfunction. 2 Systematic reviews and pilot studies show reduced headache frequency 3,4 and improved concussion recovery via ANS regulation. 5 Case reports highlight functional improvement in Bell's palsy 6 and symptom resolution in concussion. 7 While these findings are encouraging, most available data remains small-scale or anecdotal, limiting broader clinical integration. 3 At the same time, despite increased neurosurgical interest in evidence-based OMT 8 and the high prevalence of neurologic complaints in clinical care, training in neurologically focused OMT remains limited, compounded by few required neurology clerkships at osteopathic schools. 9 Moreover, early OMM exposure has been linked to greater confidence in clinical application. 10 In light of these trends, bridging this educational gap may better equip future physicians to apply OMT in neurologic care and support its broader integration into clinical practice.

Objective: To evaluate how educational exposure, perceived training barriers, and clinical experience influence osteopathic students' confidence in applying OMT in neurological conditions, and to guide curriculum and faculty development that support consistent OMT use in practice.

Methods: An anonymous cross-sectional survey was distributed by Student Affairs email in late Spring 2025 to osteopathic medical students (OMS I-IV) across PCOM's three campuses. The 14-item questionnaire used multiple-choice, 5-point Likert scales, and open-ended items to assess demographics, OMT exposure, confidence in applying OMT in neurological conditions, and perceived barriers. The confidence scale mirrored prior survey work (e.g., Shapiro et al., JAOA 2017) to align with established constructs; items were reviewed by an OMM faculty mentor and piloted with three students for face validity. Of approximately 800 eligible students, 180 submitted complete surveys (22.5% response rate); a small gift card raffle was offered to encourage participation. Also, incomplete or missing confidence rating responses were excluded. Descriptive statistics and one-way ANOVA were used to examine differences in confidence by training year and cranial instruction status. IRB exemption was granted by PCOM (45 CFR 46.104(2), Protocol #: H25030X).

The osteopathic significance lies in highlighting actionable training gaps and opportunities for structured educational interventions. Results support curriculum and faculty strategies to increase student confidence and promote consistent, high-quality OMT use for neurologic care across osteopathic practice.

Results: Student confidence in applying OMT in neurological conditions increased progressively by training year: OMS I (M = 2.11, SD = 1.17), OMS II (M= 2.64, SD = 0.99), OMS III (M = 2.89, SD = 1.15), and OMS IV (M = 3.12, SD = 1.12). Skewness

shifted from +0.54 (OMS II) to -0.32 (OMS IV), suggesting a more normal distribution in advanced students. A one-way ANOVA revealed a significant effect of training year on confidence ($F(3, 178) = 8.55$, $p < 0.001$, $\eta^2 = 0.13$). Post hoc Tukey tests indicated that OMS IV confidence was significantly higher than OMS I ($p < 0.001$) and OMS II ($p = 0.02$); differences between OMS III and IV showed a non-significant trend.

Barriers reflected this progression: Lack of confidence (n = 115) peaked in OMS IV (n = 39) and OMS III (n = 29). Lack of training (n = 80) was most common in OMS I (n = 36). Time constraints rose from 11 reports in OMS I to 30 in OMS IV. Systemic barriers like limited faculty support (n = 48) and patient reluctance (n = 51) appeared more frequently in upper years, highlighting a shift from internal knowledge gaps to practical and institutional challenges.

Students with formal cranial OMT instruction (n = 135) reported significantly higher confidence (M = 2.99, SD = 1.11) than those without (n = 32, M = 1.63, SD = 0.91) or unsure (n = 11, M = 1.91, SD = 0.94); ($F(2, 175) = 23.90$), $p < 0.001$, $\eta^2 = 0.21$. Post hoc Tukey HSD showed confidence was significantly higher in instructed students than both other groups ($p < 0.001$ vs. no; $p < 0.01$ vs. unsure). No significant difference was found between 'Not Sure" and "No" groups. Skewness dropped from +1.40 (uninstructed) to -0.17 (instructed), indicating more consistent confidence among trained students. A Pearson correlation showed a moderate positive association between training year (coded 1-4) and confidence score ($r = 0.47$, $p < 0.001$). Finally, 74% of students (n = 131) expressed interest in additional OMT training in neurological conditions, underscoring the demand for earlier, structured neuromusculoskeletal education.

Conclusion: This study demonstrated a clear progression in student confidence for applying OMT in neurologic conditions, influenced by both training year and targeted cranial instruction. Reported barriers reveal a shift from foundational skill gaps to clinical and systemic limitations as students advance. Limitations include a moderate response rate and potential self-reporting bias. These findings underscore the need for earlier, structured neurology-focused OMM education supported by consistent clinical modeling and faculty development. Implementing dedicated workshops and mentorship pathways may strengthen skill retention and better prepare future osteopathic physicians to provide high-quality OMT in neurological conditions, contributing to improved patient access and consistent use of osteopathic neuromusculoskeletal care in diverse clinical settings.

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Informed Consent: Participants were presented with the following statement at the beginning of the survey:

"You are invited to participate in a brief, anonymous survey (5 minutes) assessing osteopathic medical students' confidence and exposure to osteopathic manipulative treatment (OMT) for neurologic conditions, such as Bell's palsy, migraine, concussion, etc. Participation is voluntary. No identifying information will be collected. After completing the survey, you may enter a $20 Amazon gift card raffle via a separate form. A winner will be randomly selected after the survey closes. By continuing, you consent to participate." This information served as the basis for informed consent. No identifying information was linked to survey responses.

Ethical Approval & IRB and/or IACUC Approval: This study was reviewed by the PCOM Institutional Review Board

and determined to be exempt under 45 CFR 46.104(2). IRB Protocol #: H25030X.

Support: None reported.

Financial Disclosures: One $20 Amazon eGift card was offered as an optional participant raffle incentive. The authors report no other financial support or conflicts of interest to report.

Poster No. *H-24
Abstract No. 2025-122
Category: Health Services
Research Topic: Health Disparities/Social Determinants of Health

Perceptions of Campus Climate and Inclusivity Among LGBTQIA+ Osteopathic Medical Students: A Cross-Sectional Study

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Context: This study was created to address significant gaps in the literature regarding the experiences of LGBTQIA+ medical students. While numerous studies have documented the barriers faced by students Underrepresented in Medicine (URIM), LGBTQIA+ students have yet to be included in this classification, and challenges they face during preclinical training remain underexplored. While osteopathic programs are known for emphasizing an empathetic, whole-person approach, the specific experiences of LGBTQIA+ medical students at osteopathic programs have yet to be studied. Disparities in institutional support and inadequate LGBTQIA+ inclusion may negatively impact student well-being and success. This study reveals the interpersonal, curricular, and campus climate factors that impact LGBTQIA+ osteopathic medical students during preclinical years, aiming to identify targeted strategies that promote inclusion and equity in medical education.

Objective: To investigate LGBTQIA+ medical student perceptions of professor and institutional inclusivity, while also identifying perceived levels of impact that these experiences had on their well-being during medical school.

Methods: 119 self-identifying LGBTQIA+ medical students at Doctor of Osteopathic Medicine (DO) programs across the U.S. were recruited via email and social media to complete an anonymous, mixed-methods online survey. Students were asked about perceptions of professor and classmate inclusivity, their campus environment overall, adverse experiences, and the impact of these factors on their success during their didactic years. Students were also asked to reflect on different inclusivity components of Osteopathic Manipulative Medicine (OMM) lab. Statistical analysis was performed using IBM SPSS v.29.

Results: 119 DO students responded to the survey. 92 (77.4%) identify as cisgender and 26 (21.8%) identify as transgender and/or gender-expansive (TGE). Participants attend programs across regional settings, with 50 (42.0%) at urban schools, 47 (39.5%) suburban schools, and 22 (18.5%) rural schools.

When reflecting on classmates, only 27 (32.2%) students rated peers positively at using correct pronouns for TGE individuals, and 41 (36.0%) rated peers positively at advocating for LGBTQIA+ inclusion. Similarly, 51 (43.6%) students rated classmates positively at using inclusive terminology when discussing the LGBTQIA+ community, patients, or experiences. TGE participants were significantly less likely than cisgender participants to give classmates positive ratings on correct pronoun use ($p<0.001$), and were more likely to be impacted by correct pronoun use for them ($p<0.001$), inclusive terminology ($p=0.006$), and correct pronoun use for patients ($p=0.038$).

Similar results emerged regarding professor and faculty ratings, with approximately a third of students giving positive ratings regarding advocating for LGBTQIA+ inclusion, providing inclusive lecture material, and using correct pronouns for TGE individuals (32.7% (n=37), 33.6% (n=40), and 36.8% (n=39), respectively). 41.0% (n=48) of students gave professors positive ratings on using inclusive terminology regarding the LGBTQIA+ community. TGE students rated lecture inclusivity ($p=0.036$) and use of correct pronouns for students ($p<0.001$) lower than cisgender participants, and were more likely to report impact ($p<0.001$).

Regarding OMM lab, less than half of students gave their OMM department a positive rating (indicating “well” or “very well”) at using gender-neutral terminology for body parts, allowing them to select a lab partner they feel comfortable with, and ensuring use of correct pronouns (46.8% , 46.8%, and 47.9%, respectively). 63.3% of participants (n=69) rated their OMM department positively at

providing lab dress code options that allow them to present in alignment with their gender. Of note, 79.8% of participants (n=95) rated their OMM department positively at emphasizing consent, with 102 (85.7%) reporting that this impacts their well-being. Compared to cisgender students, TGE students rated their OMT departments more poorly at using correct pronouns for students (p = 0.003), and their wellbeing was more impacted by inadequate use of gender-neutral terminology for body parts (p = 0.02). Students in rural settings rated their OMM departments more poorly at allowing students to choose lab partners they feel comfortable with, compared to those at urban and suburban schools (p = 0.001).

Reflecting on the overall campus environment, 73.9% (n=88) of participants reported feeling the need to educate others on their LGBTQIA+ identity, and 57.1% (n=68) felt that LGBTQIA+ experiences were presented as niche, exotic, or othering by classmates, professors, or both. 55 (46.2%) reported censoring their speech or mannerisms around others at school. 40 (33.6%) participants reported being treated differently based on their identity, and 17 (14.3%) experienced overt harassment. 15/26 (57.7%) TGE respondents reported being misgendered or deadnamed at school. Notably, TGE students were over twice as likely as cisgender peers to report differential treatment (p=0.002) and 6.5 times more likely to report overt harassment (p<0.001) due to their identity. 7 (5.9%) of respondents considered transferring or dropping out of medical school as a result of their experiences as an LGBTQIA+ student on campus.

Conclusion: The results of this study reveal that LGBTQIA+ DO students often face disparities in institutional support and overall comfort at their institution. These students report a lack of inclusivity on the classmate, professor, and campus levels, and indicate that these factors impact their success and wellbeing during preclinical years. OMM departments do well at emphasizing consent during OMM lab, but stand to improve on inclusive terminology, pronoun use, and lab partner selection. Overall, LGBTQIA+ students face an unsupportive campus environment, with many experiencing differential treatment, misrepresentation of their identities, self-censorship, and overt harassment. Additionally, TGE students were consistently more likely to give poor ratings and to report adverse campus experiences, and were more likely to report an impact on their wellbeing. These findings highlight an acute need for interventions at osteopathic medical institutions that improve the preclinical environment for LGBTQIA+, and particularly TGE, medical students. The core tenets of osteopathic medicine highlight the connection of body, mind, and spirit – DO schools have the duty to honor these tenets by holistically supporting students of all identities as they develop into osteopathic physicians.

References: N/A

Informed Consent: We provided a cover page prior to the survey describing the content of the survey in detail. Participants had the ability to choose freely to participate or not.
Ethical Approval & IRB and/or IACUC Approval: Reviewed and approved. Protocol#H24-033X
Support: None reported
Financial Disclosures: None reported

Poster No. *H-25
Abstract No. 2025-083
Category: Health Services
Research Topic: Health Disparities/Social Determinants of Health

Medical and Health Care Simulation to Aid Domestic Violence Patient Care

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Context: In recent years, mental health has been an emerging topic, with individuals recognizing their psychological and emotional well-being as a vital component of their overall health. Although there has been an increase in support services and awareness of how to approach patients with mental health disorders, victims of partner violence are often under-recognized in clinical settings. Medical teams may overlook the signs that a patient has been abused by their significant other, resulting in missed opportunities to provide crucial support. Medical training often emphasizes common clinical presentations, which may lead to under-recognition of subtle or less overt signs of domestic violence. As of 2025, there are 195 accredited Osteopathic and Allopathic medical schools in the United States, with nearly 100,000 medical students enrolled nationwide. Despite the critical role healthcare professionals play in identifying and responding to domestic violence (DV), DV is not uniformly mandated across U.S medical schools (AAMC,2025). While some institutions have integrated DV content into their curricula, there is no national requirement ensuring consistent training for all medical students. According to the Association of American Medical Colleges (AAMC), during

the 2018-2019 academic year, 146 medical schools included courses in their pre-clerkship curriculum regarding domestic violence; however, the extent of the content of the curriculum was not provided, nor was the method of information display to students (AAMC, 2023). At the state level, at least five states, including Massachusetts and Florida, have taken action by implementing requirements or training mandates related to domestic violence through law and policy revisions (Administration for Children and Families, 2019). In California, while CME is not required, physicians are legally required to document and report injuries stemming from abuse (Administration for Children and Families, 2019. These efforts have influenced medical schools in those regions to include more structured DV education, but practices remain inconsistent nationally. Failure to identify abuse can result in continued harm and erosion of trust, potentially deterring the patient from seeking further support. More so, victims of domestic and intimate partner violence tend to return to their abusers. This can be due to being financially dependent on their abuser or the fear that more harm can be created since the victim left (Heron, Eisma, & Browne, 2022). When patients are not identified as victims, this can impact their overall safety. The victims are sent back to an unsafe environment where further abuse can occur, leading to even more detrimental effects on the patient's health. Those effects can range from repeat hospital visits to an increase in injuries, PTSD, or death (Halliwell, et al. 2019). Hence, to improve future and current healthcare professionals' skills in identifying a patient who is facing abuse, as well as learn communication skills to convey questions-simulation can provide a safe environment to practice. Simulations such as standardized patient encounters supplemented with additional educational resources can allow learners to identify cues, learn how to speak with a patient about support options, and identify physical or emotional signs of abuse, which can improve their patient care if they interact with a patient who has faced domestic violence in the future.

Objective: To enhance healthcare students' ability to recognize signs of domestic and intimate partner violence while equipping them with the clinical and communication skills necessary to appropriately support affected patients through cohesive, simulation-based, and structured educational approaches.

Methods: A total of 310 fourth-year medical students enrolled in the Transition to Residency course will complete online surveys via Google Forms, administered before and after the module, to assess their knowledge about domestic violence, including how to care for patients experiencing it and recognizing signs of partner violence. The inclusion criteria require all participants to be fourth-year medical students, 18 years or older, enrolled full-time at the New York Institute of Technology College of Osteopathic Medicine, and pursuing either a D.O. degree or a combined/dual degree program including their Doctorate. Participants may come from any financial background, immigration status, or sexual/gender orientation. No exclusion criteria have been established for this research study. Upon completion of the course, an independent sample analysis will be conducted to evaluate the results. This project holds osteopathic significance as it reflects the holistic philosophy of osteopathic medicine by teaching future physicians to recognize and address the social determinants, emotional trauma, and systemic barriers faced by patients affected by domestic violence—ultimately fostering more compassionate and comprehensive care.

Results: To evaluate the effectiveness of a domestic and intimate partner violence (DV/IPV) educational module, we compared pre- (N=293) and post-module (N=286) survey responses. Although data were not matched at the individual level, independent sample analyses showed significant improvements in participants' perceived knowledge and confidence. Before the module, only 27.9% rated their understanding of DV/IPV as high or very high, compared to 74.6% after (p<.001). Confidence in identifying victims increased from 26.3% to 71.5% (p<.001). Recognition of various forms of abuse (emotional, financial, physical, psychological, sexual) remained high (>90%) in both surveys. Digital/online abuse recognition rose from 92.2% to 95.5%, though not statistically significant (p=.121). Significant post-module gains were observed in participants' knowledge of how to raise awareness (87.4% vs. 79.9%, p=.018), access legal rights and resources (95.1% vs. 90.1%, p=.026), and create safety plans (95.1% vs. 89.1%, p=.009). Beliefs around physician responsibility, red flags, and communication strategies remained consistently high (>99%), likely due to a ceiling effect. Significant changes were seen in beliefs about IPV-related homicide prevalence (p=.492) or personal experiences with DV/IPV (p=.547). However, significantly more participants post-module felt empowered to use the information for community advocacy (75.9% vs. 67.9%, p=.034). These results indicate the module effectively enhanced participants' confidence, knowledge, and preparedness to address DV/IPV, both clinically and in broader community settings.

Conclusion: This study demonstrates that a structured educational module significantly improves fourth-year medical students' knowledge, confidence, and preparedness to identify and support patients experiencing domestic and intimate partner violence. Independent pre- and post-

survey analyses revealed marked increases in perceived understanding, ability to identify victims, and readiness to engage in community advocacy. These findings support the integration of simulation-based DV/IPV training in medical curricula to address critical gaps in clinical education, enhance patient safety, and promote holistic, trauma-informed care in alignment with osteopathic principles.

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Informed Consent: To ensure privacy and confidentiality, the identity of the domestic violence survivor participating as a speaker was concealed, including masking their voice and face. Individuals who participated as speakers were provided with a release and consent form, which outlines the nature of their involvement and the use of their contributions under the institution. For students engaging in the module, informed consent was obtained, ensuring that participants were fully aware of the training's objectives, activities, and their voluntary participation.

Ethical Approval & IRB and/or IACUC Approval: The Study was exempt from IRB approval.

Support: None reported.

Financial Disclosures: None reported.

Poster No. *H-29

Abstract No. 2025-127

Category: Health Services

Research Topic: Health Disparities/Social Determinants of Health

Optimizing Preventive Care: The Impact of a Student-Led Initiative to Improve Cancer Screenings in Primary Care

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Context: Preventative health measures, including routine cancer screenings, are essential for early detection, timely treatment, and reduction of cancer mortality rates. Colorectal, breast, and cervical cancer are among the most routinely screened cancers due to advancements in screening technologies.(1) However, despite the well-established importance of early detection, patient adherence and compliance with national guidelines remain suboptimal, limiting the effectiveness of these screening efforts and delaying possible treatment. (2)

Objective: To address this issue, we initiated a medical student-led project focused on improving adherence to national cancer screening guidelines across Rowan-Virtua Family Medicine (FM) practices. This poster outlines the overall efficacy of this project, including penetration rate into the patient population, closure of care gaps, and outcomes of screening and detection.

Methods: The study is a prospective interventional cohort study. Rowan-Virtua Family Medicine patients between the ages of 21-80 (n=911) were identified between January 1, 2023 to February 1, 2025 as overdue on cancer screenings based on chart review. Participants were excluded (n=3) if they were deceased or were no longer patients of Rowan-Virtua FM. Student volunteers contacted patients to discuss options for overdue screenings and inform patients of current national cancer screening guidelines. Patients were given the option to make their screening appointment, obtain a referral from the clinic, or decline screening. Patient demographics including sex, age, race/ethnicity, and insurance type were collected. Outcomes included patient eligibility, number and rates of patients reached, up-to-date patients, referrals placed, completion rates for referrals, and abnormal screening findings occurrence.

Results: Among the 908 patients included in this analysis, the average age was 60.96 (SD: 9.52), 74.01% were female,

63.33% were white, 15.75% were Black, 3.19% were Hispanic, 2.97% were Asian and 14.76% did not specify their race/ethnicity. Per chart review, 822 (90.53%) patients were identified as being due for at least one cancer screening. Of those patients, 386 (46.96%) patients reached via telephone, 28.5% received at least one referral for cancer screening, 13.73% reported being up-to-date on screenings, 19.17% reported they already had a referral and would make an appointment, and 38.6% declined screening. A total of 47 colonoscopy, 39 Cologuard® test, 48 mammogram, and 22 pap smear referrals were placed among 110 patients. 41.81% (46 out of 110) received referrals for more than one screening. Of the patients who received referrals, 54.55% of patients went on to receive at least one of their recommended screenings. The completion rates for referrals were as follows: 40.43% for colonoscopies, 41.03% for Cologuard, 56.25% for mammograms, and 45.45% for pap smears. Of the patients who completed their screenings, the rate of positive findings was as follows: 63.16% for colonoscopies, 18.75% for Cologuard, 33.33% for mammograms, and 0% for pap smears.

Conclusion: This project emphasizes the crucial role of primary care in promoting adherence to preventive health screening guidelines and highlights the importance of patient outreach in improving compliance. Notably, among the patients who completed their screenings, abnormal results were detected, necessitating further management or increased future surveillance. These findings underscore the critical role of routine screenings in early detection and intervention. Moving forward, continued efforts to educate patients on the importance of cancer screenings, increasing awareness of guidelines, and addressing barriers to screening access will be essential to further improve patient adherence and promote holistic care. This study also demonstrates the crucial impact that trained and engaged medical students can have in the closure of care gaps and improvement of preventive screening outcomes in the primary care setting.

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Ethical Approval & IRB and/or IACUC Approval: This study was reviewed and approved by the Rowan-Virtua School of Osteopathic Medicine Institutional Review Board (IRB #2024-057).
Support: None reported.
Financial Disclosures: None reported.

Poster No. *H-30
Abstract No. 2025-128
Category: Health Services
Research Topic: Osteopathic Philosophy

Enhancing Transitional Support for First-Year Medical Students: An Osteopathic, Student-Centered Perspective

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Context: Unanimously, it is recognized that first-year medical students are met with an extraordinarily steep learning curve to master the delicate balance of academic rigors, social stressors, and professional growth. This can challenge even the most prepared incoming students. As a result, a recent shift to focus more on supporting the transition for first-year medical students is observed. Both allopathic and osteopathic medical schools have taken their unique approach focusing on near-peer tutoring, identifying academically at-risk students, social support, stress management and developing self-directed learning skills.1-5 Each of these areas is indispensable for every future clinician, regardless of specialties. However, documentation of these skills in a first-year medical student and an assessment of the impact of the support programs is lacking. The Guided Learning Group Initiative (GLGI) was established with the

long-term goal to evaluate the success of a near-peer tutoring program at Rowan-Virtua School of Osteopathic Medicine, that assists both at risk and no-risk first-year medical students in their transition with academic tutoring, social support, stress management techniques and meta-cognitive learning strategies. In this report, a preliminary analysis of two cohorts of first-year students is presented.ObjectiveTo determine the students' perceived success in their ease of transition to the first year of medical school, the statistical significance of the perceived positive outcome in different domains will be evaluated. The null hypothesis would be that there is no significant difference between perceived positive and negative outcomes after the program.

Methods: Data was collected from the 2023-2024 and 2024-2025 academic years through the GLGI participant exit survey. 215 participants out of a total of 264 enrolled responded to the survey (81.4%).The inclusion criteria were as follows: participation was mandatory for those incoming students identified as needing support; participation was voluntary for other students. Voluntary participants applied during orientation following an informational session. Selection was based on advisors' evaluation of admissions metrics (e.g., MCAT, GPA), motivation, and commitment.Participants in the 18-week program – designed within a holistic, Osteopathic framework - attended weekly 1.5-hour sessions in small groups (~10 students) led by a peer tutor. Peer tutors were selected based on overall performance and successful first-year completion of first-year curriculum (≥82% average).The exit survey assessed participant satisfaction and perceived ease of transition. A bipolar, centered, 5-point Likert Scale questionnaire was used for analysis of the non-parametric data insix different domains. The Chi-Square Goodness of Fit test was used to assess statistical significance and evaluate the perceived success of the program (Excel 365). The Chi-square test of independence was also carried out (Prism 10.5). In this preliminary analysis, responses of "somewhat likely" and "extremely likely," as well as "somewhat satisfied" and "extremely satisfied," were considered positive. All other responses were grouped as negative. Additional survey items evaluated recommendations.

