



Annual Student Technology & Research Symposium

"Please join us to learn about our WesternU student summer research projects"



**Office of the Senior Vice President for
Research & Biotechnology**

Saturday, November 6, 2021

8:30 am - 4:30 pm

<https://westernu.zoom.us/j/94137086947?pwd=VHkycmJxVlFCSDlYN3E0NTlaK3NzUT09>

Meeting ID: 941 3708 6947

Passcode: 703531

STRS 2021



Sylvia Manning, PhD
Interim President

October 28, 2021

To our WesternU students and future leaders in health science research, greetings.

Please accept my congratulations on your research accomplishments over the past summer and beyond. Your curiosity, initiative, and diligence are hallmarks of what makes WesternU a vibrant and productive institution.

Congratulations to every one of you. You make us proud.

Sincerely,

Sylvia Manning

Sylvia Manning
Interim President



Devendra K. Agrawal, PhD (Biochem), PhD (Med Sciences), MBA, MS (ITM), FAAAAI, FAHA, FAPS, FIACS
Senior Vice-President for Research & Biotechnology
Professor, Department of Translational Research

Message from the Senior Vice President for Research & Biotechnology

The annual Student Technology and Research Symposium (STRS) at WesternU is held each year to recognize and encourage our health science students who performed research and scholarly activities during the summer and beyond on an array of different pre-clinical and clinical research topics in their field of education and interest. Indeed, the diverse research topics show the depth and breadth of Health Science Research conducted by our students and the faculty at WesternU.

This year, about 92 students, working independently or jointly with another student, were selected, and awarded the summer research stipend, trained, and mentored by our faculty in various Colleges at WesternU.

On behalf of the University and the Office of Senior Vice President for Research & Biotechnology, I congratulate all our summer research scholars on their hard work and collaboration with their mentors/advisors, as reflected in the abstracts and final reports submitted by many awardees. In this unprecedented crisis, the research activity of some of the students will continue till Spring 2022. However, we will have an opportunity to hear the findings from several awardees on Saturday November 6, 2021. We look forward to knowing more on their learning experience and discovery!

Despite significant ongoing challenges and constraints, the hard work of our students shows their curiosity, initiative, genuine motivation, and engagement in the academic enquiry and contribution to science. Indeed, the hard work and vision as represented in the abstracts and the reports reflect the advancement in our quality and standard of health science research, which is critical to the overall mission of WesternU.

This year we established an award mechanism to recognize top ten best written abstracts and six awards in oral presentations with one first prize, 2 second prizes, and 3 third prizes. We recognize Dr. Clive Houston-Brown, Dr. Stephanie Bowlin, and Dr. Beverly Guidry for their generous contribution for the awards to our students in health science research.

I take this opportunity to thank Dr. Hendrik Szurmant, who led the team of faculty to review the summer research projects, recommended the summer research awards, and assembled a team of judges to review the abstracts and oral presentations. I also thank the faculty members who supported research scholars in the role of mentors/advisors. This program would not be possible without the support and participation of our faculty! Also, I thank Ms. Susan Dominguez for her organization and support in the management of the summer research program and the preparation of this abstract booklet.

Devendra K. Agrawal

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Hendrik Szurmant, PhD

Chair of the WesternU Research Committee
Professor, Department of Basic Medical Sciences
College of Osteopathic Medicine of the Pacific

Message from the Chair of the WesternU Research Committee

The annual Student Summer Research Symposium is an opportunity for our student research fellows from all nine colleges of the university to showcase the progress and success of their research projects. This past year has seen some return to normalcy for our student researchers in the light of the COVID pandemic. This return to normalcy meant that students were increasingly able to conduct hands-on research in both, laboratory, and clinical settings, while others chose projects that could be conducted remotely.

On March 11, 2020, the WHO declared COVID-19 a pandemic. It seems congruous that the diversity of research opportunities pursued by our students were possible thanks to the fruits of biomedical research itself, in the form of a SARS-COV-2 vaccine.

This demonstrated success of biomedical research highlights the importance of training the next generation of healthcare professionals that not merely see themselves as consumers of medical knowledge created by others. Rather they are willing to actively participate in the process of creating new medical knowledge themselves.

In the light of this truth, I am delighted to witness the motivation of our talented students in sacrificing their summers to pursue their research interests. I am particularly happy that this year's symposium features speakers from seven different colleges including the Graduate College of Biomedical Sciences, the College of Pharmacy, the College of Veterinary Medicine, the College of Optometry, the College of Dental Medicine, the College of Podiatric Medicine and from both campuses of the College of Osteopathic Medicine of the Pacific.

Students, we are proud of you and excited to hear about your research!

Hendrik Szurmant, Ph.D.

		STUDENT TECHNOLOGY AND RESEARCH SYMPOSIUM (STRS)			
		Saturday, November 6, 2021			
Time	Number	Presenter	College	Advisor	Title
8:30- 8:35 AM		Dr. Manning			Opening Remarks
8:35- 8:40 AM		Dr. Szurmant			General Speaker Rules and Guidelines
8:40- 8:52 AM	1	Jessica Cornell	GCBS	Dr. Miou Zhou	The molecular mechanisms of HIV gp120 V3 peptide induced learning and memory deficits
8:52- 9:04 AM	2	William Fang	COMP	Dr. Devendra Agrawal	Alterations in Shoulder Tendon Structural Proteins in Hyperlipidemia
9:04- 9:16 AM	3	Saline Lay & Tiffany Nguyen	COP	Dr. Simon Bulley	Gender Differences in the Effect of Dehydration on Resistance-Sized Arteries
9:16- 9:28 AM	4	Kaelen Kay	COMP	Dr. Matthew Wedel	Variation in the Peroneus Tertius: Evolutionary and Clinical Perspectives
9:28- 9:40 AM	5	Mary Swinton	COMP-NW	Dr. Jerel Fields (UCSD)	TREM2 Regulates the Phagocytic Capabilities of HMC3 cells; implications for HIV Associated Neurocognitive Disorders
9:40- 9:52 AM	6	Emily Cleveland & Lexi Martin	COMP	Dr. Marcel Fraix	The Efficacy of Emergency Department Triage Protocols against COVID-19
9:52- 10:04 AM	7	Deanna Overton	CVM	Dr. Malika Kachani	Knowledge, Attitudes, and Practices Relating to Risk Factors for Zoonotic Diseases in the Olosokute Conservancy, Kenya
10:04- 10:16 AM	8	Aysha Ahmad & Destiny Tellez	CPM	Dr. Joseph Park	A Biopsychosocial Approach to Analyzing the Performance of First-Year Podiatric Medical Students During the COVID-19 Pandemic
10:16- 10:28 AM	9	Ilish Gedestad, Meghana Munnangi & Abigail	COMP	Dr. Anita Nelson	Surveys Of California Family Physicians and Los Angeles County Pharmacists: Pill Prescribing and Dispensing Practices
10:30- 10:40 AM		10 MINUTE BREAK			BREAK
10:40- 10:52 AM	10	Hanh Do	COMP	Dr. Finosh Thankam	Developing Biosynthetic Injectable Hydrogel for Myocardial Repair
10:52- 11:04 AM	11	Pearl Audon	COMP	Dr. Dylan Bauch (UCI)	Immunohistochemical Diagnosis of Onychomycosis by Monoclonal Antibodies Detection of Dermatophyte <i>T. rubrum</i>
11:04- 11:16 AM	12	Jessica Mazzi	COMP-NW	Dr. Glen Kisby	A Pilot Study to Assess Medical Students' Perception of Their Osteopathic Manipulative Therapy Education
11:16- 11:28 AM	13	Aashna Mehta	COMP	Dr. Megan Economidis (UCLA)	The Impacts of COVID-19 on the Social Perceptions of Breastfeeding
11:28- 11:40 AM	14	Airam Caldera & Anish Sharma	CPM	Dr. Rebecca Moellmer	Gender Disparities in Financial Relationships between Podiatric Physicians and Industry
11:40- 11:52 AM	15	Elika Salimi	COMP	Dr. Mandlin Hudson	Surveys of the Perceptions of Faculty and Students about Stress and Resilience
11:52- 12:04 PM	16	Cassandra Coleman	COMP-NW	Dr. Edie Sperling	Medical Student Awareness and Interest in Physical Medicine and Rehabilitation
12:04- 12:16 PM	17	Ashley Garatea	CVM	Dr. Joseph Rutland	Anatomical and Histological Study of the Urinary System and the Associated Adrenal Glands in the Argentine Tegu (<i>Salvator merianae</i>)
12:16- 12:28 PM	18	Michael Mears & Christina Hayes	CDM	Dr. Elizabeth Andrews	Academic Performance of Dental Students Impacted by COVID-19
12:30- 1:10 PM		LUNCH BREAK			BREAK
1:10- 1:22 PM	19	Cory Kim	COMP-NW	Dr. Brian Johnstone (OHSU)	A Novel Progenitor Cell in the Temporomandibular Joint
1:22- 1:34 PM	20	Alice Kesler	COMP	Dr. Devendra Agrawal	Damage Associated Molecular Patterns in the Pathogenesis of Cardiac Ischemia and Hyperlipidemia
1:34- 1:46 PM	21	Audrey Tam	COO	Dr. Kierstyn Nagler-Dovorany	Impact of Yoga Exercise on Quality of Life and Balance Confidence in People with Visual Impairment
1:46- 1:58 PM	22	Jennifer Lai	COMP	Dr. Marcel Fraix	Medical Student Perceptions of Intimate Partner Violence Screenings in In-Person vs Telemedicine Settings
1:58- 2:10 PM	23	Vivian Yu & Halley Egnew	COMP/COMP-NW	Dr. Elisabeth Guenther	Perception and Contraception: Attitudes Towards Hormonal Birth Control on TikTok
2:10- 2:22 PM	24	Harsh Varshney & Douglas Weng	CPM	Dr. Joseph Park	Podiatric Physician Perspective on the Use of Cannabidiol (CBD) in the Treatment of Foot and Ankle Pathology
2:22- 2:34 PM	25	Kendall Lucara	COMP-NW	Dr. Elisabeth Guenther	Osteopathic Medical Students Varying Rates of Disability Exposure Reported on Core Rotations
2:34- 2:46 PM	26	Christopher Khatchadourian & Christina Sisliyan	COMP	Dr. Vishwanath Venketaraman	Liposomal Formulation of Reduced Glutathione Reduced Bacterial Load and Alters the Immune Response in <i>M. tuberculosis</i> Infection
2:46- 2:58 PM	26	Ajith Raja	COMP	Dr. Ryan Buller (UCR)	Medical Learners' Opinions on Program Performance Feedback to Program Faculty
3:00- 3:10 PM		10 MINUTE BREAK			BREAK
3:10- 3:22 PM	28	Nicholas Scrivens	COMP-NW	Dr. Jerel Fields (UCSD)	Tenofovir Alafenamide Fumarate Alters Markers of Mitochondrial Biogenesis in the Brains of Transgenic Mice
3:22- 3:34 PM	29	Abrielle Goodwein	CVM	Dr. Curtis Eng	Characterization of Injuries Associated with Fishing Gear in California Seabirds
3:34- 3:46 PM	30	Keiko Inouye	COMP	Dr. Pinakin Davey	Screen Time and Changes to Oculo-Physiological Measurements
3:46- 3:58 PM	31	Aamna Asif & Yanwei Zhang	COMP/COMP-NW	Dr. Michelle Steinauer	What is the Cost of Immune Defense?
3:58- 4:10 PM	32	Amanda Cheng	COMP	Dr. Anita Nelson	Analysis of Attitudes on Social Media Towards Intimate Partner Violence Screening
4:10- 4:22 PM	33	Ritika Mohindra & Seerat Sekhon	COMP	Dr. Finosh Thankam	Impact of Hypoxia on Tendon-specific Genes in Mesenchymal Stem Cells
4:22- 4:30 PM		Dr. Agrawal			Closing Remarks

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4:10- 4:22 PM	33	Ritika Mohindra & Seerat Sekhon
4:22 - 4:30 PM		Dr. Agrawal

Abstract Award Recipients

Name	College	Advisor
Abrielle Goodwein	CVM	Curtis Eng
Airam Caldera, Anish Sharma	CPM	Rebecca Moellmer
Alice Kesler	COMP	Devendra K. Agrawal
Audrey Tam	COO	Kierstyn Napier Dovorany
Cory Kim	COMP-NW	Brian Johnstone, OHSU
Hanh Do	COMP	Finosh G. Thankam
Jessica Cornell	GCBS	Miou Zhou
Nicholas Scrivens	COMP-NW	Jerel Fields, UCSD
Pearl Audon	COMP	Dylan Bach, UCI
Ryan Burd	COMP-NW	Michelle L. Steinauer

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A

Ahmad, Aysha and Tellez, Destiny, College of Podiatric Medicine

Advisor: Dr. Joseph Park, CPM

Project Title: A Biopsychosocial Approach to Analyzing the Performance of First-Year Podiatric Medical Students During the COVID-19 Pandemic: A Cross-Sectional Study

Authors: Aysha Ahmad and Destiny Tellez

Goals of the Study/Hypothesis:

COVID-19 was deemed a “public health emergency of international concern” on January 11th, 2020 (CDC, 2020). A mere two months later, on March 11th, the coronavirus was declared a global pandemic (WHO, 2020). Disruptions due to the COVID-19 pandemic have forced medical schools around the world to implement major changes in curriculum delivery. These changes have impacted the professional and psychological development of medical students’ as they transition into their careers. The focus of our research is to conduct a cross-sectional survey assessing first year podiatric medical students to obtain a measure of overall well-being, throughout the COVID-19 outbreak and progression of the pandemic. Key measures included changes in sleep, physical activity, social support, as well as academic performance. By presenting these findings to faculty and administration within the 9 podiatric medical schools, committees can be formed with the goal to safeguard the mental, emotional, and physical health of their students. We hope to spearhead the implementation of novel strategies to support and ease the barriers created in life by the virus. This study aims to examine the association between moving to an online curriculum, and their transition into medical school.

Materials & Methods:

Students were asked questions regarding their mental, emotional and physical health; factors related to their academic expectations, the retraction of any on-campus learning, as well as the extrinsic barriers that disrupted their first-year education. We sampled a cohort of 18 medical students from the 2024 cohort at Western University of Health Science, College of Podiatric Medicine. Outcomes were assessed based on both numeric scaling and free response question blanks, where students could address any personal setbacks they experienced. Each question stem asked students to rate their response both during, and prior to, the pandemic. Methods of anonymity were maintained.

Results: Trends demonstrated a steady decline in factors associated with a healthy, sustainable lifestyle. Students reported a decrease in quality and duration of sleep cycles, a lack of consistency with workouts, and dissatisfaction in peer to peer social interaction. Strenuous academic expectations, in concert with the mandated lockdowns, dramatically impacted each participants daily routine. The psychological effects of being confined to a select space for extended periods of time, lack of stimuli, and reduction in reinforcement, led to varying levels of psychological distress, in the form of high stress, loneliness, lack of reinforcement, and burnout. Our results indicated that all students reported very high on validated measures of psychiatric symptoms and burnout.