Results: The overall perception of the GLGI was overwhelmingly positive. Chi-square analyses of the positive (n=994) vs neutral/negative (n=308) across the six domains yielded a $\chi 2$ value of 361.440 and a P-value of 1.367X10-80. Thus, the null hypothesis is rejected in favor of the conclusion that the participants perceived a positive impact from the GLGI.A summary of the goodness of fit analyses of the six individual domains is provided below:

Domain	Positive	Negative	Chi-Square	P-Value	Significant?
Tools/ Resources	167	48	65.86	4.83 X 10-16	Y
Skill Sets	143	72	23.44	1.28 X 10-06	Y
Question Set	172	43	77.4	1.39 X 10-18	Y
Tutor Knowledge	214	1	211.01	8.23 X 10-48	Y
Satisfaction	152	63	36.84	1.28 X 10-09	Y
Will Recommend	141	74	20.87	4.89 X 10-06	Y

In the test of independence, the null hypothesis was confirmed in every interaction analyzed with the "satisfaction" domain, except "peer tutor knowledge" ($P < 0.0001$; Fisher's exact test).

Based on additional survey items, the students (51%) also perceived that the most valuable of the tools provided were the question sets. Further correlations and implications are discussed.

Conclusion: Students perceived a positive impact from the support received through GLGI, which used a multifaceted approach: academic tutoring, social support, stress management techniques and meta-cognitive learning strategies. Students (1) believe that GLGI equipped them with the essential tools and resources, (2) are satisfied with their experience, and (3) are likely to recommend the program to another student. The results have been consistent over the two years. This holistic approach is unique among medical school tutoring programs.Future directions of this research include assessing if the perceived positive impact translates into better performance on class exams and/or feeling a more rewarding and well-rounded experience as a medical student. Further analysis will help identify critical components of GLGI that may be implemented at other medical schools.

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Informed Consent: Not applicable
Ethical Approval: For this preliminary study, no personal or protected information was used; only aggregate information was used for analyses and reporting on the evaluation of this educational program. As such, the IRB process was not applicable.
IRB and/or IACUC Approval Letter: Not Applicable.
Support: The GLGI at Rowan-Virtua School of Osteopathic Medicine was supported by a $25,000 grant from the ShopRite LPGA program. It supported the peer tutors, learning materials, and student authors. In-kind institutional support supplemented the grant by providing faculty-protected time for the Associate Director (estimated at 15% effort over six months) and coverage of administrative and office supply costs.
Financial Disclosures: None reported.

Poster No. *H-31
Abstract No. 2025-129
Category: Health Services
Research Topic: Health Disparities/Social Determinants of Health

Insurance Coverage and Cancer Screening: Examining Barriers to Access and Completion Rates

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Context: Primary care is critical in addressing care gaps and ensuring timely cancer screenings, serving as the first point of contact for patients navigating preventive healthcare.1 Early detection and prevention are key to improving treatment outcomes and reducing cancer-related morbidity and mortality.(2) However, access to these screenings is not equitable. Insurance type, coverage policies, and out-of-pocket costs often influence access to screenings.(3) Previous literature demonstrates a strong association between insurance coverage and completion of age-appropriate cancer screenings, with insured patients generally more likely to be screened than uninsured populations.(1-3) However, fewer studies explore variations within insured populations, particularly between public and private insurance holders.This study explores how insurance status, specifically comparing Medicare and private insurance, affects the utilization of cancer screening services, with a focus on disparities in breast, cervical, and colon cancer screening rates.
Objective: To determine whether patients with Medicare health insurance have lower rates of compliance and completion of colon, breast, and cervical cancer screenings compared to patients with private health insurance.Methods

The study is a prospective interventional cohort study. Patients from the Rowan Family Medicine clinic who were identified as being overdue for cancer screenings were contacted by student-led volunteers and encouraged to complete their screenings. Patients were given the option to make their screening appointment, obtain a referral from the clinic, or decline screening. Multivariate logistic regression was used to identify significant differences in screening completion based on insurance type, while controlling for age, sex, race, and comorbidities. Medicaid was excluded due to insufficient sample size. Among 911 overdue patients, data were analyzed using Google Colab.
Results: A total of 911 patients were identified as overdue for colon, breast, and/or cervical cancer screening, including 273 Medicare and 601 private insurance beneficiaries. After phone outreach, 40.4% of Medicare beneficiaries completed recommended cancer screening compared to 26.9% of private insurance holders ($p < .01$). Medicare patients were 1.5 times more likely to complete screening (OR = 1.5; 99% CI, 1.15–1.95).
Conclusion: Patients with Medicare were 1.5 times more likely to complete recommended screenings following phone outreach compared to those with private insurance in the same practice. These results support anecdotal observations that patients may be more likely to seek care once state-sponsored coverage is provided.(4) Differences in coverage details, ease of access, or familiarity with preventive services may contribute.(5) These findings highlight that insurance does not guarantee equal outcomes and that disparities exist even within insured populations.

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Informed Consent: This retrospective chart review involves no more than minimal risk and involves documents that have been collected solely for non-research purposes. The patient's charts are compiled for healthcare purposes and collected for quality improvement. This study qualifies for a waiver of informed consent as it does not pose more than minimal risk, the waiver will not adversely affect the rights and welfare of the subjects, the research could not practically be carried out without a waiver, and when appropriate, the subjects will be provided with additional information after participation.

Ethical Approval & IRB and/or IACUC Approval: IRB #PRO-2022-255 approved on May 9, 2025.

Support: None reported.

Financial Disclosures: None reported.

Poster No. *H-35
Abstract No. 2025-134
Category: Health Services
Research Topic: Impact of OMM & OMT

Pushing into the Barrier: Investigating the Use of OMM Among 3rd and 4th Year Medical Students

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Context: Osteopathic Manipulative Medicine (OMM) is an integral part of osteopathic medical education, providing students with hands-on training to diagnose and treat somatic dysfunctions. However, despite receiving over 200 hours of OMM instruction in their first two years, many students use it less frequently during their clinical rotations. This decline can be attributed to both external and internal factors. Although studies have shown that practicing Osteopathic Physicians underutilize OMM [1], the causes remain unclear. Some efforts to boost OMM use during clinical years have improved usage [2,3] but more comprehensive data is needed to better understand barriers and opportunities, and ultimately strengthen OMM integration across training [4].

Objective: To understand the frequency of OMM usage by 3rd and 4th-year medical students during clinical rotations, and to identify barriers and facilitators to OMM use in patient care. A secondary objective was to evaluate whether these trends hold across multiple osteopathic institutions.

Methods: We conducted an IRB-approved, cross-sectional survey of 3rd and 4th-year medical students from Touro College of Osteopathic Medicine - Harlem (n=53), who completed at least 5 blocks of clinical rotations, to understand the frequency and barriers of OMM application during their rotations in the fall semester. Using a Likert scale of 1 to 5, we measured students' self-confidence in OMM, perceived barriers, and the influence of positive or negative feedback from medical professionals on their OMM practices over a 5-section, 40-item survey. To expand and validate our findings, the same survey was later distributed to (n=145) 3rd and 4th-year students at 13 osteopathic medical schools across the country as part of a Phase 2 rollout. The survey included a broad range of graduation years (classes of 2025–2028), ensuring representation across clinical phases.

Results: In Phase 1, students reported moderate confidence in explaining the benefits of OMM to patients (mean: 3.7), but less confidence in adjusting techniques to individual patient needs or performing them in limited clinical spaces. The most frequently reported barriers were lack of treatment space (mean: 3.9) and limited time with patients (mean: 3.7). Key facilitators included being assigned OMM tasks by attendings (mean: 3.8) and having longer one-on-one time with patients (mean: 3.9). Most students reported few negative perceptions from preceptors or patients; however, there was also a noticeable lack of positive reinforcement. Preclinical training was considered effective in preparing students for diagnosing and explaining OMM to patients.

In Phase 2, students across 13 osteopathic medical schools, with PCOM and Rowan-Virtua SOM having the highest representation, revealed similar patterns. OMM use was highest in Family Medicine and Pediatrics rotations, and lowest in OB-GYN, Surgery, and Psychiatry. While a few students reported performing OMM under MDs, most described these opportunities as limited by the preceptor's unfamiliarity with OMM techniques and discomfort

supervising them, highlighting that preceptor training and exposure, more than degree alone, play a critical role in OMM integration during rotations.

Conclusion: This multi-institutional study reveals consistent patterns in OMM usage and barriers students face during clinical training. Findings from Phase 1 and Phase 2 identified Family Medicine and Pediatrics as the most common rotations for OMM use, while Surgery, Psychiatry, and OB/GYN were the least conducive. Key facilitators included working in outpatient settings with established OMM services, having supportive DO physicians, and longer patient interaction times. Conversely, major barriers included limited time, inadequate treatment space, and low preceptor familiarity, especially among MDs. Students felt moderately confident in identifying OMM opportunities, but less so in adapting to constraints. While overt negativity was uncommon, indifference from preceptors was frequently noted. Limitations include the self-reported nature of the data, a modest Phase 1 response rate, and limited geographic diversity, as most participating schools were located in the Northeast and may not reflect national trends [5-8]. Findings support the need for improved clinical alignment, DO mentorship, and broader institutional advocacy to sustain OMM's presence in osteopathic education [9] and highlight the need for faculty development and curricular alignment to promote long-term retention [10].

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Informed Consent: Participants provided electronic informed consent before survey participation. Responses were anonymized, and participants could withdraw at any time.

Ethical Approval & IRB and/or IACUC Approval: This study was approved via Non-Exempt, Expedited Review by the Touro College Health Sciences IRB (submitted September 27, 2023; IRB #22288). All investigators completed human subjects training.

Support: None reported.

Financial Disclosures: None reported.

Poster No. *PH-1
Abstract No. 2025-006
Category: Public Health
Research Topic: Health Disparities/Social Determinants of Health

Substance Overdose Response Training (SORT): Empowering High School Students to Act in Emergency Situations

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Context: The 2023 Youth Risk National Survey found that 12% of high school students had misused prescription opioids [1]. Moreover, Madison County had the highest rate of opioid-related overdoses among youth in southern Illinois in 2022, underscoring the need for more youth-targeted interventions such as educational initiatives that emphasize both risks of opioid use and overdose response [2]. Current

substance use and overdose education programs largely target individuals aged 18 and older, creating knowledge gaps among school-aged youth, including those in Edwardsville, Illinois.

Objective: To create an evidence-based and youth-focused interactive educational session discussing what opioids are, the process of addiction, effects of opioids, and how to recognize and respond to signs of overdose.

To empower students with the tangible skills to act in emergency situations and by doing so, develop confidence, a sense of responsibility, and a supportive role within their peer groups and communities to take action.

To evaluate the effectiveness of training sessions to assess changes in student knowledge and attitudes around opioids and opioid overdose.

Methods: The project team prepared and implemented the Substance Overdose Response Training (SORT) Program. This thirty-minute interactive and youth-focused training integrated evidence-based modules from Stanford's REACH Lab and the ATSU SOMA's Alton Class of 2026 community project on opioid overdose prevention. 107 Edwardsville High School students enrolled in the Medical and Health elective participated across four SORT Program sessions. Qualitative data on student knowledge, attitudes, and behaviors were assessed by administering pre- and post-session surveys through Qualtrics. Survey data was analyzed by comparing pre- and post-session data using R and Microsoft Excel to evaluate the overall effectiveness of the SORT Program in meeting the project goals. Analysis of the survey data included a Wilcoxon rank-sum test to assess attitude-based survey items and a McNemar's test for knowledge-based survey items.

Results: Pre-session surveys had a response rate of 85.0% (n=91) and 65.4% (n=70) for post-session surveys. However, excluding incomplete and unmatched surveys, pre- and post-session survey data for 62 participants were matched by unique identifiers for further analysis. The number of correct answers for the five knowledge-based questions increased from 2 to 3, demonstrating a positive correlation (r=0.21). There was also an increase in attitude-based questions related to the community impact of opioids (r=0.56, p<0.001), confidence to carry naloxone (r=0.41, p<0.001) and administer naloxone (r=0.16, p<0.001), and responding in overdose situations (r=0.48, p<0.001).

Conclusion: Survey results support the benefit of providing opioid overdose response training to high school students to increase knowledge of opioids and overall attitudes towards acting in emergency situations. This program could be more widely and seamlessly adopted through integration into existing health education curricula. Assessing long-term retention of knowledge gained and willingness to intervene will be crucial in measuring the sustained impact of the program. Moreover, further research should be done to elucidate the impact of these and similar educational training sessions on improving opioid overdose survival rates. Future implementations should also focus on expanding sessions to diverse student populations to determine greater generalizability of the program. In conclusion, by increasing accessibility and reach, educational programs can play a significant role in encouraging awareness, prevention, and informed decision-making among youth. With continued improvements and expansion, the SORT Program has the potential to create lasting change in communities amidst the ongoing opioid epidemic.

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Informed Consent: We worked in partnership with Edwardsville High School under the roles and responsibilities outlined in a signed Letter of Support. This Letter of Support allowed the project team to conduct training sessions and administer pre- and post-session surveys. Since this is a program development/evaluation project rather than a research project, no additional parental consent or child assent was deemed necessary. The project team allowed for students to choose to opt-out of participating in our sessions and surveys, in which case they were not included as part of data collection. Additionally, at the beginning of the surveys, was a brief consent message for participants to review before entering their responses which provided an overview of the purpose of the program, prioritization of data confidentiality, and emphasis of voluntary participation.

Ethical Approval & IRB and/or IACUC Approval: The project was submitted to the ATSU-AZ IRB and was deemed exempt from review on 12/17/2024. IRB#: 2024-216

Support: Funding from ATSU-SOMA was utilized to provide participation incentives during SORT sessions including pens, stickers, and raffle prizes (water bottle, first aid kit, puzzle).

Financial Disclosures: None reported.

Poster No. *PH-3
Abstract No. 2025-008
Category: Public Health
Research Topic: Health Disparities/Social Determinants of Health

Identifying Contributing Factors to Obesity in Family HealthCare Network Patients

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Context: California's Central Valley boasts a culturally diverse and family-oriented community supported by industries in agriculture, manufacturing, and healthcare. Despite being agriculturally rich, the Central Valley faces significant health challenges. In the Central Valley's Tulare County, for example, 44% of adults aged 18 years and older classified as obese, compared to the statewide average of 28.2% [1]. Federally Qualified Health Centers (FQHCs) in this region, including Family HealthCare Network (FHCN), are uniquely positioned to address these disparities. Understanding the social determinants of health driving obesity in this setting is essential to designing effective, equitable, and osteopathically aligned interventions.

Objective:

1. To identify key social, behavioral, and economic factors contributing to obesity in the Family Healthcare Network (FHCN) patient population.

2. To explore patient perceptions and understanding of weight, health, and related behaviors.

3. To propose patient-centered, culturally appropriate interventions aligned with osteopathic principles to address these findings.

Methods: This project employed English and Spanish Qualtrics surveys distributed at Family HealthCare Network Food Pantries located in Hanford, Terra Bella, and Fresno, California. Inclusion criteria were limited to FHCN patients who accessed food pantry services and voluntarily agreed to participate; individuals who declined participation or opted out at any time were excluded. Incentives included measuring cups, reusable shopping bags, hand sanitizers, sunscreen, water bottles, fidget toys, pill cutters, and pill boxes purchased with school allocated-funds; no direct financial compensation was provided. The survey collected data on participant demographics, household size and socioeconomic status, food access and security, dietary habits, food choice influences, physical activity and lifestyle, medical history, and health beliefs and behaviors. Survey data were analyzed using descriptive statistics and cross-tabulations to identify trends and patterns among participants. Responses were grouped by BMI categories (underweight, healthy weight, overweight, obese, and morbidly obese), and comparisons were made to explore relationships between BMI and variables such as dietary habits, food access barriers, medical history, and weight perceptions. Rooted in osteopathic principles, this project addressed obesity through a patient-centered and integrative lens. This project emphasizes preventive care, health education, and lifestyle counseling as essential tools in empowering individuals, strengthening community health, and promoting sustainable well-being for patients and future generations.

Results: Survey results (N=49) demonstrated that 87.5% of participants were overweight, obese, or morbidly obese, 10.4% had a healthy BMI, and 2.1% were underweight. Sugar intake was significantly higher among those with higher BMIs, with 94% of overweight and obese participants consuming at least one sugary drink and at least one meal with added sugars daily. In contrast, participants with healthy BMIs generally avoided added sugars.

Despite 66.7% of participants underestimating their BMI category, 61.22% acknowledged the negative impact of their weight on their health, and 96% reported actively working to improve it. When asked about food choices, cost emerged as the most influential factor with over half of participants (54%) reporting skipped meals due to financial constraints. Secondary influences included taste and convenience.

Nearly half of participants (49%) were not enrolled in CalFresh, California's food assistance program, primarily due to a lack of awareness about the program or their eligibility for it. Additionally, participants stated time constraints, motivation, and cost as the top three barriers to managing their health. Notably, many obese and morbidly obese participants were also diabetic, intensifying the importance of targeted nutritional support.

Conclusions: This project provides Family HealthCare Network with valuable insights into the key social determinants of health contributing to obesity in the Central Valley, including financial constraints, dietary challenges, and misaligned weight perceptions. By applying osteopathic principles, such as an emphasis on preventive care and the integration of body, mind, and community, this project can guide future interventions to improve weight-related health

in the FHCN community and serve as a model for other FQHCs addressing similar disparities.

Based on these findings, several interventions can be implemented to reduce obesity-related disparities among FHCN patients. One proposed intervention is promoting CalFresh awareness and enrollment through a bilingual (English and Spanish) flyer with clear, step-by-step instructions on determining eligibility, enrolling, and re-enrolling in the program. This could address the food insecurity and accessibility among most participants. Interventions focused on the importance of weight management and nutrition counseling could aim to address the high sugar consumption and distorted weight perceptions. These initiatives include bilingual nutritional workshops for patients, symposiums aimed at enhancing motivational interviewing skills for providers, and culturally tailored handouts featuring meal plans with low-sugar alternatives. Additionally, because many obese patients were also diabetic and ranked cost as their biggest factor influencing food choices, creating and distributing budget friendly, low glycemic recipes to patients could also serve as an intervention to improve the overall health of the community.

Limitations include the small sample size (n=49), which restricts the generalizability of findings, particularly for underrepresented BMI categories such as underweight and healthy weight. Additionally, the reliance on self-reported data introduces potential bias, as responses may be influenced by participants' recall or perception inaccuracies. Lastly, while BMI is a widely used metric, it may not fully capture an individual's overall health status or body composition.

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Informed Consent: Participants were provided with a description of the project including investigator contact information, as well as the project's purpose, procedures, voluntary nature, and confidentiality measures before survey initiation. Informed consent was obtained electronically by requiring participants to click a button indicating their agreement to participate before proceeding with the survey. An option to decline participation was also presented, allowing individuals to exit the survey without providing any responses.

Ethical Approval & IRB and/or IACUC Approval: This project was reviewed by A.T. Still University Institutional Review Board and determined to non-jurisdictional (#2024-203)

Support: Items used as incentives were purchased using school-allocated funds from AT Still University.

Financial Disclosures: None reported.

Poster No. *PH-4
Abstract No. 2025-020
Category: Public Health
Research Topic: Health Disparities/Social Determinants of Health

The Impact of Preclinical Curriculum Based Serving-Learning on Osteopathic Medical Students' Understanding of the Social Determinants of Health

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Context: Burrell College of Osteopathic Medicine was established in 2016 with the intent to prepare culturally competent physicians who are dedicated to serving the Southwest United States, particularly its Native American and Hispanic populations. To enhance this mission, in 2023 the college introduced a mandatory, longitudinal service-learning component into the curriculum as a pilot program through a course named Mission Medicine. Students are placed at one of seventeen "community venue sites," committing to at least four hours per month. These sites range from migrant education initiatives or delivering nutritional education within the Las Cruces Public School District and McKinney-Vento program for students facing homelessness to the Aprendamos Interventions Team working with children with intellectual disability and the Mesilla Valley Hospice and Palliative Care.

Despite a historical interest in service-learning and the recognition that it adds immense value to medical education (1,2,3,4), the integration of a required service-learning component represents a significant departure from standard practices. Current literature predominantly features elective or volunteer-based models (5,6), leaving a gap with

respect to mandatory (7), sustained preclinical community engagement and its outcome on medical student development; particularly regarding the understanding of the Social Determinants of Health (SDoH).

Objective: To determine whether mandatory, longitudinal preclinical curriculum based service-learning significantly impacts osteopathic medical students' understanding of the Social Determinants of Health.

Methods: This study involved a cohort of 218 first-year medical students at the Burrell College of Osteopathic Medicine, Las Cruces campus. Participating students completed two sequential surveys. The first survey was completed in December of 2024 prior to being assigned to their community venue site and the second survey in May 2025 at the end of their first year of medical school. A third survey will be available for completion at the end of the cohort's preclinical years, to assess the effects of the entirety of their longitudinal community based service-learning commitment. The students were told of the study in person as well as via school email when the link to participate was sent out. The surveys were designed using a 5-point Likert Scale (1= strongly disagree, 2 = somewhat disagree, 3 = neither agree nor disagree, 4 = somewhat agree, 5 = strongly agree) to assess students' enthusiasm for the integration of community based service-learning into the curriculum, perceived preparedness for serving diverse populations, and confidence in identifying SDoH related to patient and community member health disparities. There was also the opportunity for students to respond to the question, "How has your experience at your community venue site impacted your personal understanding of the Social Determinants of Health?"

Aggregated data was statistically analyzed using Qualtrics and GraphPad with unpaired t-tests to determine significance between surveys. Qualitative feedback was thematically analyzed in addition to quantitative findings to determine anecdotal impacts on the students' learning.

Understanding of the SDoH are crucial in osteopathic medicine because they can significantly influence a patient's overall mental, physical, emotional, and spiritual health. Applying a whole-person approach to medicine necessitates an understanding of the SDoH and their interconnectedness with a patient's well-being in order to have an effective, patient-centered approach towards health equity.

Results: The survey data was collected from the same student group at two different time points (Survey 1: n=137; Survey 2: n=86). Three general themes were analyzed via various questions: enthusiasm about community-based learning integration into the curriculum, perceived preparedness for serving diverse patient populations, and impact on understanding of the SDoH. Statistical analysis using unpaired t-tests revealed the following results: for enthusiasm towards community-based learning, Survey 1 had a mean of 4.20 (SD=0.82) and Survey 2 had a mean of 4.22 (SD=0.85), which was not significantly different (t=-0.16, df=176.38, p=0.875). Similarly, for preparedness to serve diverse populations, Survey 1 showed a mean of 3.96 (SD=0.92) compared to Survey 2's 3.74 (SD=1.06), which also did not reach statistical significance (t=1.58, df=161.36, p=0.117). In contrast, when assessing the difference in student's confidence about identifying the SDoH that are contributing to health disparities in the populations at their community venue site, there was a statistically significant difference measured (t = 3.0050, df = 222, p=0.003) with Survey 1 showing a mean of 3.90 (SD=0.82) compared to Survey 2's mean of 4.25 (SD=0.87).

In response to the open-ended question "How has your experience at your community venue site impacted your personal understanding of the Social Determinants of Health?" students reported enhanced empathy and compassion, directly attributing their improved understanding of the SDoH to their community venue site experiences. Notable themes included the differentiation between theoretical learning of SDoH and real person interactions, increasing awareness of community resources or lack thereof, and a more nuanced understanding of family dynamics that influence patient care.

Conclusion: Preliminary evidence suggests that mandatory pre-clinical service-learning significantly improves medical students' understanding of the SDoH. While enthusiasm for preclinical community based learning remained stable, students reported decreased feelings of preparedness to serve diverse patient populations possibly indicating initial overestimation or recognition of previously unknown preparedness gaps. Specific qualitative feedback highlighted students' greater understanding of socio-economic factors influencing healthcare access and outcomes, encounters that challenged preconceived notions, and an increase in empathy for future patient and community member interactions.

As this is a pilot program, more longitudinal data is required to comprehensively assess the long-term efficacy of including required service-learning into osteopathic medical students' preclinical curriculum. This may also be affected by community venue site placement, so future analyses will also compare responses from both within and

between those placements. In addition, attrition attributed to students being at the end of the academic year likely impacted the data completeness.

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Informed Consent: Students were presented with an informed consent in keeping with standards set by the IRB. Students were assured that their responses would remain anonymous and therefore, would not impact their Mission Medicine grade or placement at their respective community venue site.

Ethical Approval & IRB and/or IACUC Approval: The study was approved through an expedited review process in which it was evaluated by two IRB members. The investigators were invited and agreed to submit revisions and clarifications to secure final approval. IRB protocol number is 0149_2024.

Support: None reported.

Financial Disclosures: None reported.

Poster No. *PH-5

Abstract No. 2025-049

Category: Public Health

Research Topic: Health Disparities/Social Determinants of Health

Effect of CHAMPS Program Participation on Vegetable Consumption in Pediatric Populations

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Context: The prevalence of pediatric obesity has steadily increased over the past 40 years, largely driven by greater access to calorie-dense fast food. These options often lack vegetables, which provide vital nutrients essential for pediatric growth and development. Existing literature suggests that educational and mentorship interventions focusing on nutrition and physical fitness can improve dietary habits and reduce obesity risk. To address this need, Kansas City University developed the Coaching, Health, and Movement Program with Students (CHAMPS), engaging osteopathic medical students to coach families on pediatric nutrition and healthier lifestyle goals.

Objective: To determine whether participation in the CHAMPS program increases the frequency of vegetable intake among participating families.

Methods: This study employed a retrospective chart review analyzing pre- and post-program survey data. A total of 154 participants were enrolled, with 67 completing both the pre-program and 8–12-week post-program surveys. Participants were families with children identified as at risk for obesity and were recruited through the CHAMPS program. Osteopathic medical students provided education and coaching on nutrition and physical activity. Data collected from Fall 2017 to Spring 2024, including virtual programming periods during the COVID-19 pandemic, were aggregated. Statistical analysis was performed using the Wilcoxon Signed-Rank Test to assess changes in vegetable intake frequency. The CHAMPS program reflects key principles of osteopathic medicine by applying a holistic, patient-centered approach that emphasizes preventive care and lifestyle modification. Through hands-on education and personalized coaching, osteopathic medical students addressed physical, nutritional, and behavioral determinants of health, aiming to reduce pediatric obesity risk and promote overall wellness. The curriculum emphasized the importance of different food groups and

the role of specific vitamins and nutrients in supporting healthy growth and development.

Results: Of the 154 initial participants, 67 (43.5%) completed both surveys. Prior to participation, 20.8% of families reported consuming 0 servings of vegetables daily, 66.9% reported 1–2 servings, 11.7% reported 3–4 servings, and 0.6% reported 5 or more servings. After participating in CHAMPS, 4.4% reported 0 servings, 67.0% reported 1–2 servings, 26.4% reported 3–4 servings, and 2.2% reported 5 or more servings. The proportion reporting 0 servings decreased by 16.4 percentage points, while those reporting 3–4 servings increased by 14.7 percentage points. These changes were statistically significant ($p < 0.05$).

Conclusion: Participation in the CHAMPS program was associated with a significant improvement in self-reported vegetable consumption among participating families. Structured, community-based educational programs utilizing medical student coaching may promote sustainable lifestyle changes to reduce pediatric obesity. Future studies should examine the long-term effects of such interventions and their applicability across diverse populations.

References: N/A

Informed Consent: N/A
Ethical Approval & IRB and/or IACUC Approval: IRB # 2247355-1 - Score 1 for Health CHAMPSs - 101524 (3)
Support: None reported.
Financial Disclosures: None reported.

Poster No. *PH-6
Abstract No. 2025-050
Category: Public Health
Research Topic: Health Disparities/Social Determinants of Health

Community-Level Drivers of Chronic Kidney Disease Disparities in Urban Midwest Populations

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Context: Chronic kidney disease (CKD) is a growing public health concern in the United States, affecting an estimated 14% of adults, with disproportionately higher rates among racial and ethnic minorities and socioeconomically disadvantaged populations (1). In the Kansas City metropolitan area, disparities in CKD prevalence appear to align with geographic and demographic patterns, yet the underlying social and environmental factors driving these differences remain poorly understood. Social determinants of health (SDOH), including access to healthcare, education, economic stability, housing, food security, and neighborhood environment, are increasingly recognized as critical influences on CKD outcomes. While national studies have demonstrated the influence of SDOH on CKD progression and mortality, few have examined how these factors interact at a granular, zip-code level. Localized studies are essential for designing precise interventions and guiding equitable resource allocation.

Objective: This study aimed to quantify the association between CKD prevalence and multiple SDOH metrics at the zip-code level within Kansas City, with the goal of identifying modifiable upstream drivers of kidney disease risk.

Methods: We conducted a cross-sectional study of 70 zip codes in the Kansas City Metropolitan area (Kansas City, Missouri and Kansas City, Kansas) using data from 2022 to 2024. Crude prevalence rates of CKD and 37 SDOH indicators were curated from publicly available sources including the American Community Survey, CDC PLACES, the Environmental Protection Agency, National Center for Health Statistics, Neighborhood Atlas, and Open Data KC. Under an IRB-approved protocol, we compiled a community profile with demographic representation of 62% White, 20% African American, and 18% other races. All predictors were standardized and Pearson correlation coefficients were used to examine bivariate associations between SDOH variables and CKD prevalence. Mutual information regression identified the top 15 predictors. To reduce multicollinearity, we applied a variance inflation factor (VIF) threshold of <5. Ordinary least squares (OLS) regression was used to model CKD prevalence across zip codes. The final model included nine predictors after VIF filtering. Ten-fold cross-validation identified the best-fitting model based on minimum mean squared error (MSE). Benjamini-Hochberg correction was applied to control the false discovery rate (FDR). Model performance was evaluated using adjusted R^2 and F-statistics.

Results: Correlation analysis revealed strong associations between SDOH and CKD prevalence. Higher CKD was most correlated with mobility impairment ($r = 0.95$), disability ($r = 0.84$), low physical activity ($r = 0.77$), obesity ($r = 0.70$), and smoking ($r = 0.72$). Protective factors included life expectancy ($r = –0.70$), median household income ($r = –0.54$), and college graduation rate ($r = –0.47$), all with FDR-adjusted $p <$

0.001.The final multivariable model included nine predictors and demonstrated strong explanatory power (R^2 = 0.882, MSE = 0.0125, F = 49.89, p < 0.0001). The model equation was:

CKD = 2.8597 + (0.0833 × College_Graduate) – (0.1161 × Median_Household_Income) – (0.0449 × Unemployment_Rate) – (0.0413 × Area_Deprivation_Index) + (0.0571 × White) + (0.1053 × Obesity) – (0.2789 × Life_Expectancy) + (0.1098 × Physician_Checkup) – (0.3994 × Binge_Drinking) Life expectancy and binge drinking prevalence had the largest effect sizes (p < 0.001).

The negative association with life expectancy highlights systemic health inequities. The inverse relationship with binge drinking, though counterintuitive, may reflect confounding. A possible explanation for this would be that wealthier areas may report higher alcohol use alongside better access to care. Median household income was inversely associated with CKD (β = –0.1161, p = 0.036), underscoring economic vulnerability as a key driver. Though not statistically significant, obesity (β = 0.1053) and unemployment (β = –0.0449) remain clinically relevant. Preventive checkup rates showed a positive association (β = 0.1098, p = 0.059), possibly reflecting reverse causality: more frequent engagement in areas with higher CKD diagnosis. Whites also showed a positive but nonsignificant relationship, suggesting it may serve as a proxy for intersecting neighborhood conditions rather than a direct driver.

These results suggest that CKD risk is influenced more by systemic and environmental conditions than by isolated behaviors. Economic opportunity, life expectancy, and health engagement were stronger predictors than traditional lifestyle risk factors. This supports a more holistic approach to prevention and care, one informed by structural context and focused on upstream intervention.

Conclusion: This study demonstrates that chronic kidney disease prevalence across the Kansas City metropolitan area is strongly associated with community-level indicators of social and structural vulnerability. Factors such as lower life expectancy, reduced household income, and higher obesity rates emerged as consistent predictors of increased CKD burden, even after adjusting for multicollinearity and overlapping risk domains. These findings suggest that risk for CKD is shaped not solely by individual behavior or access to care, but by broader systemic forces embedded in neighborhood environments.

There are some limitations that must be addressed. This cross-sectional design limits causal inference and may introduce ecological fallacy. The modest sample size (70 zip codes) reduces generalizability and restricts modeling complexity. Attempts to improve performance using Lasso regression and Gradient Boosting did not outperform OLS, likely due to multicollinearity and sample size constraints. The majority white demographic (62%) limits broader applicability, and reliance on secondary data introduces potential reporting bias. Despite these limitations, this study is one of the first granular, SDOH-driven analyses of CKD risk in Kansas City and provides a foundation for future osteopathically aligned, data-informed prevention efforts.

Overall, the results underscore the importance of incorporating social context into chronic disease prevention and management efforts. Integrating local-level SDOH data into screening strategies, risk stratification models, and community outreach programs may enhance the effectiveness and equity of kidney health interventions. Health systems and clinicians working in urban environments like Kansas City should consider aligning services with the specific needs of high-risk geographic areas identified through these metrics.

By framing CKD risk through socioeconomic, behavioral, and environmental lenses, this study lays the groundwork for more targeted and context-sensitive approaches to public health. Future research should extend these findings using individual-level and longitudinal data to validate causal pathways and evaluate the impact of neighborhood-level interventions on CKD outcomes.

References:

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Informed Consent: All of the publicly available data provided informed consent previously from their respective organizations.

Ethical Approval & IRB and/or IACUC Approval: IRB Determination Letter - Dr. Shae - IRB NHSR # 2296267-1 -Investigating the Impact of Social Determinants of Health on Disease Outcomes – 030425.

IRB Exempt (IRB NHSR # 2296267-1)

Support: None reported.

Financial Disclosures: None reported.

Poster No. *PH-7

Abstract No. 2025-051

Category: Public Health

Research Topic: Health Disparities/Social Determinants of Health

A Roadside Tribute: Motor Vehicle Fatality Demographics in Jackson County

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Context: Motor vehicle accidents (MVA) are a leading cause of death worldwide,1 and on average, over 120 individuals are killed by MVA every day in the United States2. Nevertheless, motor vehicle fatalities (MVF) are preventable deaths. 2 An increased probability for MVFs has been identified through several risky behaviors, including, speeding, unlicensed driving, driving under the influence, and traveling without a seatbelt. 3 Moreover, recent studies have identified racial disparities in U.S. MVFs,3,4 and the MVF rate for Black individuals has increased nationally since 2014. 3,4 Additionally, previous literature has found that rural individuals are at an increased risk for MVFs, which may be linked to lowered seat belt use. 5,6,7,8 Although Jackson County (JC), Missouri is the main county containing Kansas City, it also contains over 26,000 residents who live in an area classified as rural. 9 Furthermore, 43.3% of the land area in Kansas City is considered rural. 9 Lastly, current literature has revealed higher MVF rates in Midwest counties, like Jackson County. 8 The following study elucidates health disparities for at risk MVF populations in Jackson County, Missouri, as well as stratifies them with U.S. MVF data to illuminate the public health challenge that MVFs pose.

Objective: To determine total population and race trends of MVFs in Jackson County, Missouri in comparison to the total population and race MVF trends of the United States.

Methods: De-identified death records from MVFs in 2014-2024 were obtained from the Jackson County Medical Examiner's Office, and national death statistics, including rates per 100,000, for the United States, were obtained from the Centers for Disease Control and Prevention (CDC) WONDER database. Rates per 100,000 for JC were calculated based on U.S. Census Bureau population estimates from 2020 and 2023. Data was compiled into a Microsoft Excel worksheet, coded, and trends were tracked using pivot tables and graphs. Welch's t tests were calculated with a 95% confidence interval and used to measure differences between JC MVFs and U.S. MVFs, between white and black MVFs in JC, and between black JC MVFs and black U.S. MVFs based on 6-year rates per 100,000 averages (2018-2023).

Results: Total population trends in JC reveal an upwards trend between 2014 and 2024. Furthermore, Welch's t-test showed a significant difference of the 6-year rates per 100,000 averages between JC and the U.S. (p-value 0.0058). Trends by race demonstrated a disproportionately higher number of fatalities in JC versus the U.S. for both white and black individuals according to the comparison rate per 100,000 MVFs. Additionally, Welch's t test showed a significant difference of the 6-year rates per 100,000 averages between black individuals in JC and black individuals in the U.S. (0.0041). Lastly, Welch's t test showed a significant difference of the 6-year rates per 100,000 averages between black individuals in JC and white individuals in JC (0.0004)

Conclusion: These trends and significant findings illustrate that Jackson County has a higher MVF rate in comparison to national data in the United States. There were a few limitations to this study, including: the accuracy of U.S. Census Bureau estimations for 2020 and 2023, which was used to calculate the rates per 100,000 of Jackson County data for 2018-2020 and 2021-2023, respectively. Additionally, due to the proportionally smaller numbers of Middle Eastern, Native American, Asian, Pacific Islander, Indian, and Multi-Racial MVFs, the rates per 100,000 were distorted by comparison and therefore excluded. Based on the results of this study, there needs to be further investigation to better understand why individuals in Jackson County, Missouri, and specifically black individuals living in Jackson County, are at a higher risk for MVFs. It is imperative to refocus on motor vehicle accident prevention as a county in order to reduce the occurrence of these avoidable deaths.

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Informed Consent: Informed Consent was unnecessary as no human subjects were involved.
Ethical Approval & IRB and/or IACUC Approval: IRB Determination Letter - Dr. Olinger - IRB NHSR # 2298764-1 - A Roadside Tribute Motor Vehicle Death Demographics in Kansas City - 032025.

Ethical Approval: Study does not involve human subjects as defined under 45 CFR 46.102(e)(1)(ii) because the data obtained does not contain identifiable private information and, as such, does not need IRB review.
Support: None reported.
Financial Disclosures: None reported.

Poster No. *PH-8
Abstract No. 2025-149
Category: Public Health
Research Topic: Health Disparities/Social Determinants of Health

A Trend Analysis of Non-Medical Vaccine Exemptions for Children in Two Contiguous West Texas Counties During the 12 Years Leading up to the 2025 Measles Outbreak

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Context: In January 2025, Gaines County in West Texas reported a measles outbreak, which as of May 24, 2025, has resulted in 408 confirmed cases and two fatalities. Both fatalities were the first measles-related deaths in the U.S. since 2015, and occurred in unvaccinated children with no underlying health conditions (1). Immunizations are a cornerstone of public health, reducing transmission of vaccine-preventable diseases like measles. Measles virus susceptibility is inherently multifactorial, involving elements of vaccine coverage and community-level (herd) immunity, as well as population mobility and healthcare infrastructure. Herd immunity is necessary for containing the spread of highly transmissible infectious diseases like measles and requires ~95% vaccine coverage to prevent outbreaks (2). In the U.S., all states require documentation of childhood immunization for measles virus for enrollment in school and daycare. The Centers for Disease Control and Prevention (CDC) standardized childhood immunization schedule sets kindergarten entry as a crucial checkpoint for vaccine compliance (3).

Total exemptions (TE) to immunization are categorized as either non-medical (NME) or medical (ME), which are granted for clinical contraindications. According to the CDC, in 2023–2024, thirty states exceeded a TE rate of 3.3% and 14 surpassed 5% (4). Year-to-year between 2014 and 2024, national ME rates were stable at ~0.2% (4-12). NMEs allow parents to opt out of vaccination requirements for their children for personal, philosophical, or religious reasons. NMEs also reflect vaccine hesitancy based on parental risk perception and wavering vaccine trust and confidence (13).
Objective: To examine national trends in TEs over the last decade with a focus on the proportion attributable to NMEs among school-required vaccinations for kindergarten-aged children in the U.S. To compare TEs and NMEs in two contiguous West Texas counties with comparable demographic and socioeconomic characteristics but disparate numbers of measles cases as part of the 2025 outbreak.
Methods: National kindergarten DTaP, MMR, polio, and VAR vaccine dose exemption data from 2014-2024 were obtained from the CDC's publicly available median estimates, which compiles annual reports from participating U.S. states, territories, and districts (4-12). MEs were excluded from our analysis due to their year-to-year consistency during this period.

Texas was selected as the state-level focus of this study due to its involvement in the 2025 measles outbreak. Kindergarten exemption data for all 254 Texas counties for the years 2013-2024 were obtained from the Department of State Health Services (DSHS) (14). Because of its position as the West Texas epicenter of the outbreak, Gaines County served as the reference. Contiguous Andrews County was selected as the comparator given its similar demographic and socioeconomic characteristics. As of May 27, 2025, there were three measles cases reported in Andrews County (1).

NME rates in Gaines and Andrews Counties were analyzed for temporal changes in the years leading up to the

2025 measles outbreak. To analyze trends over time, LOESS (locally estimated scatterplot smoothing) curves were generated to visually assess patterns in exemption rates across years at the national and county levels. In addition, Spearman rank-order correlations were used to quantify monotonic associations between exemption rates and year. A Welch's t-test was conducted to compare average NME rates between Gaines and Andrews counties over the past decade. All analyses were conducted using SPSS V.30, with significance set at $p < 0.05$.

Results: Visual inspection of LOESS curves at the national level indicated that NME and TE rates increased steadily in a generally linear and monotonic trend over time. In Gaines County, NME rates also showed an upward trajectory, though the trend appeared more variable, suggesting a less uniform but still increasing pattern. By contrast, in Andrews County, NME rates remained relatively flat over the study period, with no discernible upward or downward trend. These visual trends were supported by Spearman rank-order correlations. Nationally, year was strongly and positively associated with NMEs ($\rho = 0.950$, $p < 0.001$) and TEs ($\rho = 0.954$, $p < 0.001$). In Gaines County, a moderate-to-strong positive correlation was observed between year and NMEs ($\rho = 0.664$, $p = 0.026$), while Andrews County showed a weak and non-significant association ($\rho = 0.164$, $p = 0.631$).

Between 2013 and 2024, average NME rates were 14.83% and 1.21% in Gaines and Andrews counties, respectively. Welch's t-test comparing the mean NME rates showed a significant difference between Gaines ($M = 14.83$, $SD = 4.33$) and Andrews County ($M = 1.21$, $SD = 0.81$), $t(10.70) = 10.26$, $p < 0.001$. The mean difference was 13.62 (95% CI: 10.69–16.55), with a large effect size (Cohen's $d = 3.11$), reflecting substantial divergence in exemption behavior between the two counties.

Conclusion: Our study suggests that given the stability and low level of MEs between 2013 and 2024, the high and increasing NME rates in Gaines County during that same period, relative to the low and stable NME rates in Andrews County, may have been a key factor contributing to the 2025 West Texas measles outbreak that disproportionately affected the two contiguous counties. As the trends of NMEs and vaccine hesitancy at the county and national levels may continue to rise, our findings highlight the need for longitudinal and geospatial studies to better define the relationship between childhood vaccine exemptions and subsequent outbreaks of vaccine-preventable infectious diseases.

The authors acknowledge limitations including: Data were influenced by annual variation in jurisdictional participation and changes in reporting methods. The 2020–2021 data may be skewed by pandemic-related school closures, extended grace periods, and limited healthcare access. Exclusions included childcare-based kindergartens, online schools, correctional facilities, military bases, and tribal lands. Some programs reported exemptions per vaccine instead of per student. Though the Welch's t-test provides a useful summary measure of overall exemption behavior, averaging across a 12-year period may attenuate year-to-year variability and partially obscure the distinct temporal patterns observed in each county.

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Informed Consent: N/A
Ethical Approval & IRB and/or IACUC Approval: N/A
Support: None reported.
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Poster No. *PH-10
Abstract No. 2025-156
Category: Public Health
Research Topic: Health Disparities/Social Determinants of Health

Socioeconomic Trends in Adolescent Opioid Overdose–Related Emergency Department Visits and Hospital Admissions

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Context: The United States is experiencing a sustained surge in opioid-related morbidity and mortality among adolescents, fueled in part by the proliferation of illicitly manufactured fentanyl and the increasing co-occurrence of mental health crises.[1] Between 2010 and 2021, overdose deaths among U.S. adolescents nearly doubled, with a sharp increase in those involving synthetic opioids and those classified as suicides or of undetermined intent.[1] While much of the national focus has centered on adult overdose trends, youth and adolescent-specific patterns of emergency department (ED) utilization, inpatient admission, and the socioeconomic factors associated with opioid overdose remain less studied.

Objective: To characterize trends in adolescent opioid overdose–related ED visits and hospital admissions using national inpatient and ED data from the Healthcare Cost and Utilization Project (HCUP). Specifically, we sought to examine differences in overdose intent (accidental vs self-harm), as well as demographic predictors of presentation and admission. Our goal was to identify population-level disparities in care and inform future prevention and intervention strategies.

Methods: This population-level retrospective, cross-sectional study analyzed data from the 2019 and 2022 HCUP Kids' Inpatient Database (KID) and the 2022 Nationwide Emergency Department Sample (NEDS), publicly accessible databases published by the Agency for Healthcare Research and Quality. The study population consisted of adolescents aged 13 to 20 years. Opioid overdose encounters were identified using ICD-10-CM codes for accidental or intentional (self-harm) poisoning involving heroin, methadone, synthetic narcotics, other opioids, and unspecified narcotics. Primary outcomes included the proportion of adolescent ED visits and inpatient admissions due to opioid overdose, intent of overdose (accidental vs self-harm), and rates of hospital admission or transfer among overdose-related ED visits. Secondary outcomes included sociodemographic distributions (race, ZIP-code-based income quartile, urban–rural classification, and primary payer type). Comparisons between adolescents and adults were performed using adult records from the 2022 NEDS dataset. Chi-square tests were used to compare categorical variables. Odds ratios (ORs) with 95% confidence intervals (CIs) were calculated to quantify differences in presentation and admission rates. Trends over time (2019–2022) in intent-specific admissions and discharge disposition were assessed using chi-square tests for trend.

Results: In 2022, adolescents aged 13–20 accounted for 3.28% (731/22,279) of opioid overdose–related ED visits and 3.40% (186/5,468) of hospital admissions. Of the 1,509 opioid overdoses coded as intentional self-harm, 175 (11.6%) involved adolescents, compared to only 2.68% (558/20,782) of accidental overdoses. Adolescents were 4.75 times more likely than adults to present with a self-harm–related overdose (OR 4.75; 95% CI: 3.98–5.68; $p < 0.0001$). Despite this, adolescents were 36% less likely to be admitted following a self-harm overdose (OR 0.64; 95% CI: 0.47–0.88; $p = 0.0069$). Between 2019 and 2022, the proportion of white adolescents among opioid overdose admissions declined from 63.6% (1,011) to 57.2% (725), while the proportion of Black adolescents increased from 10.7% (170) to 14.9% (189) (white: $z = -107.96$, $p < 0.0001$; Black: $z = -54.18$, $p < 0.0001$). Adolescents

presenting for opioid overdose differed significantly from the all-cause adolescent ED population across several domains. Youth from the lowest-income ZIP codes (quartiles 1 and 2) were overrepresented (28.6% and 25.4% vs 33.1% and 27.8%; $\chi^2 = 15.66$, $p = 0.0013$). Racial distribution also differed significantly ($p < 0.0001$), with white adolescents comprising 59.0% of opioid-related visits compared to 54.6% of all-cause visits. Admission or transfer rates did not differ by ZIP income quartile ($p = 0.97$), race ($p = 0.81$), or urban–rural location ($p = 0.98$), but insurance status was a significant predictor ($\chi^2 = 18.77$, $p = 0.0021$). Adolescents with private insurance had the highest admission rates (33.6%) and were more likely to be transferred to behavioral health facilities (22.2%) compared to self-pay patients (8.6%) ($z = 3.01$, $p = 0.0026$), while transfers to behavioral health facilities declined overall from 2019 to 2022 by 7.6% ($p < 0.0001$).