Conclusions:

The COVID-19 pandemic has had tremendous impact on how the generalized population live their everyday lives, but the impact it had on podiatric medical students was profound. With the results stating a large difference between quality of life before and during the pandemic, it’s important to note possible solutions that could better ease the transition into an online or hybrid curriculum. Since students felt the largest impact with their professional relationships, it is important to consider accommodating more interactions between faculty and/or physicians with medical students. Not only will it further prepare them for the field, but also teach them how to work with their future colleagues

and learn from their experiences. Since the data also revealed students feeling unprepared for the start of their clinical rotations, allocating time for professional development would help the students feel more confident and at ease during this transition in their life. It is possible to combine these professional interactions while a school operates with a hybrid curriculum, which was noted as a preference for the majority of students instead of fully online or fully in-person. Another important finding speaks on behalf of trends in which we saw a decline in student activities, ranging from their free time to cook at home, exercise, spend time with family, or simply decompress due to the demand of balancing school and personal life. It appears that there is limited time for mental health, despite many resources offered by the school. With the compacted class schedules, exams, and in-person training, it would be beneficial to allocate personal time for students during the week, as an hour here and there would be highly productive for students who may need to catch up.

Asif, Aamna and Zhang, Yanwei, College of Osteopathic Medicine of Pacific

Advisor: Dr. Michelle Steinauer, COMP-NW Dr. Johannie Spaan, COMP-NW

Project Title: What is the cost of immune defense?

Authors: Aamna Asif*, Michelle Li*, Natalia Schekochikhina*, Yanwei Zhang*, Hannah Tavalire, Johannie M. Spaan, Michelle L. Steinauer.

***Co-first authors in alphabetical order**

Goals of the Study/Hypothesis:

Despite the apparent fitness benefits of immunity to pathogens, resistance traits often remain variable in natural populations where the cost of immunity plays a large role in maintaining this variation. This study sets out to understand these resistance costs particularly on the survival, growth, and reproductive fitness with a well-established *Biomphalaria glabrata*/*Schistosoma mansoni* model system, and to offer insight on whether genetic manipulation producing genetically resistant *B. glabrata* will be easily maintained in the population.

Materials & Methods:

An existing dataset was used to investigate whether the costs of *Schistosoma mansoni* resistance for five *B. glabrata* inbred lines affect survival, total lifetime reproductive success, and reproductive fitness post a single miracidia exposure compared to a control group, while accounting for average growth rate. Statistical analysis included Mantel-Cox test, ANOVA, Negative binomial regression models, and linear regression models.

Results:

Overall, we found no significant differences in growth, reproduction, or survivorship between snails exposed and the controls. For both groups, there was a cost tradeoff between average growth rate and number of clutches – favoring reproductive fitness during early stages (first 5 weeks, $P < 0.01$), and average growth rate during later stages (6-19 weeks, $P = 0.06$).

Conclusions:

Our findings could indicate that their immunity has a low energetic cost to snails, or that in the laboratory setting, energetic costs were compensated for by food provided *ad libitum*. The next step would be to limit available resources to the snails and or to increase the dose of parasites.

Measuring costs of host immunity is important for determining feasibility of control efforts aimed at genetic manipulation of vector hosts to make them resistant, as costly traits may not be easily maintained in the population. Our work is the first step in testing the fitness costs associated with naturally occurring resistance in *B. glabrata*, an important vector of schistosomiasis.

Audon, Pearl, College of Osteopathic Medicine Pacific ([Abstract award recipient](#))

Advisor: Dr. Dylan Bach, UCI School of Medicine, Bach Diagnostics

Project Title: Immunohistochemical diagnosis of onychomycosis by monoclonal antibodies detection of dermatophyte *T. rubrum*

Authors: Pearl Audon, Scott Villaluz, Hafthor Sigurdarson, Carolyn Hua, Yemile Guzman, Dylan Bach

Goals of the Study/Hypothesis:

Onychomycosis is the most common nail infection disorder. It is caused by multiple strains of fungi, predominantly *Trichophyton rubrum*. Currently, Periodic Acid-Schiff (PAS) stain is the gold standard for onychomycosis detection, but does not differentiate between the types of fungal species. Our goal is to develop a monoclonal antibody stain that can be used to drastically improve histological findings of *T. rubrum*.

Materials & Methods:

Direct ELISA of monoclonal antibody (mAb) 17B6 candidate demonstrates immunoreactivity to *T. rubrum*. Thus, the 17B6 mAb is chosen for the stain. The mAb is conjugated to horseradish peroxidase (HRP) and alkaline phosphatase (AP). Histology slides analyzed for routine onychomycosis analysis at Bach Diagnostics are subject to secondary analysis. 148 retrospective, and de-identified unstained toenail slides from 37 patients are stained with 17B6 mAb stains. 21 patients are known to be positive for onychomycosis caused by *T. rubrum*, 5 by *Candida albicans*, 5 by *Trichophyton interdigitale*, and 6 are negative. Mab stains are optimized to Quantum Hdx. Images captured by light microscopy.

Results:

Our mAb stain exhibits high binding affinity to dermatophyte cell wall, allowing it to produce strong chromogenic development to identify nuanced fungal elements not seen in PAS (Fig. 2). These fungal elements seen include potentially degraded hyphae. The statistical data determined the mAb stain could differentiate between *T. rubrum* and *C. albicans* ($p=0.026$) and negatives ($p=0.007$). Histologically, the mAb stain did not stain *Candida* structures. A halo from the counterstain can be seen encapsulating the translucent *Candida* (Fig. 3). The mAb stain did not statistically distinguish between *T. rubrum* and *T. interdigitale* ($p=0.823$). On microscopy, a lower binding affinity to *T. interdigitale* is evident with the truncated mAb staining pattern (Fig. 4). Significant findings were found when comparing dermatophytes (*T. rubrum* and *interdigitale*) to negative controls and *Candida* ($p=0.003$).

Conclusions:

Histological findings indicate our 17B6 mAb stain has an edge over traditional PAS when used to identify *T. rubrum* structures. In addition, the mAb stains were able to preferentially stain for *T. rubrum* in comparison to *Candida*, and a similar specie, *T. interdigitale*. Albeit *T. rubrum* and *interdigitale* both picked up the stain, the quality of the stains differed in affinity and completion, rendering a substantial finding. We hope to expand on this novel stain by innovating a more specific *T. rubrum* stain and further analyze the degraded hyphae structures which were discovered during this study.

References:

Poster at American Society of Clinical Pathologists Annual Meeting-exp. Oct. 27th, 2021
Paper in progress

C

Caldera, Airam and Sharma, Anish, College of Podiatric Medicine (Abstract award recipient)

Research Advisor: Dr. Rebecca Moellmer, CPM

Project Title: Gender Disparities in Financial Relationships between Podiatric Physicians and Industry

Authors: Airam Caldera, Anish Sharma

Goals of the Study/Hypothesis:

Studies across multiple physician specialties have continued to demonstrate gender-based discrepancies in financial compensation. This study aims to determine if gender disparities exist in industry relationships with podiatric medicine physicians. We hypothesize that men receive a higher proportion of royalties and consulting fees than women, adjusting for the number of men and women in the field of podiatric medicine.

Materials & Methods:

This retrospective study obtained publicly accessible data from the Centers for Medicare and Medicaid Services (CMS), at <https://openpaymentsdata.cms.gov/>. Data was gathered for payments made to podiatric physicians from industry in 2019 and 2020. Data will be limited to payment under royalties or licensing and consulting fees. Name, gender, state of active practice and years of experience will be gathered via professional sites such as <https://www.topnpi.com>. The total number of payments and amounts will be analyzed and compared between gender, state of active practice (CA, IL, ME, NE, NH, OK, FL, NY), and years of experience. Multilinear regression models will be used to determine predictors of higher payment amounts.

Results:

The study included 284 practicing podiatrists, 71% were males and 29% were females. The majority of the total payment amount (\$4,522,430.32) (92%) was made to males, while only (\$360,759.87) (8%) percent was made to females. In California, males had more years of experience (2019, $p=.006$), and received more total number of payments (2019, $p=.011$). In Illinois, males were paid higher consulting fees than women (2019, $p=.001$). In Nebraska, males had more years of experience (2019, $p=.022$). There was no predictive association between gender, state or years of experience to higher payment amounts.

Conclusions: Gender, state, and years of experience were not predictors of higher payment amounts from industry. However, males do show a higher total number of payments in every state. This marks a discrepancy in the hiring process favoring male podiatric physicians in regards to industry relationships.

Cheng, Amanda, College of Osteopathic Medicine of Pacific

Advisors: Dr. Marcel Fraix, COMP, Dr. Anita Nelson, COMP

Project Title: Analysis of Attitudes on Social Media Towards Intimate Partner Violence Screening

Authors: Amanda Cheng, Jennifer Lai, Dr. Anita Nelson, COMP, Dr. Marcel Fraix, COMP

Goals of the Study/Hypothesis:

Intimate partner violence (IPV) is a preventable public health issue that affects millions of Americans each year. We sought to determine if women and men believe that current protocols are effective and

are able to provide IPV survivors with resources for their safety. We also wanted to learn about the experiences and views of the general public on IPV screening.

Materials & Methods:

We conducted an analysis of the materials posted on Reddit, an anonymous social media platform. Posts containing the key search words in either the original post or comments were selected for analysis. Posts and comments were categorized into common themes, which were generated throughout the data collection process and were created when three similar comments were found. Frequencies of themes were compared to identify the most salient themes across all posts. Two-sample Z tests of proportions were conducted to compare proportions between perceptions of IPV survivors versus non survivors.

Results:

Though the majority of posts had a generally positive view of IPV screening, there were some concerning salient themes. Out of the total number of comments that indicated screening status, or whether or not they were screened, there were more that indicated they were screened than not screened. In general, most posters think that IPV screening is helpful. However, a significantly greater proportion of posters who indicated they were survivors of IPV believe screening is harmful than posters who indicated they have not experienced IPV. There was no significant difference in positive and negative views between pre-COVID-19 and post-COVID-19 comments.

Conclusions:

This study shows that the general population has a generally positive view of IPV screening. The negative themes identified and discrepancies in perceptions between IPV survivors and who have not experienced IPV may indicate that there are gaps in how IPV screening is being conducted.

Cleveland, Emily and Martin, Lexi, College of Osteopathic Medicine of Pacific

Advisor: Dr. Marcel Fraix, COMP

Project Title: The Efficacy of Emergency Department Triage Protocols against COVID-19

Authors: Emily Cleveland, Lexi Martin, Dr. Edward Junkins and Dr. Marcel Fraix

Goals of the Study/Hypothesis:

The goal of this study was to identify the most effective safety measures within an Emergency Department's triage protocol, specifically in regards to decreasing staff exposure to COVID-19. The researchers hypothesized that the greater the restrictive triage protocol was, the less likely staff would be exposed to COVID-19.

Materials & Methods:

A comprehensive survey was created to collect data from Emergency Department triage staff. The survey asked about demographics of hospitals, PPE accessibility and usage, triage practices implemented throughout the pandemic, and exposure to COVID-19 while working in triage. From the responses, we established a baseline restrictive protocol that hospitals implemented during the COVID-19 pandemic. This baseline restrictive protocol included: an adequate amount of PPE, separate waiting room for potentially infectious patients, limiting visitors, designating a medical professional in triage, and telephone triage prior to entry into the ED.

Results:

There were 69 individuals from across the US that completed the survey. 48% of respondents were from large-sized hospitals (greater than 500 beds) and 50.72% from medium-sized hospitals (100-499 beds). A high number of respondents (86.57%) reported exposure to

COVID-19 in triage, despite implementing the above-mentioned baseline restrictive triage protocols. PPE shortage or misuse was the only variable that trended with the high exposures of COVID-19, however it was not statistically significant ($p=0.129$). Due to small sample size, the researchers were unable to control for confounding variables such as: hospital resources, local community restrictions, and recall bias.

Conclusions:

The data rejected the hypothesis as it showed exposures to COVID-19 were still high despite having the baseline restrictive protocol as well as additional triage protocols. This data supports the virulent nature of SARS-Cov-2 as restrictive triage protocols within the ED did not decrease staff exposure to COVID-19.

Coleman, Cassandra, College of Osteopathic Medicine of Pacific

Advisor: Dr. Edie Sperling, COMP-NW

Project Title: Medical student awareness and interest in Physical Medicine and Rehabilitation

Authors: Cassandra Coleman, Christian Shafer, Dr. Edie Sperling

Goals of the Study/Hypothesis:

The goal of this research is to determine why medical students are not familiar with PM&R versus other common specialties like pediatrics, surgery, family medicine, or others. They might not have interacted with physiatrists as much as other physicians because it is a smaller field. From that understanding, we can determine how these students want to learn about PM&R and develop those opportunities for them and future students. Perhaps the PM&R interest fair cited (Brane) is advisable in addition to other educational and interactive means: faculty mentors in PM&R, a PM&R department, more preset rotations offered in PM&R without requiring students to find their own PM&R preceptor.

Materials & Methods:

A questionnaire was developed using primarily multiple-choice questions with one comment box at the end. The survey consisted of one consent question and 12 questions pertinent to the research being conducted. It was distributed to current first and second year medical students at COMP/COMP-NW via student e-mail and the private student-only Facebook page, and administered via Qualtrics. The results were analyzed by the research investigators to determine relationships between awareness of and exposure to the PM&R specialty and the decision to pursue it as a career. The survey received 167 responses from the first and second year cohort of medical students.

Results:

Of the 167 responses, 15 respondents only responded to the consent question and didn't answer any of the asked questions. Therefore, all the data below was collected for the 152 surveys that were answered. 132 students were aware of the field of PM&R before taking the questionnaire and 19 students were not. 97 students have had no prior PM&R experiences while 19 have shadowing experience in PM&R and 15 have been exposed in the PM&R club. The most common ways the students have become aware of or learn about specific medical specialties is shadowing experiences (121), the internet (108), fellow medical student colleagues (82), medical education (84), and treatment by a physician (72). When it comes to the expectations from students for their school to set up a rotation in PM&R, 27 students said that they do expect their school to set up a rotation in PM&R, 48 do not, and 77 are not sure. 53 students plan on doing a PM&R rotation while 33 do not and 66 students are not sure if they will do a PM&R rotation. When it comes to aspects that medical students view as the most important when deciding on a specialty in general, medical students ranked interest in the specialty the highest with 132 students ranking it in their top 5 of importance out (mean= 2.12) of 18 different aspects. The next highest ranked in the top 5

include work/life balance (115 students, mean rank = 2.93), personality fit (70 students, mean rank = 4.70), and patient population (68 students, mean rank = 6.22). When asked if they had to choose a specialty today, the most popular fields of medical students include Emergency Medicine (17 students), Pediatrics (17 students), and Family Medicine (16 students). 14 medical students listed they would choose PM&R as a specialty if they had to choose a specialty today. 38 medical students answered that they were interested in the field of PM&R, 44 students answered that they were not and 56 students were not sure. For those medical students who stated they were interested in pursuing PM&R, 30 medical students indicated the most important factor for pursuing this field is due to the work/life balance and 26 stated interest was the most important decision. For those not interested in pursuing PM&R, the most important reasons why include interest (46 students), prior exposure (8 students), specialty content (7 students), and specialty content (7 students). Of the medical students who were questioned, 102 students would be interested in learning more about PM&R while 16 students would not and 19 students are not sure. Of those who are interested in learning more, the most popular responses as to how they would like to learn more include: information session with PM&R faculty member (87 students), more elective rotation options during 3rd or 4th year (70), interest fair with PM&R attending physicians available to answer questions (51 students), participation in a PM&R club (41 students), required rotation during 3rd or 4th year (37 students), and attending a PM&R national conference (26). A final free response section was available for students to share their thoughts or ideas that might be helpful to our research, with many sharing they had recently learned about it at a club week presentation or mentioned briefly and most of the responses expressing interest in learning more about PM&R.