Conclusion: Adolescents account for a disproportionate share of self-harm–related opioid overdose presentations, yet experience lower hospital admission rates compared to adults. These findings align with national trends showing rising adolescent overdose-related ED visits and highlight a growing burden beyond fatality data.[2] While race, income, and geography did not significantly predict admission or transfer, insurance status consistently influenced access to higher-level care. Privately insured adolescents were more likely to be admitted or transferred to behavioral health facilities than their underinsured peers. Notably, transfer to behavioral health facilities was significantly more likely among adolescents with private insurance (22.2%) than those with self-pay (8.6%), suggesting that a family's ability to pay may influence access to more intensive or specialized treatment. Although national attention has centered on overdose mortality, our findings highlight an urgent challenge in the nonfatal overdose landscape. Between 2019 and 2022, hospitalizations increased among Black adolescents and declined among white adolescents, suggesting shifting demographic patterns. These trends may reflect changes in substance exposure, access to care, or systemic responses that warrant continued monitoring.[3] The decline in behavioral health transfers and intentional overdose admissions may reflect improved outpatient access, evolving clinical decisions, or reduced psychiatric capacity.[4] These results emphasize the need for policies that reduce insurance-based disparities and ensure consistent, comprehensive care for adolescents regardless of payer status or background. Further research is needed to explore why adolescents—despite high rates of self-harm overdose—are admitted less often than adults. Qualitative and mixed-methods studies may clarify whether these patterns reflect differences in clinical severity, provider bias, or triage gaps. The declining rate of behavioral health transfers also warrants investigation into whether it reflects outpatient expansion, inpatient shortages, or insurance limitations. Understanding these trends will be essential for designing targeted interventions that ensure adolescents receive appropriate care. Limitations include exclusion of non-hospitalized cases, such as those treated with naloxone in the community, and potential ICD-10 coding variability that may affect classification of overdose intent or substance type.

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Informed Consent: Not relevant.

Ethical Approval & IRB and/or IACUC Approval: This study was determined to be exempt from Institutional Review Board (IRB) review under the Common Rule (45 CFR 46) because it involved analysis of publicly available, de-identified data and did not constitute human subjects research.

Support: None reported.

Financial Disclosures: None reported.

Poster No. *PH-11

Abstract No. 2025-157

Category: Public Health

Research Topic: Health Disparities/Social Determinants of Health

State Lines, Different Outcomes: National Outcomes in Sex Education and Teen Pregnancy

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Context: Teen pregnancy rates in the United States vary widely by state and are influenced by both sex education policies and access to contraceptive services. While existing research suggests that comprehensive sex education and accessible reproductive care are effective in lowering teen pregnancy, few studies examine the combined impact of education mandates and clinical access on outcomes across the nation. This study was undertaken to evaluate how these factors interact at the state level, using Mississippi—the state with the highest teen pregnancy rate—as a case example.
Objective: To examine the association between state-level sex education policies, access to publicly funded contraceptive care, and teen pregnancy rates across the United States.
Methods: A retrospective, cross-sectional analysis was conducted using publicly available national datasets. States were categorized based on sex education mandates (abstinence-stressed vs. abstinence-covered or comprehensive) and parental consent policies (opt-in vs. opt-out). Teen pregnancy rates were compared using independent samples t-tests. Clinic access data were analyzed using linear regression to evaluate correlations between clinic numbers, population reliance on publicly funded services, and teen pregnancy rates. Data were sourced from the CDC, Guttmacher Institute, and other national repositories. Osteopathic significance lies in the emphasis on holistic, preventive, and education-based interventions as part of comprehensive adolescent care.
Results: States with abstinence-stressed sex education had significantly higher teen pregnancy rates than states with abstinence-covered policies ($p = 0.008$) or no abstinence requirement ($p = 0.024$). Similarly, states requiring parental opt-in for sex education had higher teen pregnancy rates than those using opt-out models ($p = 0.047$). Across the country, publicly funded clinics were more concentrated in areas with higher need and greater population reliance ($p < 0.0001$), but this access was not consistently associated with lower teen pregnancy rates—suggesting that educational barriers may undermine clinical resource effectiveness.
Conclusion: Nationally, restrictive sex education policies—particularly abstinence-stressed curricula and opt-in parental consent laws—are associated with higher teen pregnancy rates. While clinic access remains important, its impact is limited when educational frameworks fail to equip teens with adequate reproductive health knowledge. These findings support the expansion of evidence-based sex education and the removal of structural access barriers as part of a nationwide strategy to reduce teen pregnancy. This aligns with the osteopathic focus on preventive care, education, and addressing root causes of health disparities.

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Informed Consent: N/A
Ethical Approval & IRB and/or IACUC Approval: Exempt
Support: None reported.
Financial Disclosures: None reported.

Poster No. *PH-12
Abstract No. 2025-057
Category: Public Health
Research Topic: Health Disparities/Social Determinants of Health

The Social Anatomy of Coronary Heart Disease in Kansas City: A Regional Case-Control Study

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Context: Coronary heart disease (CHD) remains a leading cause of morbidity and mortality in the United States, with disproportionate burdens observed across communities due to underlying social and structural inequalities (1). Increasing evidence highlights that social determinants of health (SDOH), such as socioeconomic status, educational attainment, access to healthcare, housing stability, food insecurity, environmental exposures, and neighborhood

safety, play a critical role in shaping cardiovascular outcomes. Kansas City presents a unique case study given its long-standing history of racial and economic segregation as well as health inequalities. While citywide health reports have documented variations in CHD prevalence, these descriptive findings fail to account for the complex and cumulative influence of local social conditions. To date, there is minimal evidence that rigorously quantifies the relationship between specific SDOH indices and CHD incidences at the community level. Our case-control study addresses this critical gap by integrating zip-code level CHD prevalence data with a comprehensive panel of SDOH indicators.

Objective: Through correlational analysis, we seek to delineate the complex interplay between place-based social conditions and cardiovascular health, ultimately providing a data-driven foundation for reducing health disparities in Kansas City.

Methods: Our population is based on the Kansas City Metropolitan area (Kansas City, Missouri and Kansas City, Kansas) between 2022 and 2024. We utilized publicly available databases - American Community Survey, CDC PLACES: Local Data for Better Health, Environmental Protection Agency, National Center for Health Statistics, Neighborhood Atlas and Open Data KC - to obtain crude prevalence rates of 37 SDOH indices at the zip-code level. Under an IRB-approved protocol, we constructed a community profile for 70 zip codes in Kansas City, with a demographic composition of 62% White, 20% African American, and 18% other. All predictors were standardized. Pearson correlation coefficients were calculated to assess bivariate relationships between SDOH and CHD prevalence. Mutual information regression highlighted the top 15 predictors. Predictors with a variance inflation factor (VIF) <5 were excluded to reduce multicollinearity. Ordinary least squares regression modeled CHD prevalence across zip codes, which yielded a final model with nine predictors after VIF filtering. Benjamini-Hochberg correction was applied to manage multiple comparisons and control the false discovery rate. Adjusted R^2 and F-statistics assessed predictive model performance.

Results: We assessed the relationship between 37 SDOH and CHD prevalence across 70 zip codes in the Kansas City Metropolitan area. Pearson correlation revealed several SDOH variables that were strongly associated with CHD. The most notable positive correlations included mobility impairment (r=0.903, p<0.001), disability (r=0.810, p<0.001), physical inactivity (r=0.731, p<0.001), current smoker (r=0.705, p<0.001) and obesity (r=0.590, p<0.001), all of which are consistent with prior literature. In contrast, binge drinking (r=-0.835, p<0.001) and life expectancy (r=-0.419, p<0.001) demonstrated strong inverse associations with CHD. The inverse relationship with binge drinking was particularly unexpected and contradicts existing evidence. We suspect this finding may reflect underlying sociodemographic and contextual confounders rather than a true protective effect. For instance, self-reported binge drinking may be underreported in areas with lower health literacy, while communities with stronger healthcare infrastructure may both more accurately capture binge drinking data and implement more effective CHD prevention strategies, contributing to the observed association.

Furthermore, the linear regression model (R2 = 0.791, F-statistic=29.10, MSE=0.2029) explains 79.1% of the variance in CHD prevalence:

CHD = 5.6571 - (0.1990 * Area_Deprivation_Index) - (0.2060 * Unemployment_Rate) - (0.0292 * Median_Household_Income) - (0.2011 * Physician_Checkup) - (0.7849 * Life_Expectancy) - (0.2326 * Obesity) + (0.1506 * College_Graduate) - (1.3989 * Binge_Drinking)

Among the key coefficients in the linear regression equation, college graduation emerged as a positive predictor of CHD, while area deprivation index [a ranking of socioeconomic disadvantage], unemployment, median household income, checkup, life expectancy, obesity, and binge drinking were negative predictors. The positive associations with unemployment and college graduation, along with the negative association with area deprivation index and binge drinking, are counterintuitive and may reflect the influence of unmeasured confounders, limitations in the dataset, or regional differences in healthcare access and reporting practices. The associations between median household income, routine checkups, life expectancy, and obesity with CHD prevalence are consistent with prior studies.

Conclusion: This study confirms strong associations between multiple SDOH indices and CHD prevalence in the Kansas City Metropolitan area. The model indicates that mobility limitations, disability, physical inactivity, current smoking and obesity have a strong positive correlation with CHD, while binge drinking and life expectancy reveal a negative correlation. The unexpected finding with binge drinking likely reflects limitations with self-reporting measures, rather than providing a true protective effect. Overall, these findings reveal opportunities to reduce CHD burden by targeting modifiable SDOH through place-based interventions. Expanding access to physical activity programs, smoking cessation resources, and chronic disease management, particularly in zip codes with high rates of disability and limited mobility, may help mitigate CHD risk and

advance health equity in the Kansas City region. Future work should focus on validating these findings in various urban populations and explore how integrated interventions at the local level can sustainably reduce CHD prevalence.

Our work has important limitations that we must acknowledge. First, we used 70 zip codes in the Kansas City Metropolitan area, and unfortunately this limited sample size constrains the statistical power and generalizability of linear regression models, which typically require substantially larger datasets to achieve robust performance. Attempts to enhance predictive accuracy using Lasso regression and Gradient Boosting algorithms did not yield improved model performance. Second, CDC PLACES: Local Data for Better Health utilizes self-reporting surveys for adult binge drinking, which may lead to underreporting in low-resource zip codes, ultimately contributing to the observed inverse relationship between binge drinking and CHD. Finally, our findings are based exclusively on data from the Kansas City region, which may limit the applicability of results to other geographic areas with different demographic and social characteristics. Despite these limitations, this study stands as one of the earliest comprehensive investigations into CHD risk in Kansas City through the lens of SDOH. These findings provide a basis for future data-informed, holistic prevention initiatives rooted in osteopathic philosophy.

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Informed Consent: All of the publicly available data provided informed consent previously from their respective organizations.

Ethical Approval & IRB and/or IACUC Approval: IRB Determination Letter - Dr. Shae - IRB NHSR # 2296267-1 -Investigating the Impact of Social Determinants of Health on Disease Outcomes - 030425.

IRB Exempt (IRB NHSR # 2296267-1)

Support: None reported.

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Poster No. *PH-18

Abstract No. 2025-074

Category: Public Health

Research Topic: Health Disparities/Social Determinants of Health

Addressing Chronic Disease Burden and Healthcare Access Gaps in People Experiencing Homelessness: A Community-Based Study Through Osteopathic Medical Student-Led Interventions in Detroit

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Context: Chronic diseases such as hypertension, diabetes, and musculoskeletal disorders are among the leading causes of morbidity and mortality in the United States, accounting for 90% of the nation's $4.5 trillion in annual healthcare costs. While national statistics describe high rates of these conditions in the general population, limited data describe how people experiencing homelessness (PEH) report and recognize their chronic illness burden (1). Individuals experiencing homelessness face significant barriers to healthcare access, with transportation identified as a critical social determinant of health (SDoH). In Detroit, where approximately 6,221 individuals are homeless, over 5.7% of adults are impacted by SdoH, such as a lack of reliable transportation, hindering access to medical appointments, and exacerbating chronic conditions (2). Existing literature highlights transportation challenges but lacks actionable data on how community-based interventions can address this gap in Detroit. Existing structural barriers, including low health literacy, stigmatization from the surrounding community, and inconsistent access to care, may lead to underrecognition and underreporting of chronic illnesses in this community, contributing to health disparities in this vulnerable population (3). Detroit Street Care (DSC), a student-led street medicine program at Michigan State University College of Osteopathic Medicine, provides free healthcare at shelters and soup kitchens, offering a unique platform to investigate SDoH barriers and train osteopathic medical students (OMS) in patient-centered care to address health disparities. This structure enables students in their early stages of the medical curriculum to learn from, recognize, and address SDoH.

The current study **hypothesizes** that the gaps in health literacy impact observational studies of SDoH among PEH. In this sense, training medical students to conduct studies in these populations may enhance the students' community-based research skills, as well as their ability to interpret and apply epidemiological data resulting from such studies.

Objectives: 1)To assess osteopathic medical students' understanding of social determinant of health (SdoH) through reflective practice training; 2) to evaluate the impact of a student-led intervention on healthcare access for PEH at DSC clinics; 3) to examine the prevalence of chronic conditions among PEH and 4) to assess PEH's self-perception of chronic diseases their health literacy.

Methods: This cross-sectional, community-based study recruited PEH or housing instability in Detroit, Michigan. Participants (N=48), older than 21 who visit soup kitchens with DSC volunteer presence (IRB: STUDY00010091), were verbally surveyed during visits at soup kitchens. OMS trained (N=18) in ethics and reflective practice conducted baseline and follow-up interviews addressing demographics, health status, access to healthcare, transportation barriers, missed appointments, and whether participants had chronic conditions. Follow-up questions asked what participants sought medical care for, which was used to identify additional chronic conditions not initially disclosed. Identified conditions were categorized into the following groups: musculoskeletal/orthopedic, cardiovascular/metabolic, pulmonary and neurological. Statistical analyses included descriptive statistics and a chi-square test (95% confidence interval, $p<0.05$) to compare appointment adherence rates between groups.

Results: Of the 48 participants, only 40% self-reported chronic conditions; 66% experienced at least one chronic illness. Among those experiencing at least one chronic illness, a significantly higher ($p<0.05$) amount presented with musculoskeletal (44%) or cardiovascular/metabolic (41%), compared with pulmonary or neurological issues (9%). Among those reporting chronic illness, 38% experience more than one chronic disease affecting multiple physiological systems, which is significantly different ($p<0.01$) from those who actually experienced at least one chronic illness (66%).

Conclusion: People experiencing homelessness (PEH) face a higher burden of chronic disease compared to the general population, yet they often lack adequate access to healthcare and may not recognize their need for care due to gaps in health literacy. Their underrecognition of their own chronic illness contributes to delayed diagnoses, suboptimal management, and ongoing health disparities. In contrast, the general population, comparatively experiencing a lower burden of chronic illness, benefits from more consistent healthcare access, further highlighting the urgent need to address these inequities. According to the 2024 CDC's national data, approximately 60% of U.S. adults experience one chronic condition, with 40% reporting experiencing more than one chronic condition (4). Improving health education, removing systemic barriers, and promoting community-based outreach, such as those rooted in osteopathic medicine, are essential strategies to enhance health literacy, ensure continuity of care, and ultimately improve outcomes while reducing long-term healthcare consequences for this vulnerable population. This study highlights how osteopathic principles, such as whole-person care, emphasis on prevention, and attention to social determinants of health, can guide effective chronic disease detection and management among vulnerable populations. It also reinforces the integral role of street medicine and continuity-based care in addressing underdiagnosed chronic illness in unhoused individuals.

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Informed Consent: "You are being asked to participate in a survey-based research study regarding the association between transportation and access to free healthcare clinics for regular management of health conditions. You are being asked to answer 23 questions regarding your lifestyle habits, follow-up frequency, and the transportation you use to visit the free healthcare services offered by Detroit Street Care Clinic (DSC). The total time to complete it is about 15 min. Before agreeing, you will have access to and clarifications of all the questions in the survey, which a DSC team member will verbally administer. There are no foreseeable physical, psychological, economic, or social risks. You will not directly benefit from your participation in this study. However, your participation may contribute to identifying the level of access to medical services impacted by transportation, which

may contribute to future strategies for healthcare resources to underserved communities."

Ethical Approval & IRB and/or IACUC Approval: This study has been determined to be exempt under 45 CFR 46.104(d) 2(ii) The IRB number is STUDY00010091.

Support: Foundry for Innovative Research and Education Program at Michigan State University College of Osteopathic Medicine (MSUCOM): FIRE #2025_EMD-FIRE_001; Macomb University Center (MUC), Detroit Medical Center (DMC), and East Lansing (EL) Campus of MSUCOM; MSU Department of Pharmacology & Toxicology. Also, to the Detroit Street Care volunteers.

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Poster No. *PH-19
Abstract No. 2025-116
Category: Public Health
Research Topic: Health Disparities/Social Determinants of Health

Rationale Behind Late- and Non-Engagement in Prenatal Care: An Assessment of the Pregnancy Risk Assessment Monitoring System

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Context: Prenatal care (PNC) plays a critical role in optimizing maternal and fetal health by managing maternal complications, identifying fetal abnormalities early, and providing necessary education for expecting mothers. Despite its well-established benefits, over one million women in the United States annually fail to receive adequate or timely PNC, placing them at increased risk for adverse outcomes such as preterm birth, low birth weight, and pregnancy-related complications.

Objective: To assess the rationale behind delayed or non-engagement in prenatal care with a secondary focus on disparities in care based on ethnoracial group or geographical location.

Methods: A cross-sectional analysis was conducted utilizing data from the Pregnancy Risk Assessment Monitoring System (PRAMS) Phase 8 (2016–2022), a multi-state, population-based survey targeting women who had recently delivered live births. Participants are randomly selected to receive the PRAMS survey after birth, and were included in the study if they gave live birth within the past year and completed the survey. Variables analyzed included self-reported reasons for delayed or missed care, geographic and rural versus urban residence, and various sociodemographic characteristics. Design-based chi-square analyses were used to assess associations between these factors and PNC utilization.

Results: Within all PRAMS Phase 8, 56237 of 215926 (25.1%) women reported having late or no PNC engagement. A subset of 20 states collected rationale for not engaging PNC earlier, of whom 9,373 engaged after the 9 weeks. The most commonly selected reasons for late engagement were difficulty obtaining appointments (39.5%), unawareness of pregnancy (38.3%), and financial limitations (24.9%); however, 52.2% of women reported multiple reasons. Geographic disparities further exacerbated access issues, particularly in rural areas.

Conclusion: These findings underscore the complex, multifactorial barriers to timely PNC initiation and highlight the urgent need for targeted interventions. Public health efforts should focus on enhancing sexual education, expanding access to affordable pregnancy testing, implementing flexible payment options, and addressing healthcare workforce shortages to improve equitable access to PNC and ultimately enhance maternal-fetal outcomes across diverse populations.

Informed Consent: Not applicable, study does not meet the regulatory definition of human subject research.

Ethical Approval & IRB and/or IACUC Approval: This study was not submitted for ethics review to an institutional review board oversight because it did not meet the regulatory definition of human subject research as defined in 45 CFR 46.102(e) of the Department of Health and Human Services' Code of Federal Regulations. This study adhered to the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines.

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Poster No. *PH-22
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Category: Public Health
Research Topic: Health Disparities/Social Determinants of Health

Improving Colorectal Cancer Screening Adherence: The Impact of Multilingual Biweekly Text Reminders on FIT Kit Return Rates and Stratified Demographics

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Context: Colorectal cancer (CRC) remains the third leading cause of cancer-related death in the United States., despite the availability of effective screening methods (1). Given its responsiveness to early detection, CRC is widely regarded as one of the most preventable forms of cancer (2). In response to rising incidence in younger adults, the American Cancer Society updated its guidelines in 2018 to recommend average-risk individuals begin screening at age 45, a recommendation affirmed in 2020 by the U.S. Preventive Services Task Force (3-4). The fecal immunochemical test (FIT), a noninvasive, cost-effective, and tier-one screening modality, demonstrates a one-time sensitivity of 79% for detecting CRC (5). FIT is especially appropriate for individuals who are uninsured, underinsured, or reluctant to undergo colonoscopy. However, national FIT kit return rates remain low, averaging 50–60%, resulting in missed opportunities for early detection (6). Although reminder systems have been shown to improve FIT return rates, many of these studies were conducted prior to the COVID-19 pandemic and in limited geographic contexts, such as the Pacific Northwest and Hong Kong (7-8). Given expanded screening recommendations, pandemic-related disruptions to preventive care, and the lack of generalizable data across diverse U.S. populations, we sought to evaluate whether biweekly, language-concordant text message reminders could improve FIT kit return rates in a racially and linguistically diverse urban Chicago population.

Objective: To determine whether biweekly text-message reminders in patients' preferred languages increase Fecal Immunochemical Test (FIT) kit return rates overall and within demographic subgroups.

Methods: We conducted a retrospective observational study to evaluate the impact of a quality improvement (QI) intervention—biweekly text-message reminders in patients' preferred language—on fecal immunochemical test (FIT) kit return rates. The study included 2,092 patients aged 45–75 years eligible for colorectal cancer screening at a community health center (CHC) between 2019 and 2023. Inclusion criteria were age 45–75 years, no colonoscopy within 10 years, and no FIT return within 90 days of kit distribution; patients with prior colorectal cancer were excluded. The study was divided into two periods: a pre-intervention phase (2019–2021), during which 880 patients received take-home FIT kits without follow-up, and a post-intervention phase (2022–2023), during which 1,941 patients received the same kits plus biweekly text-message reminders in their preferred language (English, Spanish, or Polish) via the "Caremessage" platform. Messages included an option for patients to respond whether they had returned the kit ("yes"/"no"). Patients who replied "no" received an additional instructional video explaining the importance of the test and how to complete it.

Patient demographic and social data, including age, sex, race/ethnicity, employment status, relationship status, family size, and prior FIT use, were extracted from CHC's electronic medical record (EMR). To evaluate predictors of FIT return, we fitted a Bayesian hierarchical binomial-logit model with FIT return (yes/no count per patient) as the outcome. This modeling technique allows us to estimate both overall and subgroup-specific QI effects. Fixed effects included reminder period, age, family size, sex, and relationship status; random intercepts for employment status and race; and random slopes for reminder effects by language, sex, relationship, and race. Continuous covariates were centered at their means. Posterior inference used weakly informative priors and non-centered parameterizations. In line with the principles of osteopathic medicine, this QI intervention was designed to improve engagement with cancer screening among medically underserved populations by recognizing the interconnectedness of physical, behavioral, and social health factors to maximize prevention and patient-centered care.

Results: Implementation of the QI intervention—biweekly text-message reminders in patients' preferred language—led to a significant increase in overall FIT kit return rates, rising from a pre-reminder mean of 80.0% (95% CI, 79.0–81.0%) to 84.6% (95% CI, 84.0–85.2%). After adjustment, the baseline (pre-reminder) return probability for an average patient was estimated at 71% (90% credible interval, 59–80%). Each additional year of age increased the odds of return by 3% ($\beta = 0.03$; 90% CI, 0.02–0.04), and being single was associated with 40% lower baseline odds of return compared

to those in a relationship (β = 0.34; 90% CI, 0.14–0.56). On average, the QI intervention increased return odds by 32% (β_post = 0.28; 90% CI, –0.69 to 1.18), though this effect varied across subgroups. Notably, patients who did not report a race exhibited a credible decrease in response to reminders (β_race3 = –0.42; 90% CI, –1.26 to 0.11).

Demographic characteristics including sex, family size, and employment status, showed no credible effect on return likelihood. Additionally, texts personalized to patients' preferred language did not significantly improve return likelihood, suggesting other behavioral or systemic factors may influence response. Further, these findings suggest the intervention was broadly effective across diverse patient populations, with limited disparities by demographic subgroup. The statistically significant improvement in return rates post-QI intervention indicates that personalized text reminders and follow-up communication effectively enhance patient engagement with preventive healthcare services. This intervention not only reinforces the significance of adherence but also fosters a sense of connection between patients and their care teams, even in the absence of in-person visits.

Conclusion: Findings from this QI project demonstrates that biweekly, language-concordant text-message reminders represent a low-cost, scalable strategy that can modestly improve adherence to colorectal cancer screening in a racially and linguistically diverse, urban population. The increase in FIT kit return rates observed during the post-intervention period (2022–2023) underscores the value of consistent and accessible communication, particularly for at-home, noninvasive screening modalities.

However, subgroup analyses showed that the intervention's impact varied significantly across demographic groups. Age and relationship status were reliable predictors of return, while factors like family size, language preference, and sex had no meaningful effect. This variation highlights the need for tailored outreach strategies and cautions against assuming uniform effectiveness. This model may inform similar efforts to improve preventive health engagement in underserved populations, particularly those facing barriers to in-person care. Future work should explore sustainability and test layered interventions—such as personalized calls or culturally tailored content—to enhance impact.

In conclusion, this study supports the value of reminders in patients' preferred language and emphasizes the importance of equity-focused, data-driven approaches. Identifying which groups benefit most—and which need alternative strategies—can guide more inclusive and effective public health interventions.

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The impact of interactive food demonstration on nutrition education and dietary habits

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Introduction: Around 60 percent of American adults have at least one chronic disease that could mostly be managed by nutrition. The Mediterranean diet has been linked to reducing the risk of numerous health conditions, including hypertension, coronary artery disease, and other cardiovascular diseases that have high prevalence in the city of Philadelphia. This diet is known for scaling back on salt and red meats along with having an increased focus on whole grains, fruits, vegetables, legumes, olive oil, and healthy fats. With its ability to provide satiety and variation based on individual palate preferences, Mediterranean cuisine has been shown to have high compliance and a positive impact on health outcomes. The importance of educating individuals on the value of holistic dietary habits is profound, as there are various studies that demonstrate how education increases the likelihood of patients incorporating proper nutrition in their daily lives.

Methods: This study featured interactive food demonstrations within clinical settings . Patients in the waiting room first completed a demographic survey, followed by a pre survey with eight nutrition related questions to assess their baseline knowledge and habits. During recipe sampling, a guided discussion of the patient's responses, followed by a post-survey of the same eight questions to evaluate knowledge retention. The patient received ingredient take-home bags to encourage at-home replication. Follow-up surveys at one and three months assess retention of nutritional knowledge and any dietary behavior changes.

Results: There was a statistically significant improvement in test scores following the food demonstration, with the mean test scores increasing from 47.03% to 88.14% ($p<0.001$). At the one-month follow-up, participants reported that the food demonstration impacted their food choices, averaging a score of 3.88 on a 5-point scale, where 5 indicates a significant impact. Participants reported they ate home-cooked meals more frequently ($p=0.013$) and ate whole grains more frequently ($p=0.021$) at the one-month follow-up compared to baseline. Additionally, a moderate correlation was observed between participants who initially expressed a likelihood of making the recipes and those who actually prepared them at the one-month follow-up ($\rho=0.544$, $p=0.007$).

Conclusion: Interactive food demonstrations serve as an effective and engaging tool for enhancing nutrition education and influencing dietary choices, suggesting their potential role in reducing chronic disease prevalence in the Philadelphia community. Participants showed significant improvements in nutrition knowledge and reported increased home-cooked meal frequency. However, a larger sample size is necessary to assess demographic differences. Limitations include the short follow-up time, limited access to healthy ingredients, and reliance on self-reported data. Further research with extended follow-up is necessary to evaluate the sustainability of diet changes and the potential long-term impact on blood pressure. Integrating these demonstrations into community health programs could enhance their impact and reach.

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Lead Contamination Absorption into Plants of a Metro Atlanta Home

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Context: Lead pollution in residential areas of Metro Atlanta has spurred the U.S. Environmental Protection Agency (EPA) to increase efforts to remediate contaminated soil, resulting in the designation of the Westside Lead Atlanta, GA Superfund site in 2019 (1). Lead poses significant risks to human health, interfering with vital biological functions, such as blocking important calcium-dependent pathways (2-5). Historic practices of lead-based industries with poor disposal procedures have caused local soil and water pollution (2,3,6,7). This is evident particularly along historical railroad routes used for transporting metal-laden industrial goods (8). The soil along these routes frequently exhibits heightened levels of heavy metals due to regular train activity, exacerbated by waste dumping along the routes (9). Notably, former railroad easements may evolve into residential areas, as evidenced by a home in Metro Atlanta north of the Westside Lead Atlanta Superfund site. Tests conducted at this residence unveiled lead contamination with an average level of 412 mg/kg, particularly in areas where the homeowner grew crops. Since this property surpassed the 400 mg/kg lead soil screening level (SSL), the EPA designated it as the Buckhead Slag Superfund site with remediation of local soil occurring in November 2023 (10). While lead naturally exists in soil at a concentration averaging 10-30 mg/kg, levels surpassing this range suggest contamination from exogenous sources. The EPA originally had the conservative lead SSL as 400 mg/kg for residential homes, but as of January 2024 this level has changed to 200 mg/kg, indicating a public health concern (11).

Exposure to lead predominantly occurs by inhalation or ingestion (12). Lead contaminated dust can be kicked up while walking in the home and thereafter inhaled. Preliminary studies performed by the homeowner at the Buckhead Slag Superfund site involved evaluation of the dust collected from their vacuum, finding lead contamination as high as 280 mg/kg. Ingestion of lead contaminated soil was also possible since they did not adhere to strict measures of cleaning their produce before consuming. Lead poisoning is predominantly reported in children due to pica and their ability to absorb lead up to 4-5 times in comparison to adults (12). Adults typically are found to have lead poisoning through occupational and environmental sources, such as inhalation of lead particles from burning materials containing lead or by ingestion of contaminated dust, soil, water, or food (13).

Certain plants designated as hyperaccumulators, or those that can absorb heavy metals without displaying plant toxicity, pose a potential risk factor of lead poisoning by consumers (14,15). With the advent of COVID-19 in 2020, greater need for supplementing food supply stimulated home or community garden utilization (16). Many that pursued this route were unaware of the practice of analyzing the soil prior to growing crops. This increases the chance of lead contamination, especially with root-based vegetables with hyperaccumulator qualities since they are closer in proximity to the contamination source (17). Research is still ongoing on how much lead contamination may be ingested from lead contaminated produce. The purpose of this research is to evaluate the absorption of lead from contaminated soil into the plants of a Metro Atlanta home to provide further data towards analyzing the risk that ingesting lead contaminated produce may be an additional source of lead poisoning.

Objective: To assess the ability of plants to absorb lead from lead contaminated soil in order to raise awareness of an additional source of lead poisoning.

Methods: Twenty-one soil and plant sample sets were collected and prepared for lead contamination assessment using inductively coupled plasma mass spectrometry (ICP-MS). Constraints for our study included the following: the

soil collected had to be within proximity to the root system of the plant, and plants were chosen based on the ability to be fit whole within a one-gallon bag. Soil and plant sample sets were labeled according to the testing sites demarcated by the EPA for comparison (10). The plant was removed from the ground with the soil collected on and around its roots. The soil around the roots was separated into a one-quart bag while the full plant was placed in a one-gallon bag. Each bag was labeled relative to its site and given a letter representing a sample group of plant with its respective soil. Soil and plant samples were dehydrated for 48 hours at 100°F, ground with a mortar and pestle, and placed in 50 mL tubes for further preparation and analysis. The samples were processed by the University of Georgia Plasma Chemistry Lab according to their standard protocols for ICP-MS analysis. Soil samples were analyzed in triplicate whereas the limitation of available biomass after dehydration limited plant samples to be analyzed as a single sample per data set. The study employed a one sample t-test to evaluate the relationship between the contaminated soil lead level and the lead level found within the respective plant for each sample set.

Results: The results of this study demonstrate the absorption of lead from contaminated soil into local vegetation over time with an average plant lead level of 162.20 mg/kg, ranging from minimal levels of 5.06 mg/kg to significantly toxic levels of 499.49 mg/kg ($p<0.001$). The mean difference in our sets of data was 110.67 mg/kg (95% CI [76.24 mg/kg, 145.11 mg/kg]). There were two characteristics found in the plants that had greater amounts of lead absorbed: they were perennials and were known to be hyperaccumulators. Differences in lead contamination magnitude can be attributed to plants that are annuals, or only survive for one year, having minimal lead levels versus perennial plants, plants that grow for two or more years, having higher lead levels. Therefore, there may be a higher risk of consuming perennial vegetables such as asparagus, rhubarb, and artichokes in comparison to annual vegetables such as tomatoes, lettuce, and beans. One perennial fern (*Dryopteris ludoviciana*) analyzed in this sample set showed evidence of hyperaccumulation in which the plant had greater levels of lead than the surrounding soil (Data set 7C: soil, 378.6 mg/kg and plant, 499.5 mg/kg). Hyperaccumulator plants, such as ferns, are designated as having greater tolerance for heavy metal uptake and neutralization in comparison to the average plant that will have mechanisms in place to avoid heavy metal uptake (14,18).

Conclusion: Amid COVID-19, many turned to home or community gardens to supplement their food supply (19,20). Such was the case for the Westside Lead Atlanta, GA Superfund site in which community gardens were already in use (1). The same situation can be said of the homeowner of the Buckhead Slag Superfund site, who used their garden during COVID-19 until contamination was suspected. The benefit of having community and personal gardens to supplement food supply has only continued to grow despite restrictions from COVID-19 ending (16). Raising awareness about the risks of planting in untested areas is crucial to ensure safe backyard produce cultivation. We demonstrate here the importance of soil testing before gardening, particularly in areas located near historical manufacturing or transport sites.

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Racial and Gender Disparities in Completing Routine Cancer Screenings: An Analysis of Cancer Screening Responses

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Context: Preventive cancer screenings are critical for early detection and timely intervention, significantly reducing mortality associated with breast, cervical, and colorectal cancers. The U.S. Preventive Services Task Force (USPSTF) recommends routine screening for these cancers in age-appropriate populations. However, adherence to these guidelines remains suboptimal across the United States. Racial and gender disparities have consistently been reported, with people of color and men less likely to undergo screening and more likely to present with advanced disease. These disparities contribute to unequal cancer outcomes and reflect deeper structural issues in healthcare. Studies show that Black and Hispanic populations have lower rates of colorectal and breast cancer screening and face greater delays in follow-up care after abnormal results (1,2). Similarly, men are less likely to engage in routine preventive care, including colonoscopy and fecal immunochemical testing (3). Additional barriers such as socioeconomic status, language, mistrust in healthcare systems, and cultural health beliefs further compound these inequities. Primary care plays a vital role in cancer prevention by serving as the first point of contact for routine screening. Understanding local patterns of screening adherence is essential to designing targeted interventions. This study was conducted to examine completion of age-appropriate cancer screening by gender and race demographics and to evaluate whether significant differences exist in the Rowan-Virtua Family Medicine patient population.
Objective: To determine how demographic differences influence the likelihood of overdue cancer screenings and referral acceptance rates. Specifically, we predict that certain racial and gender groups will have higher rates of overdue screenings and lower referral acceptance.
Methods: This study utilized retrospective chart review and provided a prospective cohort intervention. Rowan-Virtua Family Medicine patients between the ages of 21-80 (n=911) were identified between January 1, 2023 to February 1, 2025

as overdue on cancer screenings based on chart review. We followed the United States Preventive Services Task Force's recommendations for colon, breast, and cervical cancer screenings (4). Participants were excluded (n=3) if they were deceased or were no longer patients of the practice. Student volunteers contacted these patients and offered referrals for overdue screenings. Patients had the choice of accepting the referral, making their own appointment without a new referral from us, or declining further action. If patients were not reached after three phone call attempts, another attempt was not made. We used patients' self-identified race and gender from their electronic medical record for demographic information. A chi-square test of independence was conducted to examine the relationship between demographics and screening rates. Statistical significance was set at $\alpha = 0.05$.

Results: Of 911 patients contacted, White women had the highest rates of overdue breast cancer screenings ($p < 0.05$). Women in the "other" racial category had the highest rates of cervical cancer screening completion ($p < 0.05$). Among patients overdue for colon cancer screening, men were significantly more likely to decline referrals than women (19.23% vs. 15.96%, $p < 0.05$). Patients with unspecified racial data had the highest rate of overdue colon cancer screening ($p < 0.05$). Among those who accepted referrals, White patients had the highest screening completion rate (63.15%), followed by Black (61.29%), Hispanic (57.14%), and Asian (50.00%) patients; however, these differences were not statistically significant ($p > 0.05$). The intervention resulted in successful screening referrals and completions in multiple demographic groups, but highlighted gaps in engagement among specific populations.

Conclusion: This study highlights several racial and gender disparities in cancer screening adherence. There were statistically significant race-based differences in completion of colon cancer, cervical cancer, and breast cancer screenings. Moreover, men were significantly more likely to decline referrals than women, which could be further investigated to understand why this gender-based difference exists. Limitations include non-response bias and incomplete racial data, limiting conclusions on racial disparities.

Understanding screening barriers is crucial in primary care. Identifying at-risk groups allows for targeted outreach to understand reasons for disparities and remove barriers to screening. For example, researching the motivational differences that impact women to have higher completion rates compared to men will allow future researchers to target efforts towards increasing men's screening rates more effectively. This is paramount in increasing national and global screening efforts and subsequently early detection and intervention of malignancies. Future efforts should focus on addressing barriers and expanding outreach to more diverse populations within and beyond the Rowan-Virtua Family Medicine practice.

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Informed Consent: Informed consent was not obtained for this study. A waiver of consent was received under the IRB.
Ethical Approval & IRB and/or IACUC Approval: This study was reviewed and approved by the Rowan-Virtua School of Osteopathic Medicine Institutional Review Board (IRB #2024-057).
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Poster No. *PH-31
Abstract No. 2025-090
Category: Public Health
Research Topic: Health Disparities/Social Determinants of Health

Medical Curriculum Efficacy on Students' Identification of Phenotypically Diverse Dermatoses

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Context: Throughout the literature, there has been a call for action regarding better representation of skin of color in medical school. (1-6) Medical students are exposed to dermatologic conditions for the first time during their training, which places them at a disadvantage when diagnosing skin disorders in patients with skin of color during residency. (7) Unfortunately, recent medical resources are not fully representative of the current or future United States population, which further perpetuates misdiagnosis and contributes to an educational gap in treating skin of color. (8-9) Dermatologic conditions represent 10-30% of doctors' visits in primary care clinics such as family medicine and pediatrics accordingly. (10-13) Thus, it is vital to create a strong foundation in all aspiring doctors, regardless of specialty interests, in order to ensure they are adequately prepared to treat a diverse group of patients. It has been proven that a lack of education, knowledge, and exposure when it comes to dermatologic conditions related to skin of color can also lead to poor health outcomes. (14) This research project focuses on addressing how effective medical students (first through fourth year) feel their curriculum and additional medical resources are, at aiding them with identification of common dermatologic conditions in dark and light skin tones. It encourages medical students to reflect on what methods of instruction have been implemented with success whether it be through articles, assigned reading, problem-based learning, discussion boards, guest speakers, lectures, or practice questions. It also specifically asks students to evaluate how their medical schools can improve their curriculum, and what resources have been most beneficial for learning how dermatologic conditions present in darker skin populations.

Objective: To evaluate medical students' diagnostic accuracy, confidence, and perceived curricular competence in identifying common dermatologic conditions presented on both lighter and darker skin tones. The study aims to assess whether educational gaps disproportionately affect there cognition of dermatologic conditions on skin of color and to identify where those disparities are most pronounced.

Methods: A national cross-sectional survey was conducted using Research Electronic Data Capture. The 28-question survey was developed and reviewed by dermatology residents, fellows, and academic dermatologists, and was distributed through the Dermatology Interest Group Association to medical students attending medical schools accredited by the Commission on Osteopathic College Accreditation and the Liaison Committee on Medical Education in the United States. Participants were eligible if they were current first through fourth-year medical students. A total of 41/42 students completed the survey, with a completion rate: 97.6 percent. The survey included:

1. demographic information and prior dermatology exposure
2. An image-based diagnostic quiz
3. a six-item Likert scale measuring diagnostic confidence.

The quiz included eight images showing four dermatologic conditions (acne vulgaris, atopic dermatitis, tinea versicolor, and melanoma), each on both lighter (Fitzpatrick skin types Ito II) and darker (Fitzpatrick skin types IV to V) skin tones. Images were obtained with permission from Visual Diagnostic. Responses were analyzed to compare diagnostic accuracy by skin tone for each condition. Confidence was assessed by self-reported Likert scores and perceptions of curricular adequacy. Descriptive statistics were used to summarize diagnostic performance and confidence. Inferential statistics were not used due to the limited sample size, but future research can utilize matched-pair tests. The study aligns with osteopathic principles by emphasizing equitable, culturally competent medical education that addresses the needs of a diverse patient population. It further signifies the osteopathic commitment to holistic, patient-centered care by analyzing dermatologic education that aims to enhance clinical insight, diagnostic precision, and cultural humility in future physicians.

Results:

Participant Demographics:

Medical students were evenly distributed by year with 23.8% being first-year; 22% being second-year; 26.2% being third-year; and 21.4% being fourth-years. 63.4% reported some exposure to dermatologic conditions in a variety of skin tones during medical school.

Curricular Representation and Instruction:

95% of students believed there is a disparity in how dermatologic conditions are presented in their curriculum. 56.1% mentioned previous exposure to both light and dark skin tones during clinical rotations. Lectures were the most common instructional format (87.8%). Only 51.2% of students felt their curriculum included images that represented a full range of skin tones, while 78% believed their schools could do more in this area.

Diagnostic Accuracy via Image Based Quiz:

Condition	Light Skin (Fitzpatrick I to II)	Dark Skin (Fitzpatrick IV to V)
Melanoma	85.4 percent	87.8 percent
Acne vulgaris	97.6 percent	82.9 percent
Atopic dermatitis	92.7 percent	29.3 percent
Tinea versicolor	39 percent	48.8 percent

Diagnostic accuracy differed by both condition and skin tone. Atopic dermatitis was often misdiagnosed in darker skin, with 70.7% of participants unable to recognize it correctly; 39% mistook it for lichen simplex chronicus. Tinea versicolor was often confused with pityriasis rosea, regardless of skin tone. These findings suggest that gaps in diagnostic ability may relate more to how certain conditions are taught and depicted than to skin tone alone.

Confidence and Preparedness via Likert Scale:

Only 9.8% of students felt confident diagnosing skin conditions in darker skin tones, compared to 39% for lighter skin. 46.3% disagreed that their education adequately represented a range of skin tones. More than half 53.7% believed that medical resources lack diverse dermatologic imagery, and 43.9% did not feel prepared for residency when it comes to diagnosing conditions across different skin types.

Conclusion: This study identifies condition specific disparities in medical students' ability to diagnose dermatologic conditions across different skin tones. While students demonstrated high accuracy for certain conditions such as melanoma and acne vulgaris, their ability to correctly identify atopic dermatitis in darker skin was significantly lower. Confidence diagnosing conditions in skin of color remains disproportionately low, highlighting the need for targeted curricular improvements. These findings suggest that diagnostic disparities are not uniform, but instead vary by disease type, especially for inflammatory and eczematous conditions that can present differently based on melanin levels. Future studies involving a larger and more diverse participant pool, as well as a broader range of diseases, would enhance the depth of these findings. Enhancing condition specific imagery, broadening instructional resources, and increasing hands-on clinical exposure to diverse skin types are critical steps to building diagnostic equity and clinical preparedness in future physicians.

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Informed Consent: Prior to beginning the survey, participants were given an informed consent statement outlining the purpose of the study, voluntary nature of their participation, confidentiality, and that no identifiable information would be collected.

Ethical Approval & IRB and/or IACUC Approval: IStudy was reviewed and approved – Protocol number: BHS-1872.

Support: None reported.

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Poster No. PH-33
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Research Topic: Chronic Diseases & Conditions

Effectiveness of a Mobile Recovery Coaching Intervention on Increasing Abstinence, Employment, Stable Housing, and Self-Rated Relationship Satisfaction Among Homeless Overdose Survivors in Atlantic County, NJ

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Context: Opioid overdose is the leading cause of death in US citizens aged 18-44 (1). Preliminary studies assessing overdose risk have shown that people experiencing homelessness have a significantly higher risk of overdose than the general population (2). Given that 1 in 3 homeless individuals have a substance use disorder (3), mobile interventions to help this population and prevent fatal overdose are urgently needed (4). Rowan-Virtua School of Osteopathic Medicine (Rowan-Virtua SOM) has partnered with the Hope Exists Foundation to create a Mobile Recovery Coaching Unit to engage homeless overdose survivors in Atlantic County, NJ and enroll them in a mobile peer recovery coaching program to build recovery capital (5) including referral to treatment and address housing, employment, and other needs to sustain recovery overtime. Rowan-Virtua SOM developed an osteopathic peer recovery model that was successfully implemented in residential treatment (6). This study aims to expand the use of the model on a mobile unit to engage hard-to-reach individuals and to evaluate the effectiveness of the mobile peer recovery coaching model delivered during street outreach by measuring changes in housing status, relationship satisfaction, and abstinence rates of participants. We hypothesize that homeless overdose survivor participants will see significant improvements in key survival domains at 6-month follow-up compared to intake.

Objective: To evaluate the effectiveness of the intervention in improving housing status, employment, personal relationship satisfaction, and abstinence rates.

Methods: The project took place in Atlantic County, New Jersey, which includes the gambling and seaside resort community of Atlantic City. Atlantic City has a significant opiate overdose problem, and many homeless individuals with substance use and mental health conditions travel to the casinos to gamble and use their winnings to support their opiate use. Peer recovery coaches from the Hope Exists Foundation provided street outreach to identify people experiencing homelessness with a history of overdose to enroll them in the project. Coaches administered emergency triage and intake assessments using the GPRA CSAT data collection tool. Peer recovery coaches linked clients to detoxification and residential treatment programs to stabilize their substance use and followed clients during their transition to the community. Each client received a recovery plan with continuous support and linkage to services to build recovery capital in key life domains damaged by substance use, including housing and employment. The GPRA CSAT tool was administered again at 6-month follow-up. Data from the intake and six-month follow-up GPRA were entered into SAMHSA's Performance Accountability and Reporting System (SPARS), and data was exported for analysis. A de-identified subset of the data collected was selected for this study (n=40), comprising only those who successfully completed the GPRA CSAT data collection tool at both intake and at six-month follow-up. Housing stability was coded as a binary outcome- clients living in a shelter, on the street/outdoors, or in an institution were classified as "not housed," and all others as "housed." Employment status was similarly coded; those reporting either form of unemployment ("Looking" or "Not Looking") were labeled "Unemployed," and those in full-time, part-time, or on disability were labeled "Employed/Disability." Abstinence was measured by asking the question "During the past 30 days, how many times have you used any substance, and how do you take the substance". Relationships satisfaction was measured on a five-point Likert scale (1 = Very Satisfied … 5 = Very Dissatisfied). All analyses were conducted in R. McNemar's chi-squared test was used to evaluate changes in the paired binary outcomes (housing and employment), and a one-sided Wilcoxon signed-rank test assessed whether intake dissatisfaction scores exceeded follow-up scores.

Results: Clients experienced statistically significant improvements in all measured metrics. In terms of housing status, those living in shelters decreased 100% from 7.5% to 0%, and those living on the street also decreased 100% from 87.1% to 0%. Institutional placements remained steady at 2%, while those in stable housing improved from 3.2% of clients at intake to 97.5% of clients at 6-month follow-up. This change in stable housing was significant (McNemar's $\chi^2_1 = 39.0$, $p < 0.001$), indicating the effectiveness of the mobile peer recovery coaching intervention in improving housing-related outcomes. Measures of client employment also

experienced drastic improvements. The number of individuals not looking for work decreased by 100% from 44% at intake to 0% at 6-month follow-up. Full-time employment rose from 13.2% to 25.6%, and part-time employment increased from 7.7% to 35.9%. 75% of clients reporting a lack of employment at intake were employed or on disability at follow-up. This net gain was statistically significant (McNemar's $\chi^2_1 = 9.94$, $p = 0.0017$). Self-rated satisfaction in personal relationships also showed improvements, with 0% of clients reporting any positive rating (Very Satisfied or Satisfied) at intake, and 75% of clients reporting a positive rating at the 6-month follow-up. Clients reporting high levels of dissatisfaction (Very Dissatisfied) dropped from 58.1% at intake to 0% at follow-up. Satisfaction ratings at follow-up showed significant improvement from those reported at intake (Wilcoxon $V = 780$, $p < 0.001$, one-sided). Abstinence from illegal drugs or alcohol reflected the most drastic change out of any reported metric, with 0% of clients abstinent during the 30 days prior to intake, and 92.5% of clients reporting past 30-day abstinence at follow-up. (McNemar's $\chi^2_1 = 37$, $p = < 0.0001$). These findings were all consistent with our hypothesis that positive changes would be observed across all measures.