Conclusions:

74% of students were interested in learning more about PM&R with 64% of students interested in specifically learning more through an information session with a PM&R faculty member. This information can be presented to the university as an area of focus. One response expressed interest in a session during a conference week about what a physiatrist does, and we agree that information sessions can help illuminate the path for medical students deciding on which specialty to pursue, whether that be PM&R or any other specialty within medicine.

Cornell, Jessica, Graduate College of Biomedical Sciences (*Abstract award recipient*)

Advisor: Dr. Miou Zhou, GCBS

Project Title: The molecular mechanisms of HIV gp120 V3 peptide induced learning and memory deficits

Authors: Jessica Cornell, Dr. Miou Zhou

Goals of the Study/Hypothesis:

The goal of this study is to investigate molecular mechanisms of HIV coat protein-induced memory deficits in a mouse model of HIV-associated neurocognitive deficits (HAND). The HIV-1 gp120 glycoprotein constitutes a V3 loop domain that can specifically bind and activate HIV co-receptor CCR5. We hypothesized that the V3 loop peptide will cause deficits in learning and memory and also in signaling pathways such as MAPK that are essential for memory consolidation, and that these signaling and behavioral deficits can be ameliorated with CCR5 antagonist maraviroc.

Materials and Methods:

In order to deliver V3 peptide to hippocampus, we implanted two cannulas into the hippocampal dorsal CA1 in 3-6-month-old C57Bl/6N mice. Two weeks after cannulation surgery, the V3 peptide (20 ug/ml) or PBS (control) was injected to hippocampus 30 minutes before the object-placement recognition (OPR) training, and the OPR memory was tested 24h later. Besides the in vivo V3 treatment, we also collected hippocampal and cortical slices and incubated the slices with V3 peptide for 30 minutes, 1

hour and 2 hours. pMAPK and MAPK signaling in these V3-treated slices was measured using western blot analysis. We also repeated the 2-hour V3 treatment with or without maraviroc.

Results:

Mice infused with the V3 peptide before OPR training showed cognitive impairment in comparison to controls, indicating that V3 treatment impairs learning and memory. Hippocampal slices treated with the V3 peptide for 2 hours showed a decrease in pMAPK signaling compared to controls, which was reversed with maraviroc treatment.

Conclusion: These results indicate that incubation with V3 peptide impairs hippocampal pMAPK signaling, which may be a mechanism underlying the V3-induced learning and memory deficits. Maraviroc, an FDA-approved drug for AIDS treatment, prevented signaling deficits caused by V3 peptide, suggesting that maraviroc could be a potential treatment for V3-induced cognitive deficits.

D

Hanh Do, College of Osteopathic Medicine of Pacific (*Abstract award recipient*)

Advisor: Dr. Finosh Thankam, Department of Translational Research

Project Title: Developing biosynthetic injectable hydrogel for myocardial repair

Authors: Hanh Do, Devendra K. Agrawal, Dr. Finosh Thankam

Goals of the Study/Hypothesis:

Cardiac tissue engineering (CTE) offers an alternative to the traditional cardiac management strategies by accelerating the regenerative response in the damaged heart. We hypothesize that a minimally invasive hydrogel system fabricated with biocompatible polymers of desired properties promise improved cardiac regeneration following myocardial infarction. Herein, we focused on the crosslinking and interpenetration chemistry for fabricating the three-dimensionally cross-linked network of polymeric injectable hydrogel as CTE scaffolds.

Materials & Methods:

The hydrogel system was synthesized by co-polymerization of both natural and synthetic polymeric biomaterials. The physiochemical characterization of the hydrogel was performed by infrared (IR) spectral analysis, water content and holding capacity, and surface hydrophilicity using contact angle measurements. The biocompatibility was assessed by standard direct contact assay.

Results:

An injectable hydrogel system was synthesized, and the average gelation time was optimized to be 4-5 minutes. IR spectral analysis of freeze-dried hydrogels confirmed the formation of polymeric network. The broad peak around 3400 cm^{-1} was responsible for the -OH groups. The presence of peaks around 2800 cm^{-1} , 1700 cm^{-1} , and 1080 cm^{-1} correspond the -CH group, -CO stretch, and -C-O-C- stretch, respectively. The contact angle measurements of the water swollen hydrogel revealed the surface hydrophilicity. The advancing contact angle was around $39.7\text{ deg} \pm 8.4$ while the receding contact angle was around $45.1\text{ deg} \pm 6.7$. This confirmed the amphiphilic nature of the hydrogel which is crucial for biocompatibility. Evaluation of the cell survival and proliferation in hydrogel network using direct contact assay showed no characteristic change in morphology upon contact revealing the non-toxic nature of the gel and suggesting its cytocompatibility for in vivo system.

Conclusions:

The synthesis process and characterization experiments confirmed the amphipathicity, homogeneity, cytocompatibility, and resemblance to extracellular matrix of the designed injectable hydrogel. This injectable hydrogel system opens novel minimally invasive translational avenues in regenerative cardiology.

E

Egnew, Halley and Yu, Vivian, College of Osteopathic Medicine of Pacific-NW and COMP, College of Osteopathic Medicine of Pacific Pomona

Advisor: Dr. Elisabeth Guenther, COMP-NW

Project Title: Perception and Contraception: Attitudes Towards Hormonal Birth Control on TikTok

Authors: Halley Egnew, Vivian Yu, Dr. Elisabeth Guenther, MD MPH.

Goals of the Study/Hypothesis:

Social media sites have been used to sample informal attitudes and messages shared about birth control between users. Identification of sentiment about hormonal birth control in the previously unstudied TikTok population provides insight into younger patients' attitudes towards birth control options.

Materials & Methods:

In this qualitative IRB-approved study, 100 videos per hormonal birth control method (oral contraceptive pills [OCP], injections, intrauterine devices [IUD] and implant) were identified through hashtags. Videos were analyzed for sentiment, factual accuracy, and theme saturation.

Results:

60% of the content surveyed on TikTok was negative, while 8% was positive. Content highlighted side effects (59.5%), experiences with providers (19.5%), and humor (18.5%). Implant (70%), IUD (67%) and injection (64%) videos focused on side effects more than OCP videos. OCP videos were more likely to include humor (37%). IUD (18%) and OCP (13%) videos were most likely to contain misinformation. IUD videos mentioned complications the most (17%). Humor was utilized most in OCP (37%) and IUD (16%). The humorous videos joked about the onset and severity of side effects or used satire to explain their motivation for using birth control. Humorous content used trending audio tracks, self-deprecating jokes, and facial expressions.

Conclusions:

Attitudes and themes towards hormonal birth control options presented on TikTok differ from previous studies on public platforms, introduce humor through video formats that resonate with the application's younger users. Recognition of different perceptions of birth control by younger TikTok users can strategically target misinformation and potentially identify generational differences in perception of birth control.

F

Fang, William, College of Osteopathic Medicine of Pacific
Advisor: Dr. Devendra K. Agrawal, Department of Translational Research
Project Title: Alterations in Shoulder Tendon Structural Proteins in Hyperlipidemia
Authors: William H Fang, Seerat Sekhon, Dr. Finosh G. Thankam and Dr. Devendra K. Agrawal

Goals of the Study/Hypothesis:

Hyperlipidemia impacts every system of the body, including the musculoskeletal system. Indeed, lipids could accumulate within the extracellular matrix (ECM) of the tendon and affect the mechanical properties. However, there is limited information on the development and progression of tendon pathology in atherosclerotic patients. The purpose of this study was to evaluate the expression status and molecular crosstalk of the ECM proteins in shoulder tendon tissue of hyperlipidemic microswine.

Materials & Methods:

Shoulder tendons tissue from hyperlipidemic (n=6; serum cholesterol levels 480-700 mg/dL) and control (n=6; serum cholesterol level 106-140 mg/dL) Yucatan swine were harvested, embedded in paraffin, and thin sections were used for tissue morphology with hematoxylin and eosin (H&E), Masson's trichrome, and Pentachrome staining. Immunofluorescence staining was performed for collagen types I, III, IV, V, VI, and XVII, as well as MMP2 and MMP9. The mean fluorescence intensity (MFI) of each protein was quantified, the variation with respect to control was calculated from the average MFI/nuclei and presented as log₂ fold-change (FC).

Results:

H&E staining showed disorganized ECM in hyperlipidemic tissue with extensive deposition of adipocytes compared to control tissue. Additionally, in the hyperlipidemic swine tissues, Trichrome staining revealed disorganization in collagen fibers with poorly defined vasculature, and Pentachrome staining highlighted decreased collagen expression and increased mucin deposition. Also, compared to the control tendons, the hyperlipidemic shoulder tendons demonstrated decreased expression of COL III (FC=-0.38±1.49), COL IV (FC= -0.61±1.75), and a pronounced decrease in COL XVII (FC=-1.6±1.85) and COL I (FC=-2.24±0.41). Remarkably, there was an increased expression of COL V (FC=1.02±2.13), MMP-9 (FC=0.9±0.60), and a marked increase in MMP-2 (FC=2.05±1.53) in hyperlipidemic tissues.

Conclusions:

The findings revealed structural alterations in ECM composition and components in hyperlipidemic tendon compared to normal shoulder tendons. There was a decrease in collagen proteins and an upregulation of the MMP class of proteolytic enzymes, which could lead to increased tendon injury. Such molecular alterations support the existence of increased co-morbidity of tendinopathies in hyperlipidemic patients. Further analyses are warranted to reveal potential target sites for intervention.

G

Garatea, Ashley, College of Veterinary Medicine

Advisor: Josep Rutlant and Wael Khamas, CVM

Project Title: Anatomical and histological study of the urinary system and the associated adrenal glands in the argentine tegu (Salvator merianae)

Authors: Dr. Josep Rutlant, Dr. Wael Khamas, Ashley Garatea

Goals of the Study/Hypothesis:

The anatomical structures, macroscopically and microscopically, have not been well studied in the tegu. Looking into these differences could show the advantages that allow them to adapt in new environments. Our hypothesis is that certain anatomical and histological differences of the argentine tegu kidney and adrenal glands allows the species to thrive in new environments.

Materials & Methods:

Dissection of a tegu was conducted, and the urinary system was subjected to histological studies.

Results:

Grossly, the kidneys of the tegu lie deep within the pelvic canal. They are not lobulated and flattened on a dorsoventral aspect. The left lobe sites more cranial than the right lobe within the pelvic canal. The kidney is colored light to dark brown, and the lobes connect at a fusion at the caudoventral aspect. The epididymis lies on the ventral midline of the kidney. Based on our preliminary observations, no urinary bladder is present. The organization of the kidney parenchyma that is present in other species is lacking in the tegu, with no apparent division between cortex and medulla. The structure of the nephron lacks a loop of Henle. No renal pyramids or renal pelvis is present. There are fewer glomeruli present throughout the parenchyma of the kidney, with a reduced filtration surface represented by fewer capillaries in the glomerular tuft than in other species.

Conclusions:

Tegus are unique in the fact that they possess a sexual segment that is situated between the distal tubule and the collecting duct, either connecting to or draining into this segment. The histological adaptations present in the kidney shed some light on the tegus ability to conserve water. This points to the capacity of the reptilian kidney to adapt to different environments. A reduced filtration surface means that the kidney filters less volume of fluid, allowing water to stay in the body for proper functioning. Further research to clarify residual questions is necessary to conclude these findings.

Gedestad, Ilish, Munnangi, Meghana and Matlack, Abigail

College of Osteopathic Medicine of the Pacific

Advisor: Anita Nelson, M.D.

Project Title Surveys Of California Family Physicians and Los Angeles County Pharmacists: Pill Prescribing and Dispensing Practices

Authors: Ilish Gedestad, Meghana Munnangi, Abigail Matlack

Goals of the Study/Hypothesis:

Providing women with 13 cycles of oral contraceptives at once (a one-year supply) reduces unintended pregnancy and abortion rates. Family PACT is a state-licensed Medicaid Family Planning program that is legally required to pay for 13 cycles at once if the physician orders them. Physician prescribing and pharmacy dispensing practices are key components to maximizing contraceptive efficacy. Our hypothesis states that women with Family PACT insurance and a proper prescription should receive 13 cycles of oral contraceptives.

Materials & Methods:

In a two-part IRB-approved study, we conducted an online survey of California family physicians about their pill prescribing practices. We also sampled a substantial proportion of pharmacies in Los Angeles County using a secret shopper survey to determine if staff would dispense 13 cycles as the physician ordered and if they would not, how many they would dispense and why.

Results:

51 family physicians completed the survey; 43.1% provided care to women on Family PACT. 18 of these 22 physicians reported their prescribing practices; only 5.6% prescribed 13 cycles at once. We attempted to contact 582 representative pharmacies but only successfully contacted 432. 3.2% of pharmacies stated they would dispense 13 cycles at one time. 47% stated they could not dispense 13 cycles at one time and 49.7% required that women come in to determine prescription and insurance eligibility.

Conclusions:

With only 5.6% of physicians and 3.2% of pharmacies stating they would prescribe or dispense 13 cycles, women on Family PACT insurance face a substantial barrier to accessing the legally allowed amount of oral contraceptives, placing them at a higher risk for unintended pregnancies and abortions.

Goodwein, Abrielle, College of Veterinary Medicine ([Abstract award recipient](#))

Advisor: Curtis Eng DVM, College of Veterinary Medicine

Project Title: Characterization of injuries associated with fishing gear in California seabirds

Authors: Abrielle Goodwein, Rebecca Duerr DVM, PhD, and Curtis Eng DVM

Goals of the Study/Hypothesis:

The goal of this study was to objectively characterize and describe the nature of fishing gear-associated injuries in order to create a standardized injury characterization system.

Materials & Methods:

Medical records and fishing gear of patients admitted for fishing gear-related injuries at International Bird Rescue (IBR) and cooperating rehabilitation facilities between 2018 and 2021 were evaluated. Injury descriptions found in these medical records, in conjunction with injury staging methods found in literature, were used to create a characterization system specific to fishing gear injuries in seabirds. All gear-related injuries between 2018 and 2021 were then reclassified using this fishing gear injury characterization system.