Conclusion: Mobile Peer Recovery Coaching Services were successful in creating significant positive changes in abstinence, housing, employment, and relationships. Changes in abstinence and self-reported relationship satisfaction showed the most significant improvements. This finding aligns with our hypothesis on the effectiveness of peer recovery coaching as an adjunct to SUD treatment. Although the findings here in relation to abstinence and reduction of overdose risk factors are overwhelmingly positive, further research is necessary to assess the effects of the peer recovery coaching framework on rates of overdose and other life domains. Further research is also needed to identify the factors that may have contributed to improved client outcomes, especially given the vast quantity of data collected in the GPRA CSAT tool.

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Informed Consent: Written informed consent was collected from each client at intake using an informed consent waiver approved by Rowan-Virtua SOM's Institutional Review Board (IRB)
Ethical Approval & IRB and/or IACUC Approval: Study ID: PRO-2024-18 approved on October 23, 2024.
Support: None reported.
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★Poster No. *PH-34
Abstract No. 2025-133
Category: Public Health
Research Topic: Health Disparities/Social Determinants of Health

Evaluation of Impact of Environmental and Socioeconomic Factors on Overdose Rates Among Homeless Populations in Downtown Manhattan

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Context: Homelessness significantly exacerbates vulnerability to drug misuse and overdose due to unstable housing, co-occurring mental health disorders, and limited access to timely and equitable healthcare services [1–3]. Individuals experiencing homelessness often face harsh environmental

conditions, social marginalization, and systemic neglect that create barriers to prevention, care, and recovery [4]. This study focuses on individuals residing in a high-risk corridor of downtown Manhattan, specifically 14th Street from 1st to 6th Avenues. The research seeks to understand the complex interplay of environmental, social, cultural, political, and economic factors that contribute to drug misuse and overdose risk among this population. By centering the lived experiences of overdose survivors, the study aims to inform targeted, community-responsive, evidence-based interventions to reduce overdose and improve outcomes.

Objective: This study aims to identify and characterize the environmental, social, and systemic factors contributing to drug misuse and overdose among homeless individuals in downtown Manhattan, and to develop a community-responsive, technology-assisted intervention aimed at reducing overdose risk.

Methods: A mixed-methods study was implemented, integrating qualitative and quantitative approaches. A literature review was conducted using PubMed, PsycINFO, and other databases with keywords including "opioid overdose," "substance misuse," "harm reduction," and "unhoused individuals" [5–6]. Eighteen semi-structured interviews were conducted with individuals experiencing homelessness, many of whom were also suffering from addiction. Survey responses were collected and analyzed for statistical trends, while thematic analysis was used to interpret qualitative data. To reduce barriers and preserve anonymity, interviews were conducted without recording devices, and incentives were provided in the form of non-resalable, practical items. The study emphasized ethical engagement, trauma-informed interviewing, and researcher reflexivity [7–9].

Results: Quantitative analysis demonstrated that 50% of respondents cited social pressures (e.g., influence from peers or family) and 33% cited early trauma as causes of their substance use [10]. Among those who had experienced an overdose, the majority (4 out of 7) cited mental health and addiction as their biggest challenges, compared to 1 out of 11 non-overdose respondents. Respondents who showed higher trust in the healthcare system were more likely to cite housing, not financial assistance, as their most urgently needed resource. The most common challenge cited overall was mental health and addiction (30%). There was a negative correlation between length of time spent homeless and perceived accessibility to healthcare [11]. Black respondents rated access to care lowest (2.5/5). Qualitative data reinforced the presence of systemic neglect, lack of culturally competent providers, and stigma from healthcare systems and the public [12]. Participants identified structural barriers to treatment as a core driver of continued harm.

Conclusion: This research highlights the urgent need for targeted interventions to address the multifaceted challenges faced by homeless populations in downtown Manhattan. The findings underscore the importance of addressing systemic barriers, improving access to healthcare, and fostering trust between individuals and service providers. Elevated overdose rates, coupled with high rates of mental health disorders, demand a multidisciplinary approach to care, integrating psychiatry, social work, and public health [13–14]. Community-specific interventions, such as mobile clinics, peer support programs, and culturally sensitive outreach efforts, are proposed to reduce drug-related harm. These findings provide actionable insights for policymakers, advocating for resource allocation that prioritizes housing stability and harm reduction strategies [15].

Furthermore, this study highlights a disconnect between clinical resources and the lived experiences of vulnerable populations. Despite national attention to the overdose epidemic, many harm reduction strategies remain out of reach for those most affected. The findings affirm that people are often not homeless because they use drugs; instead, they often use drugs to cope with the trauma and isolation of homelessness. Participants emphasized that mental health and housing were deeply intertwined issues. These findings support the efficacy of housing-first, rather than abstinence-first, intervention models. In contrast to most studies, which tend to focus on overdose deaths, this research prioritized overdose survivors, giving voice to those who have navigated the brink of death and lived to recount what helped or hindered their recovery. Despite the small sample size, observed trends aligned with publicly available data from the New York State Department of Health, lending additional validity to the study's findings [1].

The authors utilized their findings to design and develop a mobile application called "No-D NYC," designed to reduce overdose harm among individuals experiencing homelessness. The app connects people with nearby resources including healthcare services, harm reduction sites, housing and shelter services, food and nutrition, legal aid, transportation, accessibility, community support, emergency services, and other useful resources such as restrooms, showers, laundry, charging stations, and Wi-Fi. Developed in partnership with software engineers at Eman Enterprises LLC, the app emphasizes privacy, usability, and offline functionality, all of which are key features given limited data access and mistrust of surveillance among the target population. The app includes the following features:

- Geolocation-based listings of nearby services (e.g. healthcare, shelters, harm reduction centers)
- Offline functionality for uninterrupted access
- Peer support and emergency hotlines
- Non-stigmatizing, intuitive interface for users with limited tech literacy

Importantly, the app does not track users, collect identifying data, or require login. Future versions will include integration with the Never Use Alone overdose prevention line [17], where volunteers stay on the phone with users and can dispatch help if needed. Future versions will also include directories of local drug checking services, where people can test for dangerous impurities. Flyers will be posted at shelters, mobile clinics, and public charging stations. Future research will assess the app's efficacy in expanding access to harm reduction services and reducing overdoses. It will be shared with social workers and other healthcare providers, who will be interviewed to collect both quantitative and qualitative feedback on implementation. If successful, this model could be adapted to other high-risk urban areas. This research underscores the need for holistic, intersectional, and technology-integrated responses to overdose risk among homeless populations. By integrating lived experience, community-based data, and mobile outreach, the study offers a replicable model for other municipalities. The insights gained hold important implications for osteopathic medicine and public health, promoting care that addresses mind, body, and environment. Community-informed tools like No-D NYC can help close systemic gaps, build trust, and support long-term well-being for those often excluded from traditional systems.

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Informed Consent: Given the vulnerable status of participants experiencing homelessness and/or substance use disorders, informed consent was obtained verbally in a clear, respectful, and trauma-informed manner. Before each interview, participants were provided with a simple explanation of the study's purpose, voluntary nature, confidentiality protections, and their right to withdraw at any time without consequence. Written consent was not required to preserve anonymity and reduce barriers to participation. Participants were given time to ask questions, and only those who verbally affirmed understanding and willingness to participate were included. No identifying information was collected, and participation involved no more than minimal risk. Incentives were non-monetary and practical (e.g., hygiene supplies and home-made food) to avoid coercion.

Ethical Approval & IRB and/or IACUC Approval: This study, titled *Evaluation of Impact of Environmental and*

Socioeconomic Factors on Overdose Rates Among Homeless Populations in Downtown Manhattan, was reviewed by the Touro University NY Institutional Review Board (IRB). It was determined not to require IRB review or oversight, as it does not meet the federal definition of human subjects research under 45 CFR 46. The official determination was issued on August 7, 2024, under Protocol #23478.

Support: This study was supported by two internal awards received by Abraham Libman: the TouroCOM Harlem Summer Student Research Stipend Program and the Touro University Student Research Fellowship Grant. The former provided protected time for full-time research participation by offering a living stipend. The latter offered both a personal research fellowship and separate funding for research-related expenses. These resources were used to support participant engagement, fieldwork logistics, community outreach, and the development of a mobile application to support overdose prevention efforts.

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Poster No. *PH-36
Abstract No. 2025-135
Category: Public Health
Research Topic: Health Disparities/Social Determinants of Health

Breaking Barriers: Unveiling Patients' Voices on Access to Preventive Care A Thoughtful Exploration Through Health Center Patient Surveys

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Context: Preventive care is a fundamental component of public health aimed at reducing disease burden, improving health outcomes, and lowering healthcare costs through early detection of disease, disease prevention, and health promotion [1]. Preventive care encompasses services including, but not limited to, immunizations, screenings, counseling, and management of lifestyle factors [1]. However, disparities in the utilization of preventive services, such as cancer screenings, vaccinations, and routine checkups, persist among racial and ethnic minorities, low-income individuals, and rural populations [2,3,4,5]. Understanding the barriers that contribute to these disparities is crucial for developing targeted interventions to improve equitable healthcare access.

Objective: To investigate barriers to preventive care utilization and examine how sociodemographic, health-related, and systemic factors influence access to services.

Methods: A cross-sectional analysis was conducted using patient survey data from the Health Resources Services Administration database. The dataset includes responses from individuals utilizing federally qualified health centers across diverse sociodemographic backgrounds. From this dataset, 10,000 records were initially screened. Inclusion criteria for the study required survey respondents to be at least 18 years of age, have at least one clinical visit at a Federally Qualified Health Center, and provide complete responses on key variables that were studied. Based on these inclusion criteria, 7,500 records were included for final analysis. Descriptive statistics were used to assess the relationships between demographic factors (income, race/ethnicity, gender, insurance status), chronic conditions (hypertension, diabetes, obesity), health behaviors (smoking, routine healthcare visits), and the likelihood of receiving preventive services, including Pap smears, mammograms, colonoscopies, and vaccinations. Additionally, a multivariate analysis was performed to determine the odds ratios of receiving a mammogram based on variables such as race, income level, and health insurance status.

Results: Findings indicate that preventive care utilization varies significantly by socioeconomic status, chronic disease burden, and routine healthcare engagement. Individuals with higher incomes (> $50K) and those with private insurance had significantly greater screening rates compared to uninsured and low-income individuals (< $15K). Racial disparities were also observed, with Hispanic and Non-Hispanic Black populations engaging in screenings at higher rates than Non-Hispanic Whites, despite facing higher rates of chronic conditions such as hypertension and diabetes. Gender disparities revealed that women were more engaged in preventive care but also had a greater chronic disease burden, whereas men exhibited lower screening adherence but higher rates of smoking and obesity. Notably, individuals who regularly accessed healthcare services were significantly more likely to undergo screenings compared to those who did not.The multivariate analysis findings indicate that variables such as race, income, and access to insurance do significantly impact the odds of receiving a mammogram. Specifically, findings showed that Non-Hispanic Whites have 40% lower odds of receiving a mammogram compared to Hispanics, even after adjusting for income and insurance (p-value: 0.0012). After

analyzing income levels, those earning less than $15k are 27% less likely to get screened than those earning $15k–$35k (p-value: 0.027). Accounting for insurance status, uninsured individuals are 56% less likely to receive a mammogram than those with Medicaid (p-value: <0.001).

Conclusion: The findings highlight income, insurance coverage, and routine healthcare engagement as key determinants of preventive care utilization. Expanding healthcare access for uninsured and low-income populations, promoting routine healthcare visits, and addressing gender and racial disparities through targeted interventions are critical to improving preventive care engagement. Future policy efforts should focus on reducing financial barriers, increasing outreach for underserved populations, and strengthening healthcare infrastructure in rural communities to enhance early disease detection and management.

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Informed Consent: N/A

Ethical Approval & IRB and/or IACUC Approval: This study has been deemed exempt by the Institutional Review Board. IRB Number: #25882.

Support: None reported.

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Poster No. PH-40

Abstract No. 2025-140

Category: Public Health

Research Topic: Musculoskeletal Injuries and Prevention

BREAKING NEWS: An Exploration of Concussion Coverage in Online News Articles

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Context: A concussion is a traumatic injury to brain tissue that alters physiology (1). An incident resulting in a prominent athlete or other public figure suffering a concussion frequently finds its way onto multiple news media sites and can provide key highlights of such injuries that serve to inform public opinion and discussion (2,3). Prior studies have sought to explore terminology, tone, and other characteristics of concussion news coverage (4). Such analyses have found variability in reporting, including the use of subjective terminology such as "minor" or "severe" to qualify concussions, which could potentially influence how such injuries are viewed. In the time since these studies, research, training protocols, and media coverage of concussions have continued to accumulate in influencing the public. Furthermore, journalistic guidelines have continued to evolve through measures such as the Concussion Legacy Foundation's "Media Toolkit" and published articles likewise have listed journalistic guidelines for sports concussions (5,6). Therefore, in light of these new developments, continued evaluation of concussion media coverage is needed to provide insight into how such coverage may have changed.

Objective: The aim of this study was to employ a systematic search methodology to examine the portrayal of concussions in the media by journalists and how such portrayals compared to similar prior studies.

Methods: Google searches were conducted on six consecutive dates between September 26, 2024, and March 23, 2025 to systematically extract the top 40 online news articles resulting from the search term "concussion." Out of the 240 articles examined, 216 were included in the final data analysis. Exclusion criteria included duplicate articles, blogs, and non-human concussions. Once pulled for analysis and screened for exclusion, articles were evaluated based on their description of the incident (i.e. described as "serious" v.s. "minor"), perspective of journalists, teammates, or other direct witnesses of the event (i.e. portraying a "positive" or a

"concerning" outlook), and the article's elaboration on concussions as a whole, such as the inclusion of concussion statistics pertaining to the athlete or general concussion statistics. Results were then also examined for repeated mention of specific athletes in different articles to quantify repeat topics.

Results: 135/216 articles (62.50%) described a concussion-causing event. Of these, 2/135 (1.48%) described incidents using terms such as "minor" or "slight". 47/135 (34.81%) provided neutral commentary. 86/135 described the event as concerning using terminology such as "Slammed", "Full Force", or "Major".

118/216 articles (54.63%) provided quotes from individuals involved with the event (coaches, teammates, etc). Of these, 59/118 (50.00%) used quotes describing the athlete as "feeling fine" or otherwise indicating a positive outlook, 17/118 (14.41%) had a neutral description, and 42/118 (35.59%) mentioned quotes with descriptors such as, "concerned teammates," observers describing a, "dirty/dangerous play," or otherwise indicated a poor outlook.

87/216 articles (40.28%) provided other concussion-related data or context. Of these, 7/87 (8.05%) discussed systemic measures (league-wide or otherwise) to mitigate concussions or otherwise indicated reassuring context such as an athlete having no prior head injuries, 31/87 (35.63%) provided neutral commentary such as simply stating an athlete was in concussion protocol, and 49/87 (56.32%) provided negative context such as reporting a player's repeated concussions and/or negative long term sequelae of concussions.

Several high-profile athletes were mentioned repeatedly by multiple articles. As examples, 11/216 (5.09%) of articles mentioned Tua Tagovailoa, 17/216 (7.87%) mentioned Malik Nabers, and 16/216 (7.40%) mentioned Jaylen Hurts.

Conclusion: The article analyses in this study indicate a potential change in the previous pattern of media portrayal of concussions to the public. While previous studies have portrayed a less concerned view of concussions with frequent use of terms potentially downplaying concussion severity, our findings indicate an overall higher level of concern reflected by journalists regarding the incidence, severity, and sequelae of concussions (4). This is indicated by the authors' choice of language, with the majority of written articles pointing to the seriousness of the injuries or concerning statistics and history surrounding concussions. Other points of interest include the frequency of concussions sustained by high-profile athletes across multiple articles, which potentially indicates a shift toward reinforcing serious cases to the public, though this may also be related to the timing of when articles were accessed in relation to when such individuals were injured. Other potential explanations for this shift could include the emergence of resources such as the Concussion Legacy Foundation's "Media Toolkit" and published articles in journals listing journalistic guidelines for sports concussions (5,6). Continued vigilance of journalists to accurately portray the serious nature of concussions is paramount to public education of this pathology. We applaud the efforts of journalists evaluated in this study and call for further efforts to continue to educate the public.

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Support: None reported.
Financial Disclosures: None reported.

Poster No. *PH-41
Abstract No. 2025-024
Category: Public Health
Research Topic: Health Disparities/Social Determinants of Health

A Cross-Sectional Study of Biopsychosocial Factors Associated with Utilization of Osteopathic Manipulative Treatment Among US Adults

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Context: Osteopathic manipulative treatment (OMT) is a manual intervention used in osteopathic medicine to treat somatic dysfunction[1,2]. While commonly associated with musculoskeletal conditions such as low back pain, neck pain, and sports injuries[3-5], OMT has broader therapeutic applications, including support for systemic and chronic health issues through its effects on structural alignment, circulation, autonomic tone, and patient perception[6-8]. Although a growing body of evidence supports its clinical efficacy—particularly in randomized controlled trials and systematic reviews—OMT remains significantly underutilized. One survey from 2018 found 77.74% of osteopathic physicians use OMT on less than 5% of their patients, and 57% of osteopathic physicians did not use OMT at all[9]. Furthermore, sparse data exists to estimate use of OMT individually, as it is commonly grouped with chiropractic care in most national surveys. The 2012 NHIS data showed that 8.5% of US adults had used either chiropractic or osteopathic manipulation in the previous 12 months[10]. However, a secondary analysis on the same subset of respondents showed that of the 8.5% that used manipulation therapy, 97.6% used chiropractic[11]. This would put use of OMT at 0.2% of the US adult population [10,11]. This is far fewer than the population likely to benefit, as approximately 20% of the US adult population has conditions that OMT has been associated with effective symptom relief [3-5, 12-14]. This gap between evidence and real-world uptake suggests barriers in awareness, referral patterns, and access. Understanding the demographic, clinical, and psychological correlates of OMT utilization is essential to inform targeted outreach, improve referral practices, and support the broader integration of OMT into patient-centered care models.

Objective: To identify demographic, clinical, and psychological characteristics associated with the use of OMT among U.S. adults using a biopsychosocial framework, with the goal of informing population outreach, access strategies, and clinical integration.

Methods: A cross-sectional analysis was conducted using data from a nationally representative survey of 3,022 U.S. adults collected in August 2024. The sample was quota-matched to reflect U.S. distributions by age, sex, race/ethnicity, and geography. Participants with incomplete data were excluded. The Thought Impact Scale (TIS) was collapsed into quartiles, and Pearson Chi-square tests were used to evaluate associations between OMT use and demographic, medical, and TIS variables. For continuous psychometric measures, Levene's test was used to assess variance equality, followed by either independent samples t-tests or Welch's t-tests as appropriate. Unadjusted logistic regressions were performed for each variable, followed by a multivariate logistic regression model containing all demographic predictors. Models were then done with each non-demographic variable adjusted for all demographics. Variance inflation factors (VIFs) were calculated to assess multicollinearity. Analyses were performed using Python in Google Colab, with pandas, pyreadstat, numpy, scipy.stats, and statsmodels.api. Statistical significance was set at two-sided $p \leq 0.05$.ResultsOf the 3,022 respondents, 102 (3.4%) reported using OMT in the past year. Age and employment status were the strongest demographic predictors. Adults aged 35–49 had significantly higher odds of OMT use compared to those aged 18–34 (adjusted odds ratio [aOR] = 2.07; 95% CI: 1.22–3.51; $p < 0.001$). Full-time (aOR = 3.40; 95% CI: 1.92–6.03) and part-time employment (aOR = 2.22; 95% CI: 1.13–4.38) were also significantly associated with increased OMT use. No significant differences were found for sex, race/ethnicity, income, education, residence, or insurance status in the adjusted model.Several chronic medical conditions were independently associated with OMT utilization. These included Long COVID-19 (aOR = 4.45; 95% CI: 2.44–8.12), chronic lung disease (aOR = 4.30; 95% CI: 2.27–8.15), fibromyalgia (aOR = 3.52 95% CI: 1.82-6.79), chronic pain (aOR = 3.29 95% CI: 2.17-4.98), stroke (aOR = 3.25; 95% CI: 1.55–6.83), and chronic kidney disease (aOR = 3.14; 95% CI: 1.55–6.35). Other conditions significantly linked to OMT use included hypertension, diabetes, migraines, panic disorder, asthma, rheumatoid arthritis, anxiety, depression, low back pain, and acute COVID-19. Conditions such as cancer, high cholesterol, and heart disease were not significant after adjustment. BMI categories also showed no significant adjusted associations.Psychological traits were strong independent predictors. Higher scores on several Multidimensional

Assessment of Interoceptive Awareness (MAIA) subscales—Body Listening (aOR = 1.08; 95% CI: 1.03–1.14), Not Worrying (aOR = 1.08; 95% CI: 1.03–1.13), Self-Regulation (aOR = 1.07; 95% CI: 1.02–1.12), Attention Regulation (aOR = 1.04; 95% CI: 1.01–1.06), and Emotional Awareness (aOR = 1.04; 95% CI: 1.00–1.08)—were all associated with greater odds of OMT use. Additionally, lower scores on the Spiritual Index of Wellbeing subscales Life Scheme (aOR = 0.95; 95% CI: 0.92–0.98) and Self-Efficacy (aOR = 0.91; 95% CI: 0.88–0.94) indicated that OMT users were more likely to report reduced perceived meaning and control over health. Participants in the highest TIS quartile were nearly three times more likely to use OMT compared to those in the lowest quartile (aOR = 2.81; 95% CI: 1.46–5.41; p = 0.001), suggesting a strong relationship between subconscious bodily orientation and treatment-seeking behavior. No significant differences were observed for Big Five personality traits, locus of control, or additional MAIA subscales. Overall, OMT utilization was associated with a distinct profile of middle-aged, employed individuals who have chronic medical conditions and exhibit greater body awareness, emotional sensitivity, and lower perceived control over health outcomes.

Conclusion: This study identified multiple demographic, clinical, and psychological predictors of OMT utilization in a nationally representative sample. OMT users were more likely to be employed adults aged 35–49 with chronic or post-viral conditions and specific psychological profiles characterized by interoceptive sensitivity and reduced self-efficacy. These findings can inform referral patterns, provider training, and access initiatives aimed at expanding OMT's role in patient-centered care. Future longitudinal studies are needed to assess causal pathways, evaluate long-term outcomes, and refine strategies for incorporating OMT into chronic disease management.

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Informed Consent: Informed consent was conducted online through the Qualtrics Inc. interface. It was presented at the beginning of the survey. Those who did not consent were directed out of the survey.

Ethical Approval & IRB and/or IACUC Approval: This study was a secondary analysis of a dataset acquired through Qualtrics Inc., deemed non-human subjects research by the local IRB.

Support: None reported.

Financial Disclosures: None reported.

Poster No. *PH-42

Abstract No. 2025-052

Category: Public Health

Research Topic: Health Disparities/Social Determinants of Health

Anatomy Academy: Evaluating a Children's Health Education Outreach Program

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Context: Vulnerable populations face health inequities due to barriers in accessing accurate information and the ability to practice positive health habits [1]. Community health education initiatives offer a focused approach to addressing disparities by providing groups with tailored resources and knowledge [2]. Given the existing gaps in health outcomes and life expectancy of Kansas City, MO residents based on zip code, the importance of a youth health education program is clear [3]. Anatomy Academy is an educational outreach program under Kansas City University's Score 1 for Health that teaches 4th and 5th grade students human anatomy and health education. Osteopathic medical students (OMS) deliver lessons covering the body's major systems. The Anatomy Academy curriculum uses interactive sessions to enhance knowledge and promote positive exposure to healthcare in historically underserved communities within the Kansas City, MO area [3].

Objective: To evaluate the effectiveness of an OMS led educational intervention program in improving elementary student knowledge of health education and human anatomy.

Methods: Anatomy Academy addresses barriers in youth health education by aligning with state teaching standards for science and introducing hands-on activities to improve comprehension of health topics. The program includes eight one-hour sessions that each focus on a different topic, including the musculoskeletal system, the heart, the lungs, the mouth, the gastrointestinal system, the senses, the skin and sun safety, and the brain. Each session starts with a brief review of previous topics, followed by students rotating through four different hands-on stations led by OMS to further engage students in the material. The stations include interactive activities like making a lung model, games like a cardiovascular relay race, and visual aids to better depict sugar intake.

This evaluation assessed data from pre- and post- test surveys administered to program participants (N=76) across two elementary schools to analyze student understanding of human anatomy. Program participants had to complete both surveys to be included in the analysis. Students completed a pre-test survey in session one and a post-test survey at the end of session eight. The survey was administered electronically and consisted of multiple choice and true/false questions to measure participants' understanding of content. Students received Anatomy Academy program completion certificates after submission of the post-test survey. A paired t-test was used to analyze and compare pre- and post-test scores.

Results: There were 76 elementary age students from two schools included in the analysis. The average pre-test score was 58.1%, while the average post-test score was 71.5%, indicating a significant improvement in knowledge retention ($p<0.05$). Following the end of the 8 session program, there was an average of a 13.4% increase in score improvement.

Conclusion: This evaluation indicates that Anatomy Academy has a significant impact on improving students' understanding of human anatomy and health information. OMS were able to engage with elementary age students to encourage a positive learning environment with interactive material. These findings suggest that student involvement in Anatomy Academy is associated with positive learning outcomes.

One limitation of this study is that learning outcomes are assessed immediately before and after Anatomy Academy facilitation, and there is no long-term assessment. Future research could assess extended retention of program material through a prospective study. This could provide useful information on longitudinal recall of content, which could be applied to real life health decisions and long term habits.

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Informed Consent: Due to this study being a program evaluation project, no informed consent took place.
Ethical Approval & IRB and/or IACUC Approval: This study was deemed exempt from IRB approval.
Support: None reported.
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Poster No. *PH-43
Abstract No. 2025-055
Category: Public Health
Research Topic: Health Disparities/Social Determinants of Health

Beyond the Breath: How Social Determinants Shape Asthma Prevalence across Kansas City

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Context: Asthma is a leading chronic health condition that continues to burden Communities across the United States. In the greater Kansas City area, 8% of adults were affected by asthma in 2021 (1), highlighting a significant public health challenge. Previous research suggests that social determinants of health (SDOH) such as socioeconomic status, housing quality, and access to healthcare influence the prevalence and severity of asthma. However there exists a gap in the literature pertaining to localized zip-code level analysis of these relationships. This study aims to assess the correlations between various SDOH and asthma prevalence (CASTHSMA) in the metropolitan Kansas City Area publicly available data.

Objective: By understanding the complex interplay between social determinants and asthma risk, we aim to inform targeted interventions that reduce health disparities in Kansas City and promote community-wide well-being.

Methods: This case-control study analyzed asthma prevalence across 70 zip codes in the Kansas City Metropolitan area (Kansas City, Missouri, and Kansas City, Kansas) using publicly available data from multiple sources, including the American Community Survey, CDC PLACES, the Environmental Protection Agency, National Center for Health Statistics, Neighborhood Atlas, and Open Data KC (2022-2024). Thirty-seven social determinants of health (SDOH) indicators were examined, including factors such as poverty, education, housing, and environmental exposures. The primary outcome, asthma prevalence (CASTHMA), was normalized using inverse normal transformation. Bivariate correlations between each SDOH indicator and asthma prevalence were assessed using Pearson's correlation. Multicollinearity was addressed through variance inflation factor (VIF) analysis, excluding features with VIF ≥ 5. Ordinary Least Squares (OLS) regression modeled asthma prevalence across zip codes, and cross-validation assessed model performance. Benjamini-Hochberg correction was applied to control the false discovery rate (FDR). The demographic profile included 62% White, 20% African American, and 18% other.

Results: The analysis revealed several key SDOH factors significantly correlated with asthma prevalence. Notably, disability ($r = 0.849$, $p<0.001$), obesity ($r = 0.811$, $p<0.001$), smoking ($r = 0.815$, $p<0.001$), and low physical activity ($r = 0.840$, $p<0.001$) all showed strong positive correlations with asthma. Conversely, life expectancy ($r = -0.718$, $p<0.001$) and median household income ($r = -0.668$, $p<0.001$) exhibited strong negative correlations, suggesting that these factors may serve as protective elements against asthma. The final regression model identified nine significant predictors of asthma prevalence, including unemployment, poverty, obesity, and housing quality. The model's R^2 value was 0.8744, indicating a strong fit to the data, and the best model had a mean squared error (MSE) of 0.0271.The OLS regression model produced the following equation for asthma prevalence (CASTHMA, transformed): CASTHMA = 0.0003 + (0.0584 × Unemployed) - (0.2275 × Binge Drinking) - (0.1005 × Vacant Housing) - (0.0343 × Life Expectancy) - (0.1382 × Median Household Income) + (0.2777 × Poverty) + (0.1357 × High School Graduate) - (0.3211 × White) + (0.2716 × Obesity).

Conclusion: This study has several limitations that should be acknowledged. First, the analysis was based on data from 70 zip codes in the Kansas City Metropolitan area, which limits the sample size and may reduce the generalizability of the findings to other regions or larger datasets. The cross-sectional design of the study restricts the ability to draw causal conclusions, and longitudinal studies would be needed to explore the directionality of the relationships observed. Additionally, some of the SDOH variables, such as smoking and binge drinking, rely on self-reported data, which may introduce bias, particularly in areas with lower health literacy or reporting accuracy. Multicollinearity

among several SDOH variables led to the exclusion of certain predictors in the final regression model, potentially limiting the depth of analysis. Moreover, the study is geographically limited to Kansas City, and findings may not apply to areas with different demographic or social characteristics. Despite these limitations, this study provides valuable insights into the role of SDOH in asthma prevalence and lays the groundwork for future research and interventions.

This study underscores the importance of social determinants of health in shaping asthma prevalence in the Kansas City Metropolitan area. The findings suggest that economic vulnerability (poverty, unemployment), environmental factors (vacant housing, life expectancy), and behavioral risk factors (obesity, binge drinking) all play significant roles in determining asthma rates across zip codes. Notably, communities with higher rates of poverty, obesity, and unemployment are at greater risk for asthma. On the other hand, higher life expectancy and better housing quality serve as protective factors. Life expectancy, in particular, reflects better overall community health and access to healthcare, which can help mitigate the factors that exacerbate asthma. These insights highlight the need for community-level interventions that address these upstream social determinants to reduce asthma burden. Public health efforts should focus on improving economic stability, increasing access to healthcare, and addressing environmental hazards to mitigate asthma risks, particularly in underserved areas.

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Informed Consent: N/A
Ethical Approval & IRB and/or IACUC Approval: IRB Determination Letter - Dr. Shae - IRB NHSR # 2296267-1 -Investigating the Impact of Social Determinants of Health on Disease Outcomes - 030425.
Support: None reported.
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Poster No. *PH-44
Abstract No. 2025-065
Category: Public Health
Research Topic: Health Disparities/Social Determinants of Health

Perceptions of Health with Attention to Specific Bodily Systems Among Refugees in Erie, PA

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Context: The United States has been a home for refugees worldwide. In 2024, there were a recorded 106,000 refugees that arrived in the United States as compared to 75,100 in 2023(1). Despite these growing numbers, it has yet to be determined if this migration influences any change in refugees' health. This survey was set in Erie, Pennsylvania - the fourth highest receiving state for refugees in the United States; 4,445 people, or 4.4% of all incoming refugees(2). The survey focused on assessing new refugees' perception of which bodily systems they report the most medical conditions or concerns, and their perception of their familiarity and willingness to incorporate osteopathic medicine within their healthcare. Refugee research has many gaps within it as there is limited funding, a heightened number of barriers, such as language or education, and access to assess their current standard of patient care- a reality confirmed by the United States Committee for Refugees and Immigrants (USCRI), one of the departments with which we worked with(3).
Objective: The goal of this study was to determine which bodily systems were reported to need greater medical attention within the refugee population arriving in Erie, PA, USA. It was also to determine if a transition into the U.S. contributed to a difference in the quantity of diagnosed medical conditions. We hypothesized that systems pertaining to infectious diseases would be most affected due to the poor environmental conditions of prior refugee camps, conflict zones, or low-income countries of origin. Additionally, we aimed to assess the level of familiarity and interest in receiving osteopathic medical care. Here, we hypothesized that there would be low familiarity with osteopathic medicine due to the limitation of the field within the countries of origin, but that there would be interest to receive osteopathic care due to its minimalistic nature.
Methods: This study occurred in the timeline of collection between the Fall of 2024 through the Winter of 2025. The design was a cross-sectional survey that utilized a sample group formed from refugees seeking the services of the Erie

United States Committee for Refugees and Immigrants (USCRI) office and the Erie Health Department. All questions were written to avoid inquiring about identifiable information, categorizing volunteers by country of origin, age, gender, and education level. The surveys were translated into the following languages: English, Spanish, Arabic, Russian, Pashto, Dari/Farsi, and Swahili, these being the most representative languages of the current population groups. The survey also incorporated pictographs for the question pertaining to bodily systems to minimize the reliance on written communication. The surveys were physically printed to avoid any technological barrier and were provided to the liaisons at both organizations for distribution and collection. The two organizations collected the completed surveys in sealed envelopes to ensure anonymity. The questions that were asked were to note which bodily systems the refugees had medical conditions in the past five years, the timeline surrounding their medical condition's potential resolution, and the acquisition of any new conditions. The bodily systems included pictograms for the following written words: heart, lungs, stomach/intestines, liver, kidney, skin, musculature, brain/nervous system, mental health, and other. The questions that were asked for the timeline were "Were these medical conditions/concerns resolved prior to your arrival in the United States?", "If not, were these conditions treated in the United States since arriving?", and "Have you had any new conditions since arriving in the United States?", followed by "Yes, No, and Not Applicable" choices. Osteopathic research significance was highlighted with the incorporation of the questions "Doctors of Osteopathic Medicine treat patients using a holistic philosophy in which treatment of the body can be done using hands-on manipulation, with or without medication, to promote overall well-being. Have you heard of osteopathic medicine?", and "Would you be interested in seeing a physician trained in Osteopathic medicine?", followed by "Yes, No, and Not Applicable." Survey completion was limited to consenting adult participants 18 years of age and older. To assess statistical quantitative outcomes, the question responses were counted and quantified within Excel and GraphPad Prism. Bar graphs were created to note the distribution of responses among all participants.

Results: The response rate was 97%, or 98 participants indicating consent out of a total of 101 on the survey sheet, originating across 21 countries (including but not limited to Afghanistan, the Democratic Republic of the Congo, Ukraine, and Syria). The bodily systems that were marked as areas of high concern by our survey population were the gastrointestinal, pulmonary, musculoskeletal, and psychiatric systems: 13.9%, 8.9%, 8.9%, and 8.9% respectively. 57.4% of participants selected that their medical conditions were not resolved before they arrived in the USA. Since coming to the U.S., 37.6% noted that they had still not gotten their conditions treated, although 30.7% selected that they had received treatment. While 45.5% of our population had not attained new conditions since their arrival, 38.6% had been diagnosed with new conditions. Finally, 57.4% of our participants had not heard of osteopathic medicine, although following an explanation of the field, 61.4% indicated an interest in being seen by an osteopathic physician.

Conclusion: The bodily systems in which the highest proportion of our participants reported concerns were the gastrointestinal, pulmonary, musculoskeletal, and psychiatric systems. In addition, the majority expressed interest in being seen by an osteopathic physician. External sources support these findings by showing evidence that the burden of respiratory diseases in refugees is exacerbated by poor living conditions(4), and refugees have high and persistent rates of PTSD and depression(5). Due to the pre-established screenings for long-standing infection or possible transmission within the gastrointestinal system(6), it is reasonable to see our highest percentage of concern stemming from the gastrointestinal system. Limitations include a potential selection bias as the population has resided in the USA for less than a year, reduced application to refugees within the United States as a whole, as the study was only conducted in Erie, PA, and a potential language barrier despite the efforts towards translation and pictograph incorporation. With this information, we gain insight from a vulnerable and underserved population in our country, who typically receive insufficient representation in survey research. We hope these findings can aid in future efforts from physicians or government agencies to incorporate appropriate screenings with heightened attention to these reported bodily system areas. We also hope that the survey itself can be utilized by any local community that may need more insight into gaps in care for their refugee population.

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Informed Consent: Per LECOM IRB, the cover letter and written consent on the survey were requirements for consent due to the exempt IRB status of the study.
Ethical Approval & IRB and/or IACUC Approval: LECOM IRB Exempt on November 10, 2023
Support: None reported.
Financial Disclosures: None reported.

Poster No. *PH-45
Abstract No. 2025-103
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Research Topic: Health Disparities/Social Determinants of Health

Evaluating Community Feedback Integration in Community Health Needs Assessments: Methods and Impact

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Context: Not-for-profit (NFP) hospitals have been under greater scrutiny regarding their community benefit (CB) obligations. The Internal Revenue Service (IRS), which oversees the CB program, requires hospitals to "solicit and take into account input received" from individuals and organizations that represent the "broad interests of the community", such as a governmental local health department, and members of medically underserved, low-income, and minority populations. However, research by Pennel et al. (2017) highlights a persistent gap: while hospitals often engage institutional stakeholders in the Community Health Needs Assessment (CHNA) process, they less frequently involve a diverse range of community members (1). This limited participation raises concerns about the inclusiveness and equity of CHNA processes. Our study addresses this gap by examining how hospitals collect community input and the extent to which that feedback is meaningfully integrated into their CHNAs.
Objective: To examine how hospitals solicit and incorporate community input into their Community Health Needs Assessments and Implementation Strategies (IS), and to assess the extent to which this feedback influences identified priorities and implementation strategies.
Methods: Our study was a retrospective text analysis of publicly available CHNA/ISs that we collected from 543 hospitals. We stratified by state randomly and excluded for profit and specialty hospitals. Using qualitative content analysis methods, we extracted data from CHNAs/ISs conducted between 2018-2021 by a 20% representative sample of US nonprofit hospitals (N =543). We also used 2018 data from the American Hospital Association Annual Survey and Agency for Healthcare Research and Quality Social Determinants of Health databases. We described our sample and compared it to all United States nonprofit hospitals. We first identified which hospitals (N=57) actually collected feedback. Of the hospitals who coded "yes" we read their CHNAs/ISs to thematically code in what ways they approach receiving the feedback. This work has particular significance for osteopathic medicine, which emphasizes holistic, patient-centered care and the importance of understanding the broader community context in which individuals live and receive care. Ensuring robust and meaningful community input into CHNAs aligns with core osteopathic values and supports more equitable and responsive healthcare delivery across diverse populations.
Results: Our sample was statistically representative of U.S. nonprofit hospitals. Among the hospitals that provided detailed descriptions of their feedback collection methods, we identified a range of approaches. Twenty-seven relied on paper survey responses to collect community input while twenty hospitals utilized web-based methods, primarily through online surveys. Thirteen hospitals engaged in community outreach efforts, such as hosting open houses specifically designed to gather public input. Two hospitals employed telephone-based data collection, contacting patients directly to solicit feedback. Additionally, several hospitals implemented unique, site-specific strategies not seen elsewhere, including gathering feedback during clinical rounding or while patients waited for scheduled appointments. While some of the coded hospitals did include community feedback in their CHNAs, some lacked specificity in

describing how that feedback was collected, limiting the clarity and reproducibility of their approach. We found that many of the more successful hospitals utilized a combination of survey approaches, suggesting that a multi-modal strategy may enhance both the reach and quality of community input.

Conclusion: This research highlights critical gaps in how hospitals engage communities in CHNAs and implementation strategies to address local health needs. While nonprofit hospitals have made progress in identifying regional health concerns, there remains a need for stronger alignment between assessment findings and meaningful community involvement. When it comes to soliciting input from the community, few hospitals employ strategies that go beyond posting their CHNA/IS on their website for public comment. While posting CHNAs/ISs online meets the IRS requirements for making the documents widely available, it does not seem aligned with the spirit of community engagement requirements. To foster deeper engagement, hospital leaders and community benefit directors should consider adopting more proactive and inclusive strategies that amplify diverse community voices. In doing so, they not only strengthen alignment with regulatory expectations but also enhance the relevance and impact of their community benefit efforts. Osteopathic physicians are taught to treat the whole person —not just the symptoms they present with—and to consider the broader social, environmental, and economic factors that influence their health. These social determinants of health play a critical role in shaping patient health and outcomes. By studying how hospitals gather and act on feedback from their surrounding communities, we can better identify and address barriers to care. This community-informed approach empowers hospitals to deliver more equitable, responsive, and holistic care tailored to the needs of the populations they serve.

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Ethical Approval & IRB and/or IACUC Approval: N/A
Support: None reported.
Financial Disclosures: None reported.

Poster No. *INT-1
Abstract No. 2025-011
Category: International Health
Research Topic: International Health

Stigma, Culture, and Care: A Quantitative Analysis of Mental Health Treatment-Seeking Behavior Among Hondurans

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Context: During a Medical Service Trip to rural Honduras, novel data was recorded that indicated Honduran citizens have a negative outlook on seeking treatment for mental health disorders. This data is one of a kind with very little research being done on mental health within third world countries like Honduras, and subsequently a notable gap in the literature on the receptivity of citizens towards treating mental health conditions.

Objective: To use previously collected data on depression and anxiety in Honduras, and quantify the attitudes of citizens specifically towards treatment, with a concurrent analysis on the confounding variables surrounding mental health in Honduras as a whole.

Methods: Data was collected over the course of three years between 2023 to 2025 in the Santa Barbára region of Honduras spanning over 2000 patients seen by the team involved in the medical aid. Results were narrowed down to 98 total patients who fell into the right criteria, and completed the necessary survey to qualify into the study. The survey was collected by a group called Action for Education, a non-profit organization from the United States who specializes in providing primary care to this specific region of Honduras. The survey consisted of 4 questions that followed up after the completion of a complete medical history, with a focus on openness, and accessibility towards treatment of mental health disorders with associated variables. Data was analyzed using Pearson's correlation coefficient, Two Tailed T-Test assuming equal variances. This study was designed in alignment with the osteopathic philosophy that health is influenced by the interrelationship of mind, body, and spirit

and the importance of treating the whole person. In line with this approach, the survey methodology incorporated cultural, psychosocial, and environmental variables that may influence mental health treatment-seeking behavior. Internet use, social support, household structure, and perceived stigma were measured as reflections of determinants of health beyond clinical treatment. These factors support a more holistic approach to mental health, particularly in communities where structural and cultural influences may deter individuals from seeking treatment.

Results: The results of the initial survey asking if patients would seek professional help to a mental health disorder showed a 52.9% majority in favor of denying treatment from a professional (Image 1). Conversely, a majority of survey respondents also chose they were open to talking to friends about mental health disorders at a 94.1% rate (Image 2). Using a Pearson Correlation Coefficient, the results showed an increase of the standard deviation of treatment-seeking behavior of 0.32 per hour of internet usage time showing a positive correlation between the two variables above the 0.30 threshold standard deviations for strong correlation. Using a Two-Tailed T test, it was found that the results of the Pearson Correlation Coefficient were statistically significant with P = 0.00002787795772. Additional survey results showed that 42.1% of respondents would not select treatment based on both cost, and also the same percentage had no reason as to why they would not seek out treatment. 5.3% of respondents would not seek out treatment due to work conflicts. Lastly, 10.5% of respondents would not seek out treatment on the account of distance.

Conclusion: According to Piette, et al. in a 2010 study, they stated that patients with increased access to technology were more likely to seek out medical attention [1]. After carefully reviewing the results of the data collected from 98 patients in Santa Barbara, Honduras during a medical trip, there is a positive relationship between hours spent utilizing technology per week, with likelihood of seeking out treatment for mental health disorders. There is a significant lack of availability of psychiatric care within third world countries, with the cited number being one psychologist per one hundred thousand people in Honduras [2]. Through this study we are able to identify a notable gap within the literature on the attitudes of Honduras towards seeking out treatment when faced with mental health conditions, as well as an expressed lack of availability of healthcare directed towards mental disorders. With the data showing a majority of Hondurans denying the option of seeking out treatment for mental health disorders, if they were faced with one, we strongly encourage further research into expanding availability of care for disorders such as Depression, and Anxiety within Honduras.

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Informed Consent: All patients involved in the surveys during the years 2023, 2024, and 2025 consented verbally to the release of information anonymously for research purposes.

Ethical Approval & IRB and/or IACUC Approval: Exempt

Support: None reported.

Financial Disclosures: None reported.

Poster No. *INT-4

Abstract No. 2025-048

Category: International Health

Research Topic: International Health

Potential Risk Factors and Prevalence of H. pylori Infection among Adult Patients with or without Dyspepsia Symptoms in Guatemala

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Context: For our project, we conducted a study investigating the potential factors that contribute to the prevalence of H. Pylori infection among men and women in the Guatemalan population. H. pylori is one of the most common infections in Guatemala [1]. There are many potential risk factors associated with this infection. Past studies have shown that risk factors such as socio-economic status, poor food hygiene,

contaminated water resources, density/crowded living conditions, smoking, use of NSAIDS, BMI, and family history of gastric disease predispose Guatemalans to this infection [3,4,5,6]. In Guatemala, recent data suggests the prevalence of H. pylori has been reported to be greater than 50% [2]. Adult patients presenting at Kansas City University's Global Health clinic who participated in the study completed a survey with questions pertaining to history of gastric symptoms and or previous diagnosis of H. pylori infection, family history of gastric cancer and/or peptic ulcers, type of drinking water, use of smoking, and size of household. We performed a H. pylori antibody fingerstick rapid blood test to identify if they have H. pylori antibodies present.

Objective:

- To identify the prevalence and risk factors of *H. pylori* infection in Guatemala
- To provide awareness of *H. pylori* infection in Guatemala
- To foster the development of future studies of *H. pylori* infection in Guatemala.

Methods: The study consists of a survey and an *H. pylori* blood test. At the end of their clinic visit, patients over the age of 18 were asked if they wished to participate in the study. If they verbally consented to the study, they received an H. pylori fingerstick test using the usual sterile technique and were given a 10-minute survey to complete using the recruitment statement. Recruitment scripts were in English and Spanish. The survey includes questions about biological and behavioral contributors to *H. pylori* infection. Risk factors asked in the survey for *H. pylori* were age, sex, household number, type of drinking water source used, smoking status, anti-inflammatory medication use, family history of stomach cancer, history of peptic ulcer disease, past diagnosis of intestinal disease and if they are currently taking medication and/or have taken medication in the past for the intestinal disease, and if they had gastrointestinal symptoms in the last month (burping, flatuence, nausea, vomiting, stomach pain, acid in the throat, and black stool).

Participants were not randomized in this study. 52 participants were enrolled in the study. Descriptive statistics were used to examine counts and frequencies of all variables assessed in the surveys. Chi-squared tests and unpaired t-tests were used to examine the association between categorical variables and mean values of groups based on the variables assessed in the study, respectively. All tests were based on the total number of participants recorded. In addition, we used an adjusted odds-ratio to assess the subject's risk of disease using a confidence interval of 95%.

Results: Of the 52 participants enrolled in the study, a total of 47 adult patients were used in data analysis. The mean age was 45.5 ± 17.8 years, and 40 (85.1%) were female. Overall, *H. pylori* antibody positivity was detected in 5 individuals (10.6%). All 5 participants who tested positive for *H. pylori* were female. The mean of BMI was 28.0 ± 6.7 for all participants. 88.9% of participants were from the lowest socioeconomic class (earns less than 3,000 quetzales per month). 93.5% of all participants reported currently not smoking. 80.9% of participants reported having stomach pain, 65.2% reported having flatulence, and 77.8% of participants reported having acid in the throat.

From the Chi-squared and Independent unpaired t-tests, the p-values were not statistically significant among all risk factors, and ranged from 0.087 (currently using medication for intestinal disease) to 0.806 (vomiting), all of which are greater than the 0.05 p-value used for determining significance.