Results:

28 different species were admitted to IBR for fishing gear-associated injuries between January 1, 2018 and July 20, 2021. A four-stage characterization system was developed for both line and hook injuries. 49% of recorded injuries attributed to fishing line resulted in a severe, Stage IV classification. 74% of recorded injuries attributed to fishing hooks resulted in a severe, Stage IV classification. Rates of survival to release dates for seabirds within their fishing gear-associated injury characterization stage varied but were the lowest for Stage IV injuries. Results further indicated that there is evidence to suggest a relationship between commissure wounds and hook ingestion.

Conclusions:

In conclusion, we created an applicable staging system to characterize injuries from fishing gear that can aid in standardizing fishing gear-associated injuries across rehabilitation facilities and allow further investigation into the effects of various fishing gear. Results stress the need for responsible recreational fishing activities and community outreach and education regarding the effects of

discarded fishing gear. As we learn about the effects and injuries associated with fishing gear, we can translate information to recreational fishers and work towards sustainable fishing practices that preserve our coastal bird species.

H

Hayes, Christina and Mears, Michael, College of Dental Medicine

Advisor: Elizabeth Andrews, DDS, MS - CDM

Project Title: Academic Performance of Dental Students Impacted by COVID-19

Authors: Christina Hayes, Michael Mears, Sean Rowan, Dr. Fanglong Dong, Dr. Elizabeth Andrews

Goals of the Study/Hypothesis:

Previous studies focused on attitudes and behaviors of dental students but haven't examined direct effects of COVID-19 on academic performance in US dental schools. This study examined effects of the COVID-19 pandemic on dental students' academic performance in the DMD curriculum. It was hypothesized that the pandemic provided a more beneficial learning environment.

Materials & Methods:

This mixed study design implemented a cross sectional survey with retrospective data extraction of students' academic grades. DMD 2020 through 2024 first year Doctor of Dental Medicine (DMD1) cohorts' performance data was collected. Data were analyzed using SAS software for Windows version 9.4 (Cary, North Carolina, USA). Outcomes assessed included academic grades for courses in DMD1 year. Independent t-test and Chi-square crosstabs were conducted to assess statistical significance between pre- and post-COVID cohorts. All statistical tests were two-sided; P-values < 0.05 were considered to be statistically significant.

Results:

A total of 351 participants' academic grades were extracted. The distribution of cohorts was roughly equal with approximately 70 participants from each class. More than half of participants were female (50.7%, n=178). There were statistically significant associations between pre- and post-COVID grades in 5/12 DMD1 courses. Grade percentages (out of 100) identified statistically significant increased average grades in 4/12 DMD1 courses with 1/12 courses demonstrating a statistically significant decrease in grade percentage (Gross Anatomy). There were no statistically significant differences for 7/12 by course percent.

Conclusions:

Students performed better overall in courses delivered remotely that had clinical application and engaged them through small group team-based activities. The courses with improved performance utilized methods to engage students such as breakout sessions, drive up community outreach, and shared files to submit group work. The majority of academic performance was similar to four previous cohorts, demonstrating courses could have a hybrid approach streamlining an already packed curricular schedule.

Inouye, Keiko, College of Osteopathic Medicine of the Pacific
Advisor: Dr. Pinakin Davey - College of Optometry, Western University of Health Sciences
Project Title: Screen Time and Changes to Oculo-Physiological Measurements
Authors: Keiko Inouye, Dr. Pinakin Davey

Goals of the Study/Hypothesis:

Due to the COVID-19 pandemic, the average amount of time spent in front of a screen has spiked considerably. Prior studies suggested that reading standardized text/font from an iPad causes measurable physiological and visual changes compared to paper. The goal of this study was to determine whether a 30 minute cognitively demanding reading task on iPad would produce similar symptoms compared to printed media. We hypothesized that physiological and visual changes, specifically increased blood pressure and decreased achromatic and color contrast sensitivity, would be observed when reading from iPad.

Materials & Methods:

We recruited 30 volunteers to evaluate whether these changes could be observed in 30 minutes using a cognitively demanding reading task. These volunteers were asked to do a total of 3 readings: iPad in well-lit room, paper in well-lit room, and iPad in dark room. Physiological and visual measurements were taken before and after readings, and patients were asked to fill out a dry eye questionnaire before and after each visit.

Results:

Our results showed a significant increase in dry eye symptoms across all readings ($p < 0.05$), although there was no significant difference between symptoms for iPad and paper when reading in a well-lit room ($p = 0.89$). We also noted decreased blood pressure across all three readings, increased contrast sensitivity with paper and decreased contrast sensitivity with iPad in a well-lit room and decreased blue cone sensitivity with iPad in a dark room.

Conclusions:

Based on the parameters measured, we can surmise that 30 minutes of reading a cognitively demanding task is not enough time to evoke the previously observed physiological response to screens, although the visual changes were consistent. The results of the dry eye symptom questionnaire suggest that for shorter periods, ambient light might alleviate ocular fatigue that was noted when reading from the iPad in a dark room.

K

Kay, Kaelen, College of Osteopathic Medicine of Pacific
Advisor: Dr. Mathew Wedel, COMP and DPM
Project Title: Variation in the Peroneus Tertius: Evolutionary and Clinical Perspectives
Authors: Kaelen Kay, Jeremiah Scott, Dr. Mathew Wedel

Goals of the Study/Hypothesis:

Peroneus tertius (PT), located in the anterior compartment of the leg, functions in dorsiflexion and eversion of the foot. PT was thought to be unique to humans but is now known to be present in many other primates. PT is variable in origin, insertion, size, and number of musculotendinous slips. Previous studies have also reported variability in terms of prevalence, ranging between 38-100%. Our goals are to summarize the evolutionary origin, anatomical variations, and clinical implications of the muscle.

Materials & Methods:

We synthesized information from the literature on the evolution, prevalence, variability, and clinical correlations of PT using Google Scholar, NCBI, and ResearchGate. For statistical analysis, we measured prevalence using the number of limbs with PT present per number of legs total. We compared studies that observed the muscle in human cadavers (n=11) versus studies that used palpation on living subjects (n=11).

Results:

We found that the prevalence of PT varies depending on the method of data collection. Studies using cadaveric dissection consistently report a significantly ($p < 0.0001$) higher prevalence of PT (86–100%) than studies relying on palpation (38–84%).

Conclusions:

Although the higher prevalence of PT in humans compared to other primates has been linked to the evolution of bipedality, PT is not crucial for bipedal gait. Studies have found that PT is not correlated with a significant difference in ROM or strength of dorsiflexion or eversion. The difference between dissection and palpation studies in the prevalence of PT suggest that palpation underestimates the true prevalence of PT. We suggest that the variability in size and course of PT, as well as PT being difficult to palpate through the extensor retinaculum, combine to make the muscle difficult to diagnose via palpation. Although palpation studies are potentially faster and less expensive than dissection studies, we urge caution in interpreting their results.

Kesler, Alice, College of Osteopathic Medicine of Pacific ([Abstract award recipient](#))

Advisor: Dr. Devendra K. Agrawal, Department of Translational Research

Project Title: Damage Associated Molecular Patterns in the Pathogenesis of Cardiac Ischemia and Hyperlipidemia

Authors: Alice Kesler, Dr. Finosh Thankam, Dr. Devendra K. Agrawal

Goals of the Study:

Cardiovascular diseases (CVD) have long-standing treatments available, yet they remain the leading cause of death worldwide. Inflammation aggravates cardiac pathology. Damage-associated molecular patterns (DAMPs) related to CVD and their molecular mechanisms remain unclear. We hypothesize that ischemic insults following an infarction in the myocardium accelerate inflammation via release of DAMPs, aggravating myocardial inflammation. We investigated and compared the expression of DAMPs in ischemic (ISC), hyperlipidemic (HL), and normal myocardium.

Materials & Methods:

Yucatan swine myocardial tissues were harvested from ischemic (ISC), hyperlipidemic (HL), and normal hearts. Thin longitudinal sections of the myocardial tissue were used for tissue morphology with hematoxylin and eosin (H&E), Masson trichrome, and Pentachrome staining. Immunofluorescence staining (IF) was performed for HMGB1, IL-1 β , TLR2, and TLR4. ImageJ software was used to quantify the mean fluorescence intensity (MFI) of each protein. The variation with respect to control (tissue from normal hearts) was calculated from the average MFI/nuclei. Results are presented as log₂ fold-change. One-way ANOVA with Bonferroni correction and Students' *t*-test were used for statistical analyses. A value of $p < 0.05$ was considered significant between the experimental groups.

Results:

The histological examinations revealed myocardial pathology including inflammation, fatty infiltration, and ECM disorganization. IF revealed altered expression of DAMP-mediators among treatment groups than the normal control. HMGB1 was upregulated in HL (FC = 2.49 ± 0.54) and was downregulated in ISC (FC = -5.42 ± 0.11). TLR2 was upregulated in HL (FC = 1.19 ± 1.04). Increased

IL-1 β expression was observed in HL (FC=1.19 \pm 1.88) which was further increased in ISC (FC=2.69 \pm 5.54).

Conclusions:

There is a difference in various DAMP response based on the treatment groups where the TLR2 and IL-1 β are upregulated with the rise in myocardial inflammation. HMGB1 upregulation in hyperlipidemia suggests its potential role in inflammation and macrophage recruitment to the site of damage. Deciphering the molecular mechanisms underlying the activation and downstream signaling of DAMPs offers immense translational opportunities.

Khatchadourian, Christopher and Sisliyan, Christina, College of Osteopathic Medicine of Pacific

Advisor: Dr. Vishwanath Venketaraman, COMP & Graduate College of biomedical Sciences

Project Title: Liposomal Formulation of Reduced Glutathione Reduces Bacterial Load and Alters the Immune Response in Mycobacterium Tuberculosis Infection

Authors: Christopher Khatchadourian, Christina Sisliyan, Nala Kachour, Abrianna Beever, James Owens, Ruoqiong Cao, Afsal Kolloli, Ranjeet Kumar, Kayvan Sasaninia, Charles Vaughn, Mohkam Singh, Edward Truong, Klara Zakery, Wael Khamas, Selvakumar Subbian, Vishwanath Venketaraman

Goals of the Study/Hypothesis:

At physiological concentrations, reduced form of glutathione (rGSH) inhibits the growth of *Mycobacterium tuberculosis* (*Mtb*) within granulomas. This experiment aims to elucidate the effects of liposomal formulation of GSH (L-GSH) on the levels of free radicals, inflammatory cytokines, granuloma formation, and *Mtb* survival.

Materials & Methods:

WT C57BL6 mice (11 males and 11 females) were infected with 100 CFU of *Mtb*. Treatment groups included 40mM L-GSH (40LGSH) or 80mM L-GSH (80LGSH) administered via drinking water. Control groups were administered mock treatment via drinking water.

Results:

Mtb infection increased free radical production as measured by Malondialdehyde (MDA) and diminished the levels of rGSH and total glutathione (tGSH) in the lungs. 40LGSH treatment showed significant increases in rGSH levels at 2-, 4-, and 8-weeks post-infection and tGSH at 4- and 8-weeks post-infection in lung lysates. 40LGSH treatment showed significant increases in rGSH and tGSH levels in the plasma at 4-weeks post-infection. 80LGSH treatment significantly increased rGSH and tGSH levels in lung lysates at 8-weeks post-infection. Both treatments resulted in reduced MDA levels in lung tissue and plasma. L-GSH treatments reduced the lung area involved in granuloma formation, granuloma size, and complexity. 40LGSH treatment significantly decreased the bacterial burden in the lungs at 4-weeks post-infection, spleen at 2-, 4- and 8-weeks post-infection and liver at 4-weeks post-infection. Both treatments significantly decreased the levels of IL-6 at 4-weeks post-infection and IL-10 at 8-weeks post-infection, and significantly increased IL-2 levels at 2 and 8-weeks post-infection in lung lysates. 40LGSH treatment significantly increased IFN- γ levels at 2-, 4- and 8-weeks post-infection in lung lysates.

Conclusions:

40LGSH effectively increased the levels of reduced and total GSH in the lung and plasma. L-GSH treatment altered cytokine profile and reduced bacterial load, granulomatous response, and free radical levels in mice. Thus, L-GSH may be implicated as an adjuvant to standard therapy in *Mtb* infection.

Kim, Cory, College of Osteopathic Medicine of Pacific (Abstract award recipient)
Advisor: Dr. Brian Johnstone. Oregon Health and Science University Department of Orthopedics and Rehabilitation
Project Title: A Novel Progenitor Cell in the Temporomandibular Joint
Authors: Cory Kim, Kenneth Weekes, Phillip Lam, Mathew Carnely, Cheyeon Jenny Lee, Brian Johnstone

Goals of the Study/Hypothesis:

Temporomandibular joint (TMJ) disorders can be severely debilitating, usually consisting of damage to the fibrocartilage articular disc. Discectomies to surgically treat a damaged articular disc can advance osteoarthritis and thus are not a viable long-term solution.

We sought to study an adult multipotent progenitor cell from the articular disc found within the TMJ. The novel articular disc progenitor cells (ADPs) identified were characterized and are promising for the use in tissue bioengineering applications.

Materials and Methods:

Articular discs dissected from rhesus TMJs underwent a fibronectin adhesion assay to isolate progenitor cells. Progenitor cells were then subject to osteogenic, adipogenic, and chondrogenic differentiation pathways. Histological analysis was performed to determine the extent of mineralization or lipid formation in osteogenic and adipogenic cultures respectively. Quantitative polymerase chain reaction analysis and biochemical assays were also done to further characterize the cells and their extracellular matrix productions. Additionally, flow cytometry compared ADPs to other previously characterized stem cells and total articular cartilage populations.

Results:

ADPs were shown to possess stem cell like properties with the ability to clonally expand up to fifty population doublings. Phenotypic plasticity was demonstrated by the ability to differentiate into osteoblasts, adipocytes, and chondrocytes. Most clones favored a greater production of total collagen, while others favored greater glycosaminoglycan (GAG) production. Flow cytometric analysis showed ADP's possessing the same stem cell markers as previously defined mesenchymal stem cells (MSCs), articular cartilage progenitor cells (ACPs), and tendon progenitor cells (TPCs).

Conclusions:

We have characterized a progenitor cell population in the TMJ articular disc that has stem cell like properties (ADPs). Their heterogenous secretion profiles would allow one to select an optimal subpopulation for a given treatment application (i.e. fibrous vs chondrogenic matrix production). Additional *in vivo* studies are needed to begin utilizing ADPs for regenerative disc healing.

L

Lai, Jennifer, College of Osteopathic Medicine of Pacific
Advisor: Drs. Marcel Fraix, Anita Nelson and Mandilin Hudson
Project Title: Medical Student Perceptions of Intimate Partner Violence Screenings in In-Person vs. Telemedicine Settings
Authors: Lai J, Cheng A, Nelson AL, Fraix M, Hudson M

Goals of the Study/Hypothesis:

Intimate Partner Violence (IPV) is a public health crisis that impacts 25% of women and 10% of men in the US, totaling 43 million women and 38 million men. IPV screenings traditionally occurred at doctor offices, but with the transition to telemedicine, screening is done at home. This study sought to identify potential educational and practice gaps in care surrounding IPV screenings in different

settings. We aimed to understand medical students' general experiences, attitudes, and perceptions of IPV screening.

Materials & Methods:

To assess student experiences with IPV screenings as both patients and as clinicians-in-training, two separate IRB-approved surveys were created and beta-tested for WesternU COMP/COMPNW medical students. One for those who had clinical rotations and the other for those who had not. Questions included personal experiences with in-person and telemedicine IPV screenings, how IPV screening was conducted, and perceptions of importance of IPV. Fourth-year students were asked additional questions regarding their experiences observing patients being screened. We used descriptive analysis of the responses to determine the frequency and modality of IPV screenings.

Results:

170 students participated in the study for a response rate of 13%: 140 students from the non-clinical cohort and 30 students from the clinical cohort. Overall, 36.9% of students who had been seen for an in-person appointment reported getting screened for IPV, while 12.5% of students seen in telemedicine appointments were screened. Students more frequently received in-person written surveys versus a verbal telemedicine screening. Healthcare personnel who administered screenings were primarily medical assistants and doctors in both environments. In the clinical cohort, the frequency of observed in-person vs telemedicine IPV screenings shifted from 56% to 8.33%.

Conclusions:

This study is unique because it provides the perspective of medical students as both patients and healthcare providers in training and demonstrates both educational and practice gaps in this new environment.

Lay, Saline and Nguyen, Tiffany, College of Pharmacy

Advisor: Dr. Simon Bulley, College of Pharmacy

Project Title: Gender Differences in the Effect of Dehydration on Resistance-Sized Arteries

Authors: Saline Lay, Tiffany Nguyen, Dr. Simon Bulley

Goals of the Study/Hypothesis:

Dehydration is a common physiological imbalance of water volume in the body which can become fatal if the body's homeostatic mechanism is broken. Water loss exceeding the amount of water intake results in this harmful decrease in total body water, which is a concern especially in developing countries where water scarcity is on the rise. Untreated dehydration can have consequences for the normal functioning of major physiological systems, including the cardiovascular system, and in particular the regulation of blood pressure. An important player in a state of dehydration is arginine vasopressin (AVP), an antidiuretic hormone. AVP is released via the renin-angiotensin-aldosterone system (RAAS) in response to water loss, resulting in reabsorption of sodium and water through aquaporins (AQP), upon binding of AVP to its receptors. Although it is known that AVP causes reabsorption of water, the distinct mechanism can still be further studied to truly understand the effects of dehydration on the human body and ultimately, to find the best therapeutic options to restore physiological functions impacted by dehydration. Additionally, many prior studies have shown a contradictory difference between male and female regulation of AVP. AVP and oxytocin (OXT) are two hormones of interest because of their similarities in osmotic regulation and their links to estradiol and testosterone. Throughout prior studies, the data is still conflicting on the actions of the sex hormones on AVP and OXT secretion. Therefore, there is a need to clarify the effect of male and female sex hormones on the expression of AVP and OXT induced by dehydration. Understanding this key concept will be useful in understanding various methods to treat, identify, and possibly even prevent dehydration in males and females distinctly. The goals of the study were to determine whether (1) AQP7 expression is also altered in 48-hr dehydrated female mesenteric arteries, (2) estrogen

contributes to changes in AQP7 expression, (3) glycerol pretreatment elevates AQP7 expression, (4) whether AQP7 and AQP9 are expressed in Perivascular Adipose Tissue (PVAT) surrounding mesenteric arteries, and (5) whether expression of osmosensitive Transient Receptor Potential (TRP) channels is altered in mesenteric arteries of dehydrated mice. We hypothesize that estrogen plays a role in dehydration-mediated changes in the expression of AQP7 and TRPV channels in mesenteric arteries, indicating there are sex differences in the regulation of these channels in mesenteric arteries during dehydration.

Materials & Methods:

Microscopy was performed for tissue dissection of the aorta, mesenteric arteries, hindlimb arteries, cerebral arteries, and PVAT as well as for the preparation of *en face* arterial sections in male and female mice. Confocal microscopy was used for immunofluorescence of *en face* mesenteric artery sections and PVAT for AQP7, AQP9, TRPV1, TRPV2, and TRPV4. A freezing point osmometer to measure blood plasma osmolality from control and 48-hr dehydrated mice. Dehydration-induced changes in protein expression were measured using the Simple Western automatic western system.

Results:

From our preliminary research, we confirmed that AQP7 increases in dehydrated male mesenteric arteries and AQP7 also increases in dehydrated female mesenteric arteries. Alternatively, as we suspected, AQP7 does not increase in dehydrated ovariectomized females (castrated females unable to release oxytocin). Estradiol rescues the increase in AQP7 expression in dehydrated ovariectomized females. We also observed that AQP7 and AQP9 are expressed in PVAT surrounding mesenteric arteries. Glycerol pretreatment results in an increase in expression. On the other hand, it seems that TRPV2 appears to increase in dehydrated males, but not females; however, this needs further elucidation through repeated samples.

Conclusions:

Thus far, it is safe to conclude that females and males systemically regulate their smooth muscle cell function in mesenteric arteries, in response to dehydration, through increasing the expression of the aquaporin AQP7, which is permeable to both water, and glycerol an energy substrate. The sex hormones, in particular oxytocin, play an important factor in this anomaly, possibly in the sense that oxytocin allows AQP7 expression to increase in response to dehydration. Although further samples need to be examined and further analysis of the protein expression between the different samples needs to be done, the results so far do show there is a difference worth exploring.

Lucara, Kendall, College of Osteopathic Medicine of Pacific Northwest

Advisor: Dr. Elisabeth Guenther, COMP-NW

Project Title: Osteopathic Medical Students Varying Rates Of Disability Exposure Reported on Core Rotations While Osteopathic Medical Students Report Support for Formal Disability Training

Authors: Kendall Lucara OMS II, Sara Henderson OMS III, Megan Blair OMS III, Anita Nelson MD, Elisabeth Guenther MD, MPH, FAAP

Goals of the Study/Hypothesis:

In the 2014 US Census, 17.6% of adults were severely disabled. People living with a disability have self-reported higher rates of dissatisfaction in their healthcare experience and there are no standards in the Commission on Osteopathic College Accreditation curricula for treating those with disabilities. We sought to quantify the exposure to caring for patients with disabilities that osteopathic medical students (OMS) get while on clinical rotations, to investigate how prepared students felt they were to care for this population and their attitudes towards formal disability training.

Materials & Methods:

An anonymous, beta-tested, IRB-approved survey and clarifying disability definitions were distributed electronically to all 3rd and 4th year OMS on clinical rotations in the spring. Descriptive statistics were calculated for each question based on the denominator of individuals who responded to the specific question.

Results:

Of the 600 surveys distributed, 40 were completed. 51% of respondents reported exposure to caring for people with disabilities prior to medical school. 30% reported being exposed to greater than 20 patients with disabilities on rotations. Exposure rates to caring for patients with disabilities differed by core rotation: internal medicine (86%), psychiatry (84%), family medicine (79%), pediatrics (77%), osteopathic manipulative medicine (76%), surgery (53%), and obstetrics and gynecology (36%). Students reported the most comfort caring for patients with physical/ambulatory disabilities (85%). Using the Likert-scale, 68% reported feeling probably (4/5) or definitely (5/5) prepared to care for patients with disabilities. However, 68% also felt the current curriculum probably or definitely did not fully prepare them and thought formal disability training should be added to pre-clinical curriculum.

Conclusions:

Experience with caring for individuals with disabilities was observed on all core medical rotations, but rates varied by specialty. Majority of students were in support of implementing formal disability training and felt the current curriculum did not prepare them to care for these patients.

M

Mazzi, Jessica, College of Osteopathic Medicine of Pacific Northwest Graduation

Advisor: Dr. Glen Kisby, COMP-NW

Project Title: A Pilot Study to Assess Medical Students' Perception of Their Osteopathic Manipulative Therapy Education

Authors: Rachel Gantz, Nathan Leavitt, Jessica Mazzi, Johannie Spaan, Dr. Glen Kisby

Goals of the Study/Hypothesis:

The goal of this pilot study was to assess how the OMT training curriculum influenced a medical student's perception of OMT and their intent to use the treatment modality as a future practicing physician.

Materials & Methods:

Data was gathered via a Qualtrics based survey of 13-questions that was disseminated through email by the clinical education department at two osteopathic medical schools to students in all four class years (n=1320). The survey contained multiple choice and free response questions regarding year in school, type of training received, whether OMT played a role in their choice of medical school, confidence in OMT skills, what they regarded as positive or negative factors in their education and their intent to utilize OMT in future practice.

Results:

A response rate of 18.3% was collected for a sample distribution across year of OMS I (31.7%), OMS II (21.3%), OMS III (24.6%) and OMS IV (22.5%). Nearly half of students (42.98%) indicated that they were satisfied with their pre-clinical OMT training and 46.28% reported being "somewhat confident" in their ability to treat with OMT. Student's perception was positively influenced by hands-on, in person training and prior medical experiences. Student perception was negatively impacted by virtual learning experiences and preclinical lecture hours. Overall, students who had specifically chosen an osteopathic school due to the availability of OMT had higher satisfaction in their

preclinical education $p < 0.01$, higher satisfaction in their 3rd year clerkship $p < 0.01$ and were confident in their skillset $p < 0.01$.

Conclusions:

A student's OMT education should be geared towards hands on and clinical experiences to increase confidence level and thereby their future use of OMT in practice. Additional studies with a larger sample size and response rate are indicated to further investigate the generalizability of our results with the goal of optimizing OMT education in medical school.

Mehta, Aashna, College of Osteopathic Medicine of Pacific

Advisor: Dr. Megan Economidis, UCLA Harbor

Project Title: The Impacts of COVID-19 on the Social Perceptions of Breastfeeding

Authors: Aashna Mehta, Elizabeth Wright, Dr. Anita Nelson, Dr. Hindi Stohl, Dr. Megan Economidis

Goals of the Study/Hypothesis:

There is a growing concern amongst physicians that the increased stress of COVID-19 has significantly impacted the number of women choosing to breastfeed. However, not many qualitative studies address whether COVID-19 has impacted breastfeeding perceptions. This study aims to identify hidden challenges women face while breastfeeding and to determine if those changed with the onset of the pandemic.

Materials & Methods:

This research was conducted manually across two social media sites, Reddit and TikTok, using the search terms "breastfeeding," "breastisbest," and "fedisbest." Posts with the most comments from pre-pandemic times [Jan 1, 2018 to March 15, 2020] were compared to the posts with the most comments from [March 15, 2020 to June 15, 2020].

Results:

248 posts were analyzed with a total of 433 mentions of the selected themes. Fifteen themes were noted across both Reddit and TikTok, and the top 2 themes across both platforms were "providing medical advice" and "supporting women's breastfeeding decisions." On Reddit, "supporting women's breastfeeding decisions" was the most mentioned theme before the onset of the pandemic (37.2%), but "providing medical advice" became the most mentioned theme after COVID-19 (42.4%). 60.0% of the posts on TikTok: After COVID19 included "providing medical advice" while only 42.4% of the posts on Reddit: After COVID19 provided medical advice. Some comments included the fact that not allowing visitors in hospitals and in their homes initially allowed them to successfully connect with their babies and initiate breastfeeding.

Conclusions:

Social media platforms provide a niche community for breastfeeding women to communicate with and support each other. Despite the stress of COVID-19, posts on Reddit illustrated that the pandemic positively impacted women's abilities to breastfeed. We hope that this study encourages physicians to engage in deeper conversations with their breastfeeding patients to help them better critically analyze information online but still receive the positive community support they need.

Mohindra, Ritika and Sekhon, Seerat, College of Osteopathic Medicine of Pacific
Advisor: Dr. Finosh Thankam, Dept of Translational Research
Project Title: Impact of Hypoxia on Tendon-specific Genes in Mesenchymal Stem Cells
Authors: Ritika Mohindra, Seerat Sekhon, Dr. Devendra K. Agrawal, Dr. Finosh G. Thankam

Goals of the Study/Hypothesis:

Tendon damage is characterized by hypoxia-driven collagen breakdown, which possibly triggers stem cells from surrounding adipose tissue (ADMSCs) to release regenerative factors via exosomes. We investigated the effects of hypoxia on ADMSC differentiation to determine possible therapeutic targets following tendon injury. We hypothesized that mediators from hypoxic tenocytes facilitate the differentiation of ADMSCs to tendon lineage.

Materials & Methods:

ADMSCs harvested from Yucatan microswine were exposed to hypoxic tenocytes to induce tenogenic differentiation, which was examined by immunofluorescence (IF) of tenomodulin, scleraxis, tenascin-c, and collagen I. Mean fluorescence intensity (MFI) was quantified for each biomarker and log₂ fold-change (FC) were calculated. Shoulder tenocytes were cultured under hypoxic conditions using cobalt (II) chloride (CoCl₂) and qPCR was performed to compare gene expression, represented as fold-difference (FD), under conditioned media prepared from hypoxic culture conditions. The experimental groups include: (i) control ADMSCs, (ii) normoxic tenocytes, (iii) hypoxic tenocytes, (iv) ADMSC treated with media from normoxic tenocytes, and (v) ADMSCs treated with media from hypoxic tenocytes.

Results:

The hypoxic tenocytes demonstrated increased expression of α -SMA (FC=0.73 \pm 0.30), scleraxis (FC=1.03 \pm 0.35), and tenomodulin (FC=1.30 \pm 0.24) and decreased expression of tenascin-c (FC=-0.60 \pm 0.38) compared to normoxic conditions. In the transcript analysis by qPCR, the hypoxic tenocytes demonstrated increased expression of collagen I (FD=3.00, n=1), scleraxis (FD=1.21, n=1), and tenomodulin (FD=4.69, n=1). The hypoxic ADMSCs similarly demonstrated increased collagen 1 (FD=2.21, n=1), tenomodulin (FD=0.02, n=1), and scleraxis (FD=1.40, n=1).

Conclusions:

The results indicate that hypoxia increases tendon-specific gene expression in tenocytes, which possibly impacts ADMSC differentiation. Further investigation will elucidate the extent of the hypoxic impact, however ADMSCs show promise as therapeutic targets following tendon injury.

O

Overton, Deanna, College of Veterinary Medicine
Advisor: Malika Kachani, DVM, PhD, College of Veterinary Medicine
Project Title: Knowledge, Attitudes, and Practices Relating to Risk Factors for Zoonotic Diseases in the Oloisukut Conservancy, Kenya: A One Health Intervention Approach
Authors: Christina Trabanco, Deanna Overton, Eberhard Zeyhle, Erastus Mulinge, Dr. Malika Kachani

Goals of the Study/Hypothesis:

The goals of this study were (1) to assess the major risk factors for zoonotic and animal diseases in the Oloisukut Conservancy, Narok County, Kenya, and (2) to identify the most important needs of the community and its proposed solutions to human and animal health

problems. Due to the close interactions of people, wildlife, domestic dogs, and livestock in the conservancy, we hypothesized that the risk of zoonotic disease transmission was high.