The odds ratio was also calculated for all risk factors with *H. pylori* status, but none were statistically significant. Therefore, these tests indicated no significant relationship with the *H. pylori* blood test.

Conclusions: The Chi-squared, independent t-test, and the odds ratio did not demonstrate any statistical significance in the risk factors tested and their relationship to H. pylori status. While the study has clear limitations, more research should be done to better define the relationships between *H. pylori* infection and its risk factors in Guatemala. Future studies would need a larger sample size and more accurate *H. pylori* testing for more conclusive results.

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Informed Consent: Patients over the age of 18 were asked if they wanted to participate in the study by using the recruitment script we read to them. If they verbally consented to the study, they filled out a survey and received an *H. pylori* blood test.
Ethical Approval & IRB and/or IACUC Approval: Kansas City University IRB has approved the research study under 45 CFR 46.104 Exempt Category (d – 2- criteria # i) on January 16, 2025.
Support: None reported.
Financial Disclosures: None reported.

Poster No. *INT-5
Abstract No. 2025-058
Category: International Health
Research Topic: International Health

The Impact of Visual Aids to Enhance Patients' Medical Knowledge Retention in a Rural Kenyan Clinic

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Context: This study was conducted to assess efficacy of visual aid use in the setting of international medical mission trips to assist US medical students in educating patients with a different native language. Previous studies have addressed the positive impact visual aids can have regarding patient education. They did not, however, address care delivered by medical students in resource limited settings.
Objective: This study aimed to determine whether a visual aid distributed by third year US medical students on a medical mission trip to patients diagnosed with Hypertension contributes towards their understanding of their disease. Specifically, the visual aids will illustrate what lifestyle choices contributed to their disease, and what lifestyle choices will help manage their disease. As this study is performed on a medical mission trip by third year US medical students in a country where English is not the first language, this study will illuminate whether visual aids assist students in explaining diagnoses to patients whose primary language is not English in a country outside of the United States.
Methods: We conducted a pretest-posttest randomized controlled trial enrolling patients that had a pre-enrollment diagnosis of hypertension in a student ran rural community clinic in Kenya, Africa. Utilizing Luo interpreters without formal training, clinic patients were approached for enrollment if they were 18 or older and had a pre-existing diagnosis of hypertension. Once enrolled, patients were randomized in a one-to-one fashion to either receive a visual aid and standard discussion of hypertensive management and lifestyle modification recommendations or to just receiving standard discussion of hypertensive management and lifestyle modification recommendations. All enrolled patients received a pre-study survey at the beginning of the visit and then were seen and treated for their chief complaint. Upon the conclusion of the visit, medial students read a hypertension management and lifestyle modification standardized script to the patients about their diagnosis of hypertension. Those assigned to the control group then completed a follow up survey. Those patients assigned to the visual aid group received a visual aid demonstrating lifestyle choices that positively or negatively impacted their hypertension diagnosis, then received the same follow-up survey as the control group. Multiple paired T tests were conducted to compare pre- and post-survey responses between groups to assess the effectiveness of the visual aid on the measured outcomes.
Results: There were no significant differences in the ages of individuals in either group, the average age of pre-intervention survey takers was 58 years of age ($t(25) = -1.03$, $p = .315$ [2-tailed]). We analyzed a total of 25 pre-test surveys (13 in visual aid group, 12 in control group) and a total of 27 post-study surveys (16 in visual aid group, 11 in control group). In the post-intervention survey, it was noted that the groups shared similar blood pressures with a mean blood pressure of 160/92 mmHg and 161/93 mmHg, for the visual aid group and control group, respectively. Between group analysis indicated that there was a significant improvement in the visual aid group's understanding of the importance of decreasing their blood pressures demonstrated by a statistically significant difference in change scores between the visual aid group and the control group ($t(16.33) = 2.99$, $p = .009$). Although both groups saw an increase in understanding of how food affects high blood pressure, there was no significant difference between the groups on their understanding of how food affects high blood pressure ($t(22.36) = 0.03$, $p = .98$). The visual aid group demonstrated a significant increase in understanding that exercise improves blood pressure compared to the control group ($t(21.78) = 2.13$, $p = .045$).

Conclusion: Based on the data collected, the addition of a visual aid utilized by medical students delivering care to underserved populations in rural Kenya did enhance understanding of their hypertension diagnosis. Participants presented with a visual aid had statistically significant improvement in their understanding how physical exercise impacts hypertension as well as their overall understanding of hypertension as a disease. Interestingly, despite the fact that the visual aid was primarily focused on diet, there was no significant improvement in understanding how diet plays a role in hypertension development between the two groups. We analyzed socioeconomic factors and found that the visual aid group showed higher education attainment with over 75% having a least primary education compared to 36% in the control group. The data from this study can be used to support future use of visual aids when a language barrier is present between patients and providers. The data is also applicable for providers paired with translators possessing minimal formal training, such as the ones used in this study. Additionally, this study specifically supports the utility of visual aids for medical students' interactions with non-English speaking patients, as students face additional challenges of completing their medical training on medical mission trips. Future work on this study could be advanced to include a larger sample size to determine if there is an improvement in understanding how diet impacts hypertension progression, and whether the other socioeconomic factors play a role. Financial Disclosures: None reported Support: None reported Ethical Approval This study was reviewed and approved by the Kansas City University Institutional Review Board. Informed Consent A Consent Recruitment statement was read to patients that met inclusion criteria. The study was deemed exempt from signed consent as we were not collecting any individual identifying data.

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Informed Consent: A consent recruitment statement was read to patients that met inclusion criteria. The study was deemed exempt from signed consent as we were not collecting any individual identifying data.

Ethical Approval & IRB and/or IACUC Approval: The Kansas City University IRB has approved the research study under 45 CFR 46.104 Exempt Category (d)(2)(Criteria # i) & 45 CFR 46.104 Exempt Category (d)(3)(Criteria # i-A).
Support: None reported.
Financial Disclosures: None reported.

Poster No. *INT-6
Abstract No. 2025-095
Category: International Health
Research Topic: International Health

Addressing Healthcare Gaps in Rural India: A Retrospective Study of Patients in a Gujarat Medical Camp

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Context: Rural regions of Gujarat, India face persistent healthcare disparities due to limited provider availability, financial hardship, and transportation barriers. While mobile health initiatives and medical camps have demonstrated effectiveness in underserved settings, literature predominantly focuses on urban populations, leaving rural health needs under-examined. Identifying common health concerns in rural camps may inform tailored resource allocation and policy development.1-2.
Objective: To identify the most common medical complaints among patients attending a short-term medical camp in rural Gujarat, India, and assess barriers to accessing care.
Methods: A retrospective chart review was conducted using records from a seven-day medical camp in rural Gujarat. All patients presenting with medical complaints were eligible for inclusion. Exclusion criteria included patients seeking only dental, optometry, or preventive health education services. Institutional Review Board-exempt data (Application ID: 2025-203) were collected through structured interviews and physical examinations. Demographics, clinical complaints, vital signs, and diagnoses were recorded. A total of 646 patients met inclusion criteria. Diagnoses were categorized by medical specialty. Descriptive statistics were used to analyze the frequency of diagnoses and patient characteristics. This context aligns closely with osteopathic principles,

which emphasize whole-person care by addressing structural and nutritional concerns and promoting culturally informed, holistic outreach efforts.

Results: Of the 647 patients, 520 (80.4%) had at least one diagnosis recorded. Musculoskeletal complaints were most common (n = 167, 32.1%), primarily low back pain (n = 91). Dermatologic (n = 122, 23.5%) and otolaryngology/respiratory (n = 115, 22.1%) issues followed. The cohort's mean age was 34.2 ± 20.3 years, with 29.2% under 18. Gender was recorded in 548 cases (56.4% female). Among adults, 11.3% were underweight (Body Mass Index (BMI) < 18.5), and 8.2% were obese (BMI > 30). In children, 20.2% were underweight. Random blood sugar (RBS) testing in 51 patients yielded a mean of 163.9 mg/dL; 13 (2.01%) met criteria for new diabetes diagnoses (RBS > 200 mg/dL). Blood pressure was recorded in 552 adults (mean 126/76 mmHg). Medication data were available for 625 patients. The most frequently prescribed treatments included analgesics (30.9%), multivitamins (18.7%), and gastrointestinal agents (9.2%). Osteopathic manipulative treatment (OMT) was administered to 22 patients presenting primarily with musculoskeletal complaints such as low back or joint pain. Techniques employed included soft tissue, muscle energy, and myofascial release. Patients receiving OMT reported immediate improvement in pain or mobility following treatment, supporting its utility as a non-pharmacologic option in resource-limited settings.

Conclusion: Musculoskeletal, dermatologic, and respiratory conditions are the most prevalent patient concerns in this rural population. A significant portion of both children and adults were undernourished. Limited access to diagnostic tools and medications reflects broader systemic gaps in care. These findings underscore the need for sustainable, community-based health interventions in rural India and reinforce osteopathic commitments to holistic, preventive, and equitable healthcare. Future studies should also incorporate osteopathic education initiatives to help build local capacity and promote long-term health outcomes.

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Informed Consent: As a retrospective review of de-identified chart data, formal informed consent was waived by the IRB.

Ethical Approval & IRB and/or IACUC Approval: Approved IRB exemption by Nova Southeastern University Institutional Review Board. IRB ID #: 2025-203.
Support: None reported.
Financial Disclosures: None reported.

★**Poster No. *INT-7**
Abstract No. 2025-148
Category: International Health
Research Topic: International Health

Assessing Menstrual Health Education and Awareness Among Women in Iquitos, Peru: A Survey-Based Study

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Context: Iquitos, Peru faces persistent challenges in public health infrastructure, education, and access to care—conditions exacerbated by geographic isolation, cultural taboos, and economic hardship. In rural Peru, women often rely on family, especially mothers, for menstrual knowledge which frequently results in incomplete understanding of menstruation.1 Menstruation remains a stigmatized topic across Peru, where even women who receive formal instruction often report incomplete knowledge, social discomfort, and poor access to resources.2 Previous studies in underserved countries highlight that insufficient education and reinforced stigma surrounding menstruation are associated with decreased school and work participation, unhygienic practices, and emotional distress.3-4 Despite national efforts, the implementation of comprehensive health education remains fragmented and underfunded, limiting its reach and effectiveness.5 During an annual global outreach trip to Iquitos, organized by a medical school chapter of DOCARE International, a team of osteopathic medical students conducted a survey to assess local knowledge, cultural perspectives, and access to menstrual health resources.

Objective: The goal of this study was to assess menstrual health education and awareness among women in Iquitos, Peru, with a focus on understanding the challenges, gaps, and cultural influences surrounding menstrual health

knowledge and practices in this specific region. The project sought to identify any misconceptions, stigma, or barriers that hinder access to proper menstrual health information and resources, thereby informing future interventions. Researchers hypothesized that menstrual instruction would be perceived as insufficient and that cultural stigma, limited resources, and discomfort discussing menstruation would remain significant barriers to informed menstrual health management.

Methods: This cross-sectional study utilized a structured, bilingual survey administered during a week-long seminar series focused on providing sustainable menstrual health solutions and education to girls and women globally held at a global outreach clinic in Iquitos in March 2025. This study was classified as exempt from Institutional Review Board approval. The survey targeted women aged 18 and older and collected data on demographics, menstrual health knowledge, symptom burden, education sources, supply access, and comfort levels discussing menstruation. Surveys were administered by trained student researchers with interpreter support to ensure cultural and linguistic accuracy. The survey included both quantitative (Likert-type scale, multiple choice) and qualitative (open-ended) questions. Responses remained anonymous and were analyzed for descriptive statistics and thematic coding for qualitative responses. Cultural sensitivity and participant privacy were prioritized throughout the study by keeping sessions female-only in congruence with local culture.

Results: Fifty-one women completed the survey. While 88% of respondents reported receiving formal menstrual education in school, 12% rated the quality of this education as "poor" or "did not receive any." Over half (54%) first learned about menstruation at home, most often from their mothers (89%). A notable 33% reported not learning about menstruation until or after menarche. Commonly reported symptoms included cramps (15%), bloating (27%), and heavy bleeding (21%). Nearly half of participants (46%) reported missing work or school due to menstrual symptoms. Regarding resource access, 23% reported only occasional access to menstrual products. When asked what topics were missing in school education, 46% identified a lack of instruction on physical symptoms, 24% noted lack of education on emotional well-being during menstruation, and 22% indicated insufficient guidance on use of menstrual products. Despite these challenges, the majority of women agreed that menstrual education is "very important," with a mean score of 4.9 on a 5-point Likert-type scale. Women also reported a mean Likert-type score of 3.7 for comfort in discussing menstruation publicly. The data indicates that future research is needed to bridge the gaps in menstrual education and remove the stigma from reproductive healthcare to better support the population of Iquitos, Peru.

Conclusion: Findings from this study reveal that while most participants reported receiving some form of menstrual education in school, significant gaps persist in both content and delivery. Many women first learned about menstruation at home, where information lacked context. Formal education often failed to address emotional well-being, product usage, and symptom management. Moreover, a sizable proportion of respondents experienced missed school or work due to menstrual discomfort, and a lack of reliable access to menstrual products was a common concern.

These findings are consistent with previous studies from similar regions, where inadequate menstrual hygiene management is associated with feelings of shame, social withdrawal, and reduced academic and economic participation. The study further confirms that stigma surrounding menstruation remains a powerful barrier to open discussion and informed practices. While most women surveyed recognized the importance of menstrual education and expressed moderate comfort discussing the topic, cultural taboos and emotional discomfort remain significant challenges.

To address these gaps, future outreach should be directed at integrative education with focuses on emotional support, product access, and public discussion strategies to reduce stigma and empower women. By addressing these issues, such efforts may enhance health equity and improve quality of life for women in underserved regions of Peru.

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Informed Consent: When obtaining consent from each participant, a cover letter was provided to all participants prior to participation to relay vital information on the study, including purpose of study, animosity of data, terms of participation, and the risk and benefits of the study being conducted.
Ethical Approval & IRB and/or IACUC Approval: IRB 2025-4 Study was deemed exempt
Support: None reported.
Financial Disclosures: None reported.

★Poster No. *INT-8
Abstract No. 2025-154
Category: International Health
Research Topic: Impact of OMM & OMT

Osteopathic Manipulative Treatment (OMT) for Injury Prevention in Collegiate Baseball Pitchers: Findings and Revised Protocol from a Feasibility Study on Shoulder and Hip Interventions

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Context: Shoulders and elbows are the two most commonly injured joints in overhead athletes[1]. Specifically, Superior Labrum Anterior to Posterior (SLAP) tears, Glenohumeral Internal Rotation Deficit (GIRD), biceps tendinitis and Ulnar Collateral Ligament (UCL) damage remain some of the most commonly occurring injuries[2]. One study by Vargas et. al. reported that pitching was the mechanism of injury in 70% of the biceps tendinitis cases in injured baseball players. The enormous amount of valgus stress placed on the elbow during pitching puts athletes at high risk of UCL injuries. One possible explanation is generalized ligamentous laxity of the athletes at these joints[1,3]. The shoulder and elbow are part of the kinetic chain that acquires energy from the lower body and transmits it through these two joints to the to the baseballball when pitching. Thus, injury at one joint leads to compensation by the other, putting the other joint at further risk of injury as well. Pitching puts the shoulder into forceful internal rotation, one of the fastest human movements in sports[1]. Thus, limited internal rotation can hinder this phase of pitching phase, and the high velocities can provokeinvite more injury. Posterior shoulder capsule tightness, another common physical exam finding in baseball players, is another risk factor for injury, leading to pathology such as rotator cuff and labral tears, shoulder impingements, etc[2]. OMT for the shoulder has been repeatedly proven to be beneficial for these athletes[1,2,4,5]; however, elbow treatment is not emphasized in literature.
Objective: To propose an updated treatment protocol for baseball pitchers to include the elbow based on WCUCOM's feasibility study's results.
Methods: A feasibility study was conducted by William Carey University College of Osteopathic Medicine's (WCUCOM) Osteopathic Manipulative Medicine (OMM) department on baseball pitchers by treating their shoulders and hips and recording their ranges of motion and pitching metrics. Techniques used included Muscle Energy (MET), Balanced Ligamentous Tension (BLT), articulatory, Fascial Distortion Model (FDM), Direct Inhibitory Pressure (DIP), Myofascial Release (MFR), and Counterstrain (CS). To provide a rationale to also include elbows in the treatment protocol for the proposed continuing study, a literature review was conducted on injury prevention with OMT in athletes. The following keywords were used: Osteopathic Manipulative Medicine, Osteopathic Manipulative Treatment, Athletes, Injury prevention, Baseball. The treatment modalities used and the results from the studies were analyzed and compared to WCUCOM's study in order to identify shortcomings, weaknesses, and to propose a new protocol for future studies.
Results: WCUCOM's pilot study showed that 40% of the non-treated players (control group) developed injuries whereas the ones treated with OMT did not. One of the players that developed an injury and had to drop out of the study had a UCL injury. Another player developed biceps tendinitis. The players that were treated experienced increased shoulder internal rotation and abduction after a single treatment ($p<0.05$), but this gain was not maintained at follow-up. Curcio et. al. studied the effects on OMT on shoulder ranges of motion using the Spencer technique. Results showed increased shoulder internal rotation and abduction ($p<0.05$) as well; however, these results were also not retained at follow-up5. Another study by Moore et. al. reported on the positive effects of MET on the posterior shoulder joint. They showed that treating the shoulder abductors resulted in increased adduction and internal rotation ($p<0.05$)4. These studies show that OMT is beneficial in increasing shoulder ROM, thus preventing injuries by stabilizing the shoulder. However, there have been no studies performed at the elbow joint, despite being one of the most injured joints. This review informed the recommendation to include the elbow in the revised treatment protocol. The original protocol from the WCUCOM study was as follows:MET of the throwing shoulder, FDM of bilateral iliotibial (IT) bands, DIP of

bilateral external rotators of hips, LAS of lower extremities, MFR of the abdominal diaphragm, MET of the sacrum, MFR of the scapulothoracic joint, and CS of the subscapularis and latissimus dorsi. It is advantageous to also include the dominant elbow in this protocol, as the elbow joint is the continuation of the kinetic chain. The revised protocol would then include BLT of the elbow, specifically the UCL. Balancing the elbow would stabilize it and allow it to efficiently bear the valgus force during pitching. A balanced shoulder and elbow would provide two stabilized joints that would work effortlessly with each other during pitching, without having to compensate for the other's lack of motion or instability.

Conclusion: The acceleration phase of pitching, one of the fastest movements in sports, puts excessive force on the shoulder and elbow. This puts pitchers at high risk of injuries such as shoulder impingement, rotator cuff tears, SLAP tears, GIRD, and UCL injury. OMT is effective in preventing injuries in overhead athletes. Past studies show increased shoulder ranges of motion in pitchers with OMT. WCUCOM's original study focused on the whole kinetic chain of pitching, but only and treated hips and shoulders. The revised protocol takes into account common elbow injuries and therefore includes elbow BLT in the treatment.

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Informed Consent: Participants were shown a live demonstration of the treatment protocol and were given a copy of the informed consent form to read at their convenience. Then, at baseline data collection, they completed the informed consent form online.

Ethical Approval & IRB and/or IACUC Approval: An IRB application was submitted to WCUCOM's IRB. The IRB then reviewed and approved our study. IRB #2024-062

Support: None reported.
Financial Disclosures: None reported.

Poster No. *INT-9
Abstract No. 2025-155
Category: International Health
Research Topic: International Health

Cardiovascular Disease Awareness and Health: A Comparative Multivariable Analysis

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Context: Cardiovascular disease (CVD) has become a critical public health challenge in India, with a steadily rising burden observed over the past few decades. Notably, the Indian population tends to develop cardiovascular conditions at a younger age compared to other regions, and substantial knowledge gaps persist regarding disease risk factors and preventive strategies, especially in rural and underserved areas. While studies have explored cardiovascular risk awareness in select Indian regions, there remains a relative paucity of comparative data examining knowledge disparities between healthcare professionals and the general public, especially within individual urban settings. In Bangalore, one of India's fastest-growing metropolitan cities, preliminary studies suggest that baseline knowledge among healthcare workers may still be lacking and moreover, younger populations, including college students and nursing trainees, often demonstrate inconsistent understanding of cardiac risk factors, particularly around nutrition and disease mechanisms

Objective: To build upon existing literature by investigating cardiovascular health awareness in Bangalore, Karnataka, among both healthcare professionals and the general population. The dual focus allows for a comparative analysis that may reveal critical gaps in public and professional knowledge alike and aims to identify knowledge disparities that could inform future educational interventions and public health strategies across similar urban populations in India.

Methods: This cross-sectional study assessed knowledge of cardiac disease and self-reported physical health among the general population and healthcare workers in Bangalore, Karnataka. A survey was constructed with eleven questions, all of which were adapted from previously validated

questionnaires on cardiovascular disease awareness and health behaviors. Participants were recruited through convenience sampling for healthcare workers and snowball sampling for the general population. For the general population, the survey was disseminated through an online form in Qualtrics, with initial respondents encouraged to share the link to reach a broader audience. Healthcare workers, students and adjacent staff were recruited from the Sir C.V Raman Hospital and Rehoboth Nursing School in Bangalore, where paper versions of the survey were distributed. The survey responses were entered into SPSS (V. 29) for analysis. Data preprocessing included cleaning the dataset, excluding individuals under the age of 18 or over 65, and recoding categorical variables into binary formats. Chi-square tests were conducted to assess significant differences between healthcare workers and the general population in their survey responses. A p-value of less than 0.05 was considered indicative of statistical significance.

Results: From the 152 total responses, participant demographics consisted of healthcare professionals that were predominantly female students aged 18–24, in comparison to the general population which were mainly individuals aged 45–54. Concerning cardiovascular disease knowledge and awareness, a significant difference was observed in which 88.5% of the general population correctly identified that cholesterol should be checked every 1–3 years, which differed from the 70.1% of healthcare professionals who correctly identified the answer. In assessment of one's own health, 47.7% of healthcare professionals reported falling ill more than the average person, in contrast to 25% of the general population and physical activity levels were also higher in the general population, with 50% exercising more than 120 minutes per week, compared to just 10.4% of healthcare professionals.

Conclusion: The disparity in the results regarding cardiovascular health knowledge between healthcare workers and the general population raises the concern for a possible gap in current healthcare education regarding prevention medicine. If students carry these misunderstandings into practice, this could potentially increase the risk for not only inadequate levels of screening for cardiovascular disease but also lead to missed opportunities in implementing preventative measures as well. When examining the questions that assessed participants' view on their own current health, healthcare workers reported to have worse perception of their own health, with 52.3% of respondents agreeing to the statement that they get sick more often than other people as well as almost ninety percent of respondents reporting to less than 120 minutes of exercise each week. These findings parallel what is seen among healthcare professionals in the United States, in which current literature reports healthcare workers being at higher risk for a variety of different ailments, ranging from sleep and musculoskeletal disorders to depression, anxiety and burnout. Our study was able to add to current literature surrounding not only the current knowledge base regarding cardiovascular health in Bangalore, but also how medical and health knowledge does not equate to healthier lifestyle practices among health care workers. Further exploration of this dichotomy is warranted in efforts to not only be able to draw similarities among healthcare workers on a global scale but also reform current medical curriculum and create interventions that would aim to incorporate self-care and healthy lifestyle strategies into medical training.

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Informed Consent: Prior to completing the survey, a statement was attached detailing the purpose of the study and that participation was entirely voluntary and of the patient's own merit. Listed below was the statement utilized:

This questionnaire aims to collect information regarding your knowledge and awareness about what is cardiac disease as well as your activities of daily living with regards to exercise and dietary habits. The results from this survey will hopefully allow for the identification of gaps in knowledge and understanding that can be targeted in interventions by local governments in efforts to combat the rising prevalence of cardiac related injury and death. Participation in the survey is completely voluntary. To protect each individual's privacy and ensure that personal information is not associated with survey responses, we ask that you do not disclose your name, address, or other personal identifiers. All information collected from this survey will remain anonymous.

Ethical Approval & IRB and/or IACUC Approval: IRB #2024-065 approved on November 3, 2024, in compliance with the Code of Federal Regulations on the Protection of Human Subjects (45 CFR Part 46).

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