Materials & Methods:

The study used the One Health (OH) approach, participatory epidemiology (PE), and knowledge, attitudes, and practices (KAP) surveys. Individual interviews were conducted with fifteen households in the Oloisukut Conservancy. The KAP surveys were used to assess the community's knowledge on diseases in both humans and animals, their beliefs towards these diseases, their common practices, community needs, and proposed solutions. Results were grouped into qualitative and quantitative responses. A cross-tabulation analysis was conducted on qualitative data to determine statistical significance.

Results:

The results highlighted the community's familiarity with and possible risk factors for, the transmission of zoonotic diseases including brucellosis, anthrax, rabies, bovine tuberculosis, cystic echinococcosis, and trypanosomiasis. Additionally, the community demonstrated knowledge and understanding of economically important animal diseases such as foot and mouth disease and east coast fever. Due to a small sample size, we were unable to correlate zoonotic disease risk with specific variables. The overarching needs were identified as access to water, healthcare, and veterinary care, protection from wildlife and predators, and availability of educational resources for both children and adults.

Conclusions:

This study provides preliminary results that highlight the presence of major zoonotic diseases, risk factors for transmission, and major community needs in the Oloisukut Conservancy. Future studies may expand on the current findings to further identify zoonotic disease risks and develop appropriate control interventions.

R

Raja, Ajith, College of Osteopathic Medicine of Pacific

Advisor: Dr. Ryan Buller

Project Title: Medical Learners' Opinions on Program Performance Feedback to Program Faculty

Authors: Dr. Ryan Buller, Ajith Raja, Timothy Allison-Aipa

Goals of the Study/Hypothesis:

There is little focus on how learners can give feedback to program faculty in residencies and fellowships in the United States. We hope to fill this gap by identifying learners' attitudes towards learner-provided feedback. This study aims to determine if learners feel comfortable giving honest feedback to their program, the feedback method they prefer, and whether this feedback correlates with a culture of camaraderie between residents and faculty.

Materials & Methods:

A questionnaire was developed based on our study objectives, using both multiple choice and open response questions. The survey was sent to 125 residents and fellows at the Riverside open response questions. The survey was sent to 125 residents and fellows at the Riverside University Health System (RUHS) medical program. Cronbach's alpha was calculated to

determine internal validity. Descriptive statistics, and a correlation coefficient was calculated from survey responses.

Results:

Results showed that learners felt comfortable giving honest feedback to their program, and preferred individual, anonymous, written feedback as their feedback method of choice. There were also strong correlations between attitudes toward feedback and feelings of camaraderie.

Conclusions:

Our study shows that residents have a positive attitude towards giving feedback, and that feedback may be helpful in fostering camaraderie in medical education. Although our study was under-powered, it provides much needed insight from the learner perspective, opening the doors for future studies.

References:

Submitted to the Journal of Medical Education and Curricular Development (MDE)

S

Salimi, Erika, College of Osteopathic Medicine of Pacific

Advisor: Dr. Mandilin Hudson, COMP-NW

Project Title: Surveys of The Perceptions of Faculty and Students about Stress and Resilience

Authors: Erika Salimi, Saakshi Dulani, Dr. Anita Nelson MD, Dr. Mandilin Hudson

Goals of the Study/Hypothesis:

To explore faculty and student perceptions about resilience and stress and their relation to academic success for osteopathic medical students.

Materials & Methods:

Two beta-tested, IRB-approved instruments surveyed preclinical faculty and students separately. The faculty survey asked about resilience as a learnable skill and its importance for student success. The student survey explored risk factors using standardized measures. We calculated response rates and percentage distributions of the answers.

Results:

The response rates were 21% and 10%, respectively. Faculty: 55% were clinical, 30% basic science faculty, 5% both. All respondents said resilience is very or extremely important to student success. 90% said it improves academic success. Exploring how resilience is developed, 60% said it is more learned than intrinsic, 34% thought learned through life experiences, and 34% through informal teaching in the context of individual challenge. 35% said there should be more screening of applicants but 30% disagreed. 65% said formal student training should be added in the DO curriculum. 85% thought faculty would benefit from formal training. Students: The study population was 46% first- 24% second- 14% third- and 16% fourth- year students. 96% reported to having anxiety in personal or professional relationships. 75% said that medical school had been the hardest time of their lives. Only 40% of students were satisfied with their academic performance and only 42% with their general wellbeing. 96% reported anxiety, but only 65% said they would seek help for such problems.

Conclusions:

Osteopathic medicine emphasizes humanistic values, but COCA curriculum requires no explicit resilience training. Most faculty thought that resilience is more learned than intrinsic. Most students, though optimistic, reported experiencing stress needing resilience. Providing training for students and instruction for faculty on how to teach it could be worthwhile.

Scrivens, Nicholas, College of Osteopathic Medicine of Pacific Northwest ([Abstract award recipient](#))

Advisor: Jerel Fields, PhD, UCSD. Edie Sperling, DPT, COMP-NW.

Project Title: Tenofovir Alafenamide Fumarate Alters Markers of Mitochondrial Biogenesis in the Brains of Transgenic Mice

Authors: Nicholas Scrivens, Mary Swinton, Dr. Jerel Fields

Goals of Study/Hypothesis:

HIV associated neurocognitive disorder (HAND) affects 30-50% of people with HIV despite the effectiveness of antiretroviral therapy (ART). Neuronal mitochondrial dysfunction is a prospective etiology of HAND, with previous studies finding that HIV proteins gp120 and Tat and ART drug tenofovir disoproxil fumarate (TDF) alter levels of transcription factor A mitochondrial (TFAM), peroxisome proliferator-activated receptor γ coactivator 1- α (PGC-1 α) and glial fibrillary acidic protein (GFAP) in mouse brains. This study quantified the previously unknown effects of gp120 and Tat combined with new generation ART drug tenofovir alafenamide fumarate (TAF) on TFAM, PGC-1 α and GFAP levels in mouse brains, further investigating the separate and combined effects of HIV and ART in the neuropathogenesis of HAND.

Materials & Methods:

Transgenic mice co-expressing gp120 and Tat in the brain were exposed to TAF by oral gavage daily for 30 days. Brain specimens were analyzed by immunoblot and immunohistochemistry (IHC) to quantify changes in TFAM and PGC-1 α as markers of mitochondrial biogenesis and GFAP as a marker for astrogliosis.

Results:

Both immunoblot and IHC showed decreased TFAM levels in hippocampi of mice treated with TAF and gp120/TAF compared to control, more notably in males. PGC-1 α levels were unchanged between all groups on both immunoblot and IHC. IHC staining showed increased GFAP among TAF and gp120/TAF mice, which was more pronounced in male gp120/TAF mice.

Conclusions: These findings are consistent with previous studies showing that TDF and gp120 decrease TFAM. Unchanged PGC-1 α levels between treatment groups suggests that the mechanism responsible for altered TFAM levels may be downstream of PGC-1 α , among other possible causes. GFAP levels increased in TAF, gp120 and gp120/TAF mice, indicating increased astrogliosis in these groups. The more pronounced differences in male mice indicate that sex may play a role in neuronal mitochondrial response to gp120 and/or TAF.

Swinton, Mary, College of Osteopathic Medicine of Pacific Northwest

Advisor: Dr. Jerel Adam Fields, UCSD and Dr. Elisabeth Guenther, COMP

Project Title: TREM2 regulates the phagocytic capabilities of HMC3 cells; implications for HIV Associated Neurocognitive Disorders

Authors: Mary Swinton and Dr. Jerel Adam Fields

Goals of the Study/Hypothesis: Despite effective antiretroviral therapy and reduced viral loads, HIV-associated neurocognitive disorder (HAND) persists, and the underlying mechanisms are unknown. Recent studies suggest that cannabis may be neuroprotective in HAND by reducing

inflammation. Microglia play an important role in neuroinflammation and exist on a spectrum of phenotypes ranging from pro-inflammatory and toxic (M1) to anti-inflammatory and neuroprotective (M2). The M2 phenotype is associated with increased TREM2, increased amyloid beta (A β) phagocytosis, and reduced neurodegeneration. We proposed that HIV relevant stimuli (HRS) would induce the M1 phenotype and reduce TREM2 expression, and a cannabinoid receptor agonist would reverse these changes.

Materials & Methods:

A human microglial cell line, HMC3, was used as a model. First, we exposed the microglia to HRS and measured levels of TREM2 and cytokines by western blot and real-time quantitative reverse transcription PCR (RT-qPCR). In addition, we measured the ability of the microglia to phagocytose A β using fluorescein labeled A β . We repeated this experiment by both inducing and knocking down TREM2, using a cannabinoid receptor agonist and siRNA respectively.

Results:

HMC3 cells treated with HRS showed reduced TREM2 and increased inflammatory cytokine levels as seen by western blot and RT-qPCR. Furthermore, siRNA knockdown of TREM2 in these same cells significantly decreased phagocytosis of A β compared to controls, as shown by reduced fluorescein intensity levels per cell. Lastly, a cannabinoid receptor agonist increased HMC3 TREM2 expression levels, shown by western blot and RT-qPCR.

Conclusions: HRS reduces TREM2 and increases proinflammatory cytokines in HMC3s, inducing the toxic M1 phenotype. In addition, TREM2 knockdown reduces HMC3 phagocytic ability. Thus, maintaining TREM2 expression levels could be targeted to promote the protective phenotype of microglia. Lastly, we show that cannabinoid receptor agonists could have therapeutic potential to increase the M2 phenotype and treat patients with HAND.

T

Tam, Audrey, College of Optometry ([Abstract award recipient](#))

Advisor: Dr. Kierstyn Napier-Dovorany, COO

Project Title: Impact of yoga exercise on quality of life and balance confidence in people with visual impairment

Authors: Audrey Tam, Dr. Kierstyn Napier-Dovorany, Nicole Stoehr

Goals of the Study/Hypothesis:

The purpose of this study was to evaluate balance confidence, quality of life improvement of doing yoga exercise of visually impaired people.

Materials & Methods:

Activities-specific Balance Confidence (ABC) Scale and SF-36 Health Surveys were administered before and after 8-weekly yoga sessions. Qualitative feedback was obtained at week 4 and week 8. Two-tailed ttest was utilized to measure differences after yoga intervention with paired for evaluation of pre vs post yoga; unpaired to compare between groups.

Results:

16 participants had an average age of 50 years old; 75% were female. 81% reported having visual acuity less than 20/70, 87.5% reported having reduced visual field. 12.5% have experienced a fall within the last 6 months. 62.5% have experience doing yoga exercise. There was a significant improvement in current health conditions limiting moderate activities (p=0.04) as well as improvements in work due to physical health (p=0.04). In addition, balance confidence was significantly improved in those less than 50 years old (n=6) as compared to those 50 years of age or

older after 8 weeks of yoga ($p=0.04$). In this group social functioning was also significantly improved ($p=0.01$). Qualitatively, participants felt an improvement in flexibility ($n=6$ at 4 weeks, $n=5$ at 8 weeks), strength ($n=7$ at 4 weeks, $n=9$ at 8 weeks), and balance ($n=3$ at 4 weeks, $n=5$ at 8 weeks) as a result of regular yoga practice. 9 participants stated a desire to continue with yoga practice.

Conclusions:

This pilot study of the impact of yoga on people with visual impairment showed modest improvements in balance, confidence, and quality of life. These participants are already exercising regularly, which is likely contributing to high balance confidence regardless of yoga practice. Yet, many participants reported improvements in physical function and would like to continue yoga practice in the future.



Varshney, Harsh, Weng, Douglas, College of Podiatric Medicine

Advisor: Dr. Joseph Park, DPM, College of Podiatric Medicine

Project Title: Podiatric Physician Perspective on the use of Cannabidiol (CBD) in the Treatment of Foot and Ankle Pathology

Authors: Harsh Varshney, Douglas Weng

Goals of the Study/Hypothesis:

With the emergence of cannabidiol products as a fast-growing alternative treatment option in medical care and with subsequent ongoing legalization processes, more research is needed to explore the use and stances amongst physicians. This particular study focuses on the podiatric physician's perspective on its use. Pre-existing research has found implications for the use of CBD in pain management and its application in the field of podiatric medicine may serve an important role in long term care for patients. This study aims to understand how podiatric physicians view the use of CBD based products in their medical practice as well as the level of education or research providers have been exposed to in the use of CBD products. The survey study collected responses in order to answer the research question. With the data collected, there is a positive shift in the outlook on the use CBD products with providers interested in exploring the uses of these products. This study provides a tool to further explore not only how providers view these products, but also how they engage in conversation about these products with their patients. The goal of this study was the develop a better understand of the current perspective that podiatric physicians have on the use of cannabidiol products in their practice, particularly as it pertains to patient care. We hypothesized that there would be a positive shift in the use of CBD products and the outlook that providers have when recommending these products to patients.

Materials & Methods:

Data was collected utilizing a Qualtrics survey. Survey participants were collected electronically via optional participation of podiatric physicians throughout Southern California to learn about beliefs and personal experience with CBD products. Participation was delivered via email with information protected and stored via the Qualtrics platform. The survey itself was designed to have anonymous participation to reduce the influence of bias in responses. Questions in the survey included aspects of practice involving reasons for CBD recommendations and frequency of recommendation. The survey consisted of a total of 13 questions designed to be delivered in a branched method dependent on our practitioners responding to the previous question.

Results:

We received a total of 50 responses for this study. At the end of the study we allowed for an open response from participants. The responses we received provide important considerations for

potential future research taking into account different forms of CBD products and their administration.

Conclusions:

The data suggests that there is a positive shift towards the perception of CBD use in podiatric practice. Further research needs to be conducted on the long-term effects of CBD as well as how CBD plays into context-specific pathologies as they pertain to the field of podiatric medicine.

PROJECT ABSTRACTS Submitted (Students not presenting)

A

Abjelina, Jacob and Mariano, Chanelle, College of Podiatric Medicine

Advisor: Dr. Kelly Parks, DPM - College of Podiatric Medicine

Project Title: Evaluation of Similarities and Discrepancies in International Podiatry

Authors: Jacob Abjelina and Chanelle Mariano

Goals of the Study/Hypothesis:

The purpose of this study is to summarize the available information regarding podiatric education and scope of practice on an international level.

Materials & Methods:

The investigated education and practice standards were modeled after the milestones required to achieve the title of Doctor of Podiatric Medicine (DPM) in the United States and were categorized into the following segments: *Presence of a national podiatric association, degree requirements, pre-requisite courses, admissions test, length of medical school education, residency or continued education requirement, and ability to perform surgery.* Data was primarily obtained from verified governments, educational establishments, and Podiatric associations.

Results:

The findings of the study indicate diverse training, education, and practice across 28 countries that had reliable information available. Of the 198 countries currently recognized by the Office of the Historian, sufficient information regarding podiatric medical schooling and practice could be found for 28 countries.

Conclusions:

This study was limited by the lack of information online for a majority of the countries and was limited to searches in the English language and American terminology. Implications of these results signify possible conflict in terms of receiving podiatric care when travelling overseas or when pursuing a career in podiatry within or outside of one's territory due to the various healthcare systems and overall recognition of the field itself in certain countries. Inconsistencies of what defines a podiatric practice or even podiatry as a medical field create confusion in regard to the importance of the field. Also, as the dispute for parity with physicians in the United States continues, this data can be used to dispute the policies that disregard podiatry as a physician's practice.

B

Bhavsar, Harsh and Khan, Maaz, College of Podiatric Medicine

Advisor: Dr. Kelly Parks, College of Podiatric Medicine

Project Title: Podiatric Medicine Research Poster Evaluation

Authors: Harsh Bhavsar and Maaz Khan

Goals of the Study/Hypothesis:

The purpose of this investigation was to evaluate podiatric medical research posters as visual communication tools based on the efficacy of their presentation and organization.

Materials & Methods:

100 podiatric scientific posters presented at the ACFAS 2019 Annual Scientific Conference were obtained from an online database. Each poster was evaluated using the “60 second poster evaluation”, a rubric of 13 criteria for evaluating a poster’s overall appearance and organization as a means of effectively communicating content. The score for each individual criteria as well as the overall score was tabulated for each poster.

Results:

Overall, the evaluated posters scored high (mean: 14) with a greater than 80% adherence to the “60 second poster evaluation” criteria. The average score for each of the individual criteria was also high in all but two cases; the average was not greater than 80% adherence for text size (71.5%) and author identification (51.5%).

Conclusions:

These results suggest text size and author identification represent the greatest areas for future improvement of overall scores, visual appeal, and communication efficacy in podiatric poster presentations. A limitation of this investigation is the “60 second poster evaluation” tool used is not a validated scoring instrument and has no quantifiable scale. Additionally, there is risk for bias as personal preferences or opinion on visual aesthetics of the scorer can impact the score poster to poster. Discovery or development of a validated, simple tool with strong interobserver reliability for measuring efficacy of poster visual communication would be beneficial to future investigations. Statistical power of future investigations could also be strengthened by including posters from other conferences and other health professions.

Burd, Ryan and Cayton, Jared, College of Osteopathic Medicine of Pacific Northwest ([Abstract award recipient](#))

Advisor: Dr. Michelle Steinauer, College of Osteopathic Medicine of the Pacific Northwest

Project Title: Characterization of the Highly Diverse Genomic

Authors: Ryan Burd, Jared Cayton, Tom Pennance, Jacob A. Tennessen, Fredrick, Rawago, Maurice Odiere, George Owino, Michelle Steinauer

Goals of the Study/Hypothesis:

Schistosomiasis is a neglected tropical disease impacting millions primarily in regions of poverty. Freshwater snails are obligate vectors of schistosomes causing this disease. Our goal is to uncover the genetics underlying snail immunity to schistosomes so novel control strategies may be developed, preventing human infection. Pathogen recognition receptors (PRRs) are part of the first-line defense against pathogens. They are hypothesized to be under balancing selection due to selection pressure on pathogens to evolve novel epitopes to evade immune recognition and on host receptors to detect pathogens. PRRs and other immune loci are expected to be among the most diverse regions of the genome. Using whole genome data from African snail vector, *Biomphalaria sudanica*, we hypothesize that diverse regions of the genome are enriched with immune related loci and that we can identify novel PRRs in these regions.

Materials & Methods:

Five *B. sudanica* strains (collected: Lake Victoria, Kenya) were sequenced using PacBio and Illumina paired-end reads. Mean inter-line diversity (Π) was calculated across the genomes and segmented into smaller windows (10-100kb). Each window with $\Pi > 1\%$ had 1Mb of surrounding nucleotides annotated and transmembrane domains (TMDs) identified using predictive software. The proportion of TMD peptides in high-diversity windows was compared to the proportion in 30 random contig regions.

Results:

67 of 6815 contigs met our Π threshold of 1%. 421 of 818 immune-suspected peptides have TMDs, represented comparably to randomized control regions. Immune-related genes associated with *Schistosoma* resistance in other species including PTC2 and PTC1/GRC were identified in regions targetted using our approach. This successfully identified known *B. glabrata* PRRs and novel PRRs in *B. sudanica*.

Conclusions:

Our study shows support for the diversity-based approach to identifying PRRs in *Biomphalaria*. Our list of candidate genes for PRR provides a foundation guiding resistance and gene knockout studies for *Biomphalaria* species.

C

Chen, Grace, College of Osteopathic Medicine of the Pacific

Advisor: Dr. Kabirullah Lutfy, Ph.D. College of Pharmacy

Project Title: Inducing nicotine dependence and altered alcohol self-administration via electronic cigarettes containing nicotine in mice

Authors: Grace Chen, Kabirullah Lutfy

Goals of the Study/Hypothesis:

Recently, e-cigarettes (e-cig) have developed as an alternative to conventional cigarettes. In the United States, e-cigarettes were made are the most popular tobacco products among adolescents, with 20.8% of 9- to 12th graders reporting usage in the last 30-days in 2020. Adolescence is a period in which the developing brain is highly plastic, and exposure to nicotine has been linked to various cortical changes. In humans, early smoking has been linked to lower rates of successful smoking cessation as well as increased nicotine and other drugs use later in life. Yet, the influence of the first- and second-hand e-cig exposure on the development of addiction is less clear. The goal of this study was to investigate the impact of second-hand nicotine exposure on alcohol self-administration in mice.

Materials & Methods:

Nicotine exposure was conducted in chambers meant to simulate second-hand e-cigarette smoking behaviors, using Menthol-flavored blu PLUS+ Tank nicotine cartridges containing 2.4% nicotine, a commonly used e-cigarette device. Four female adolescent (PN28-PN32) C57BL/6J mice were exposed to nicotine (either 0% or 2.4%) daily for 5 consecutive days for 4 hours per day each week for a total of 6 weeks, and two mice not exposed to chambers or nicotine served as controls. Alcohol was provided ad lib at the end of the nicotine exposure each day for all mice at increasing concentrations of 6%, 12%, and 16% ethanol.

Results:

Alcohol self-administration (consumption), food intake, and bodyweights were recorded daily during the e-cig exposure period for a total of 6 weeks in the treated (e-cig containing 2.4% nicotine) and control (e-cig containing 0% nicotine) groups. Across all groups of mice, alcohol consumption was significantly less than water consumption and decreased further as alcohol concentration rose, although it was unclear whether these effects were due to palatability or nicotine exposure.

Conclusions:

Further directions regarding the impact of nicotine on alcohol intake would be to see whether negative affective states following nicotine withdrawal would be similar following e-cigarette exposure.

Conner, Jessica, College of Veterinary Medicine

Advisor: Dr. Curtis Eng, College of Veterinary Medicine

Project Title: Development & standardization of cardiac diagnostic parameters of the bearded dragon (*Pogona vitticeps*)

Authors: Jessica Conner, Bart Huber, Curtis Eng

Goals of the Study/Hypothesis:

Heart disease in reptiles has not been well described & clinical signs are fairly non-specific (lethargy, weakness, etc.), and could very well be diagnostically under-represented. As reptiles live longer in captivity it is probable that the prevalence of heart disease will continue to rise with age. With bearded dragons being one of the most popular lizards owned by pet owners, cardiovascular pathologies like congestive heart failure & aneurysms have been previously reported in this species. One of the many diagnostic tools in detecting cardiovascular disease is measurement of heart size. While the vertebral heart score is well known and quite established in cats and dogs, there are no such standards for diagnostic cardiac evaluation in reptiles. This retrospective study aims to define and standardize normal heart parameters in a small population of bearded dragons. Using past cases that required radiology and computed tomography, the long axis of the heart was measured at its longest section; the short axis was then measured at the tallest section in a perpendicular segment from the long axis. Additionally, the widest sections of the heart-from left to right-were measured and recorded. The measurements of the long and short axis of the heart will be compared to various vertebrae in hopes of creating a reptilian vertebral heart score equivalent. For further comparison, the same measurements were recorded from bearded dragons previously diagnosed with CHF, cardiomegaly or other cardiac pathologies. Descriptive data analysis provided through this study will begin the process of creating a set of normal or standard heart parameters for future clinical cardiac diagnoses as well as contribute to reptile cardiology research.

Materials & Methods:

For all animals, heart axis measurements were taken in the lateral view due to better visibility. The long axis of the heart was measured at its longest section, from the most cranial border of the base of the heart to the most distant ventral/caudal contour of the cardiac apex. Retrospective review of the medical records of 34 bearded dragons from a small animal/exotic animal practice in Corona, CA. Patient selection was based on the animal having radiographs, computed tomography (CT) scans or both of the thoracic portion of the coelomic cavity. These animals previously presented for both cardiac and non-cardiac abnormalities or illnesses. Sizes of both the short and long axis were summed and then correlated to either lizard length, pectoral girdle length, and pelvic girdle length. Data obtained from this study are expressed as mean \pm standard deviation. Basic descriptive statistical analysis was performed on all animals included in the study. Data was also analyzed in smaller groups that were divided as follows: all animals, animals included in the radiographic study, animals included in the CT study, females, and males. Values that were obtained through these groups included: means, ranges, standard deviation and coefficients of variance. Regression and correlation analyses were used to determine the relationship between heart size & snout-to-vent length, pectoral girdle width, or pelvic girdle width. Heart size was created via summation of both the short axis and long axis measurements. To rule out variation in heart size due to dehydration, a t-test was performed on hydrated vs. dehydrated patients. Probability of $P < 0.05$ was considered significant. Main software used for data analysis was Graphpad Prism.

Results:

Average measurements in bearded dragons **not** diagnosed with cardiac pathology throughout both modalities. In total 16 bearded dragons were diagnosed with cardiac issues, nine were male & seven female. Average measurements in bearded dragons diagnosed *with* cardiac pathology throughout both modalities: Short axis: 1.82 ± 0.54 cm; Long axis: 3.35 ± 0.54 cm; Heart width (from DV view): 2.81 ± 0.59 cm; Heart size (short + long axes): 5.17 ± 0.99 cm. Notes for both modalities: Average heart size found in cardiac subjects was 21% larger than average heart size of non-cardiac subjects which was confirmed with a t-test ($P < 0.0001$). Gender and hydration status did not significantly influence the size of individual axis measurements or the size of the heart in non-cardiac patients, confirmed via t-test. The differences in measurements between modalities was slight; the biggest difference was found in mean short axis length with the radiograph value measuring 15% larger than its counterpart. Of the three body measurements used for comparison to heart sizes, the best correlation was found between heart size and lizard length ($r = 0.59$; $P < 0.0001$; Fig. 4). There was essentially no significant correlation found between heart size and pectoral girdle length ($r = 0.26$; $P < 0.052$) or heart size and pelvic girdle length ($r = 0.13$; $P < 0.34$).

Conclusions:

There is a considerable size difference between the heart size of those with and without cardiac pathology. This information helps to start the process of establishing average heart sizes versus enlarged hearts.

D

Davis, Lauren, College of Osteopathic Medicine of Pacific

Adviso: Dr. Nuriya Robinson, UCLA

Project Title: Medical students' knowledge and perceptions surrounding early pregnancy loss

Authors: Lauren Davis OMS II, Emily Ong OMS II, Nuriya Robinson

Goals of the Study/Hypothesis:

The aim of this research was to identify possible gaps in knowledge of EPL and the psychosocial effects of EPL among medical students.

Materials & Methods:

A survey was developed with questions to assess student's knowledge of the prevalence of EPL, possible psychosocial effects women may experience after pregnancy loss and personal experiences of EPL. The survey was distributed via an anonymous link on Qualtrics to first through fourth year medical students at COMP and COMP-NW campuses. Responses were analyzed and response percentages were generated through Qualtrics.

Results:

98 students (70 preclinical, 28 clinical) completed the survey. 70% of students correctly identified the percentage of pregnancies ending in EPL. 71.43% correctly identified genetics as the most common cause of EPL. Students underestimated the percentage of women feeling they received adequate emotional support following an EPL. 36.73% of students stated they have mainly learned about EPL via personal/life experiences, 20.41% of students selected their knowledge comes from media/social media, 15.31% from pre-clinical education and 12.24% from clinical education. 72.32% of respondents had some personal experience with EPL via friend, self, family and partner.

Conclusions:

Most of the respondents were able to correctly identify some of the basic statistics and causes of EPL. However, the percentage of students who answered correctly did not vary much between the clinical and preclinical students, indicating that some students are going through their education and clinical rotations without basic knowledge of this common occurrence. With nearly 75% of respondents having a connection to someone who had an EPL, firsthand insight into their experience might have led to underestimating women's support from the health care community following an EPL. This could have also been due to a fifth of the respondents learning about EPL from media/social media where women have been increasingly sharing personal experiences and struggles following EPL.

E

Ettenger, Simon, College of Veterinary Medicine

Advisor: Gillian Angliss, Dr. Rhea Hanselmann, CVM

Project Title: What's our impact? Examining accessible veterinary services at Western University of Health Sciences' College of Veterinary Medicine

Authors: Simon Ettenger, Gillian Angliss, Rhea Hanselmann

Goals of the Study/Hypothesis:

Low-income and unhoused individuals face significant barriers in accessing veterinary care for their companion animals. Inadequate access to veterinary care has multiple negative consequences that include adverse public health outcomes, stress to the human-animal bond, and the prevention of unhoused individuals with pets from accessing shelter. The city of Pomona, California, home to Western University of Health Sciences' College of Veterinary Medicine (WesternU CVM), has a large proportion of economically disadvantaged residents and there is evidence that many in need of veterinary services are unable to obtain them. The goals of this project were to create an inventory of low-cost veterinary services currently provided by WesternU CVM, characterize the populations of pet owners that have accessed veterinary care through these services, and illustrate the types of veterinary services provided.

Materials & Methods:

Medical records from WesternU sites offering low-cost veterinary services were reviewed and pertinent information extracted, including geographic location of clients and specific preventive care services provided. Data were analyzed descriptively to characterize the populations of pet owners that have accessed veterinary care through these services, and illustrate the types of veterinary services provided.

Results:

The current low-cost services offered by WesternU CVM benefit surrounding communities but do not reach many Pomona residents. When on-campus services were offered during a 4-month period in 2021, Pomona residents accounted for a much larger proportion of clients served.

Conclusions:

There is a need for more accessible, low-cost veterinary services in Pomona. WesternU CVM is well positioned to address the inequities in access to veterinary care that exist in the community.

G

Gevorgyan, Nare, College of Pharmacy

Advisor: Dr. Simon Bulley, College of Pharmacy

Project Title: The contribution of glucose to dehydration-induced alterations in V1aR and AT1R expression and function in resistance-sized mesenteric arteries

Authors: Nare Gevorgyan, Dr. Simon Bulley

Goals of the Study/Hypothesis:

VSMC-specific GLUT1 knockout mouse model proposal examines VSMC-specific GLUT1 knockout role in freshly isolated resistance-sized mesenteric arteries of dehydrated mice and its effect on expression alteration of vasopressin receptors (V1aR), vasopressin associated aquaporin receptors (AQP), and angiotensin receptors (AT1R) and their function. Dehydration is characterized by the water input and output disbalance in the body. To possibly prevent dehydration complications, particularly variations in blood pressure levels in the body it is critical to study the underlying mechanisms of the VSMC-specific GLUT1 knockout mouse model. The existing studies have shown that elevated glucose levels downregulate V1aR and AT1R by reducing the expression and function of these receptors in dehydrated mice. In addition, it has been shown that dehydration results in increased GLUT1 expression in VSMCs. There is a high likelihood of increased glucose uptake as well which will be assessed by using ELISA in the scope of the proposed model. GLUT-1 is mainly expressed in VSMCs suggesting its knockout importance in studying whether glucose uptake through GLUT1 changes the V1aR and AT1R receptor expression and their function. This model specifically focuses on confirming the VSMC-specific GLUT-1 knockout (KO) by using Simple Western and Immunofluorescence imaging to confirm the specificity of GLUT1 knockout to VSMCs by indicating expression in endothelial cells (ECs) in mesenteric arteries. To study whether VSMC-specific GLUT-1 KO prevents a reduction in V1aR and AT1R function myography will be used.

Materials & Methods:

Tissue dissection, genomic DNA isolation, genomic DNA PCR, protein isolation, Simple Western, confocal microscopy

Results:

I confirmed the expression of GLUT1, GLUT3, and GLUT9 in resistance-sized mesenteric arteries, through the use of Simple Western, measuring protein expression, and immunofluorescence of en face arterial sections, showing expression in both vascular smooth muscle cells and endothelial cells. I also measured an increase in GLUT1 protein expression after 48-hours of dehydration in mouse mesenteric arteries. I determined that our smooth muscle cell-specific GLUT1 knockout model did produce homozygous knockout mice that were viable and fertile. I also confirmed GLUT1 knockout in mesenteric artery smooth muscle cells, but not endothelial cells, therefore confirming its cell-type specificity.

Conclusions:

There are several glucose transporters expressed in resistance-sized mesenteric arteries, found in both vascular smooth muscle cells and endothelial cells. Mice that have been dehydrated for 48 hours appear to have increased expression of GLUT1, compared to control mice. Our smooth muscle cell-specific GLUT knockout mouse appears to be viable and fertile and has smooth muscle cell specificity, however, we were unable to validate this through Simple Western experiment, or measure whether other GLUTs, AT1R, or V1aR expression was changed due to GLUT1 knockout due to a low number of experimental mice.

Ghazaryan, Nane, College of Optometry
Advisor: Dr. Frank Spors, College of Optometry
Project Title: Field of View Measurements in Low Vision Telescopes
Authors: Nane Ghazaryan, Dr. Frank Spors, Dr. Bennett McAllister

Goals of the Study/Hypothesis:

Small telescopes have been proven to be useful for people with vision impairment by assisting them in identifying distant objects. This extends the range of useable vision and aids in mobility and independent travel. Currently, small telescopes are labeled by their magnification power and objective lens size, both of which are easy to measure clinically. A third parameter that is critical to ease of use and function is field of view. While telescope manufacturers make claims about field of view, verifying those claims is not easily determined in a clinical setting. In this study, we utilized a standard tangent screen and kinetic techniques to verify the extents of the useful visual fields through a variety of commonly prescribed telescopic devices in the discipline of low vision rehabilitation. The aim of this study is to determine the accuracy of useful visual field of view claims by low vision telescope manufacturers for commonly prescribed telescopes in a setting which can be easily duplicated in a clinical Low Vision practice. The clinically useful visual fields of 20 telescopes will be determined and compared with the manufacturer-stated fields of view.

Materials & Methods:

In total, the clinically useful visual fields of 20 telescopes were determined based on measurements in one observer which has an intact visual field. The visual fields were measured by the investigator as dynamic visual fields using a tangent screen set up. A tangent screen, which is commonly available in clinical Low Vision practice was hung on the wall and each telescope will be placed on a tripod 2, 4, and 6 meters from the tangent screen. Using the tangent screen wand with standardized Goldmann target size of 2mm and a moving speed of five degrees per second, the investigator directed observer looking through the telescope to say when they saw (not seeing to seeing) or lost (seeing to not seeing) the target in four diagonal visual field meridians. Diagonal meridians were used to avoid blind spot interference of the optic nerve head. Each measurement was repeated three times and the average was used. To avoid experimental bias, the manufacturer-stated fields of view were not known by the investigators prior to concluding all measurements. The obtained values were converted to a dynamic visual field map and the extent of the visual field of view for each telescope was determined. Statistical analysis was conducted using repeated-measures ANOVA with Dunnett's multiple comparisons test. The manufacturer-stated visual field angles were used as reference (controls). The analysis was conducted using Prism 7 (GraphPad).

Results:

When conducting the repeated-measures ANOVA, there was a statistically significant difference between the manufacturer-stated visual field angles and the measured field angles. When conducting Dunnett's multiple comparisons test, it showed that this difference existed for 2 m and 4 m measurement distance, but not 6 m. At the 2 m distance, the average of the measured visual field angles (13.12 degrees, SD 3.802) was substantially larger than the average of the manufacturer-stated visual field angles (11.08 degrees, SD 3.163). Since this average difference was more than 1 degree, it was considered clinically relevant. At the 4 m distance, the average of the measured visual field angles (12.41 degrees, SD 3.766) was substantially larger than the average of the manufacturer-stated visual field angles (11.08 degrees, SD 3.163). Since this average difference was more than degree, it was considered clinically relevant. Even though not statistically relevant, at the 6 m distance, the average of the measured visual field angles (11.88 degrees, SD 3.449) was slightly larger than the average of the manufacturer-stated visual field angles (11.08 degrees, SD 3.163). Since this average difference was less than 1 degree, it was considered clinically not relevant.

Conclusions:

For the 20 measured telescopes, the manufacturer-stated field angles are appropriate for a measurement distance of 6 m. At shorter distances of 2 m and 4 m, the manufacturer-stated visual field angles underestimate the measured visual field angles.

Since telescopes are inherently designed for seeing distant objects, and the visual field angles are stated accordingly. Therefore, the manufacturer-stated visual field angles are reliable when the telescopes are used as indicated.

Ghermezi, Jonathan and McColgan, Anthony, College of Podiatric Medicine

Advisor: Dr. Sadra, CPM

Project Title: COVID-19 affects Podiatric Medicine effecting various approaches coursing the pandemic

Authors: Jonathan Ghermezi, Anthony McColgan

Goals of the Study/Hypothesis:

We are investigating the COVID-19 pandemic impact on podiatric medical providers sampled from the APMA provider list. As the pandemic persists, the podiatric medical community charges forward. Assessment of podiatric medicine under COVID-19 is necessary for understanding adjustments that were made to encourage market sustainability or failed to do so. We hypothesize that providers who have been treating covid patients are more likely to encounter difficulties throughout the pandemic such as patient cancelations and increased costs due to PPE, but both groups will experience more difficulties compared to previous years as the pandemic has caused unforeseen circumstances. An orthopedic provider study in Germany surveyed about the preparedness, resources, awareness (aka "informedness"), depletion, reduction, and concern in hospitals versus private practice. The private sector saw more hardship compared to the hospitals. The German study hypothesized all orthopedic sectors would experience loss for all activity, meaning there would be loss for revenue, patient load, medical supply, appointments, etcetera.

Materials & Methods:

To be structured similarly to this study, an online Qualtrics survey link was emailed directly to over 3,000 American Podiatric Medical Association members. Each of the 18 questions was optional, and all responses were anonymous. The survey was open for 60 days and in total had 36 participants.

Results:

As we had hypothesized, providers who are treating covid patients are more likely to establish separate treatment areas in comparison to their counterparts. Our results showed that 80% of providers who treat covid patients also have separate treatment areas while only 13% of their counterparts had separate treatment areas.

Conclusions:

Our results conclude that there has been a difference of experiences throughout the pandemic between providers who treat covid patients and those who do not, both groups strongly believe that their professional existence is not in jeopardy and that they will continue to work in the specialty.

H

Ha, Alexandra, Nguyen, Austin, College of Osteopathic Medicine of the Pacific

Advisor: Stephanie White, DO

Project Title: Effects of COVID-19 on Mammogram Screening Completion Rates

Authors: Alexandra Ha, Austin Nguyen

Goals of the Study/Hypothesis:

COVID-19 pandemic affected mammogram screening completion rates due to decline in routine medical tests and treatments since hospital services were reduced or clinics were closed. To assess and quantify the effects of the pandemic on the rates of breast cancer screening, chart reviews were conducted to collect data from a community clinic in LA county. Review was done on charts of patients who were seen between May to July in 2019 and 2020 and who met the recommended age of 50-74 for a screening mammogram. From the data collected, a 42.8% decrease in mammogram completion rates was observed in 2020 as compared to 2019. This indicates that a pandemic like COVID-19 affects routine preventative care like mammogram screening. The research goal was to assess the effect of a pandemic like COVID-19 on the rate of mammogram screening completion rates within a community clinic in LA county.

Materials & Methods:

Chart reviews of individuals seen within the months of May, June, July of the years 2019 and 2020 were conducted at a community clinic in Pomona, CA. Patient charts to review were selected based on the recommended age of 50-74 for screening mammograms as stated by the U.S. Preventative Service Task Force (USPSTF). Diagnostic mammograms were not assessed in this study. Since the USPSTF recommended biennial screening mammograms, patients who were due for a mammogram were defined as those who had completed a mammogram two years or more prior to 2019 or 2020 (month was not considered, only year). From there, we looked to see if the healthcare provider had referred the patient within the months of May, June, July and if those patients completed the mammogram by the end of the same year they were referred.

Results:

For 2019, it was found that 68.0% of patients seen within the months of May, June, July were due for a screening mammogram. The providers at the community clinic gave referrals out to 20.6% of those patients who were due and of those who were given a referral, 71.4% completed the mammogram. For 2020, it was found that 52.0% of patients who were seen in May, June, July of that year were due for screening mammograms. 19.2% of those patients due were given referrals by their providers and 28.6% completed the mammogram.

Conclusions:

Based on the preliminary data collected from a community clinic in LA county, a lower amount of mammogram completion rates can be seen in 2020 compared to 2019 by 42.8%. This indicates that a pandemic like COVID-19 does have an effect on mammogram completion rates and possibly routine care in general.

Johar, Leepakshi, College of Osteopathic Medicine of the Pacific

Advisor: Dr. Hendrik Szurmant, College of Medicine of the Pacific

Project Title: The WalR Protein of Gram-Positive Pathogens as a Target for the Development of New Antimicrobials

Authors: Leepakshi Johar, Chaimae Majdi, Edouard Badarau, Jean Dessolin, Zohra Benfodda, Hendrik Szurmant

Goals of the Study/Hypothesis:

So-called 'two component systems' (TCS) are the primary means by which bacteria sense and respond to their environment. They regulate important decisions such as virulence factor expression, antimicrobial resistance development, sporulation, motility to name a few. Gram-positive bacteria have a single system, the WalRK system, that is essential for viability. TCS comprise a sensor histidine kinase that auto-phosphorylates and then activates an associated response regulator/transcription factor protein by phosphoryl group transfer. Since similar proteins are not found in the animal kingdom, TCS in general and the WalRK system in particular, have been suggested as excellent targets for anti-infective agents. Past drug discovery efforts have primarily focused on the WalK histidine kinase, but multiple arguments can be made that the WalR response regulator is the better target. Utilizing a combined virtual and experimental approach, we aim to chemically target the WalR protein.

Materials & Methods:

For screening of virtual compound libraries, we utilized existing crystal structures of various WalR protein fragments to model a full-length WalR protein and define the DNA-binding site. Molecular dynamic docking simulations along with the Life Chemicals compound library were utilized to virtually identify chemical hit compounds. Standard molecular cloning and affinity purification techniques were utilized for WalR overexpression. Isothermal titration calorimetry is used for the quantification of protein/small molecule affinities.

Results:

A 17,000-compound library was reduced to 4354 molecules with a previously identified ability to bind to DNA-polymerases. These compounds were virtual screened for their propensity to bind to the DNA-binding surface of the WalR DNA-binding domain. Eight hit molecules were predicted to strongly associate with the defined DNA-binding interface. Of these, three compounds shared a thiazolo[4,5-d]pyridazine core. To experimentally validate the ability of these compounds to bind to WalR we cloned, expressed, and purified to homogeneity two WalR constructs comprising either the full-length or the isolated DNA-binding domain. While the full-length protein proved largely insoluble, the isolated DNA-binding domain could be purified to homogeneity at high yields. Utilizing this construct, isothermal titration calorimetric experiments are underway to validate the hit compounds.

Conclusions:

Compounds that inhibit the activity of the essential WalR transcription factor could serve as antibiotics against numerous important human pathogens, including but not limited to Staphylococci, Streptococci, Bacilli and Listeria. Our research is a step forward towards identifying such molecules.

K

Kain, Alicia, Ream-Garcia, Rasmussen, Matt, College of Health Sciences
Advisor: Chad Lairamore DPT, College of Health Sciences (Lebanon, OR)
Project Title: Movement, Mindfulness, and Pain Science in Chronic Pain Patients with Adverse Childhood Experiences: A Physical Therapy Intervention for Trauma (A Push for Trauma-Informed Care in PT)
Authors: Cynthia Ream-Garcia, Alicia Kain, Matt Rasmussen, Sharna Prasad, Chad Lairamore

Project Abstract:

Early life stressors, known as Adverse Childhood Experiences (ACEs), have been linked to negative health and social later in life outcomes including chronic pain, heart disease, mental health disorders, addiction, incarceration, and early mortality with impacts seen intergenerationally. 64% of individuals identify as having at least one ACE, with an increased prevalence in underserved urban and rural communities, communities that statistically have been shown to be more heavily impacted by these comorbidities and negative social outcomes. It is observed that trauma plays a role in the health of the nation, specifically marginalized communities. Movement, Mindfulness and Pain Science have been proven secularly as key treatment interventions for chronic pain with minimal research analyzing its effects when integrated and no research looking at its effects on chronic pain patients with ACEs. Movement Mindfulness and Pain Science (MMaPS) a bi-weekly 8-week chronic pain program, integrates these interventions in addition to ACE education in a highly impacted rural community. Measurable changes are hypothesized to be seen in quality of life (QOL), patient function (PSFS), pain catastrophizing and fear avoidance (FABQ). The researchers look to provide a physical therapy intervention to help mitigate the impacts of trauma and ACEs on the individual, intergenerationally and in society.

Kim, Elizabeth, Trumble, Mary, College of Osteopathic Medicine of Pacific Northwest Advisor: Dr. Elisabeth Guenther, COMP-NW
Project Title: Effect of Obesity on Cervical Cancer Screening
Authors: Jacquelyn Dunn, DO, Megan Cahn, PhD, Shaban Demirel, OD, PhD, Mary Trumble, OMSII, Lisa Kim, OMSII

Goals of the Study/Hypothesis:

Obesity has been determined to be a risk factor for developing cervical cancer and is linked to poor cervical cancer outcomes. Decreased rates of cervical cancer screening (CCS) and obesity are shown to be correlated throughout previous studies, however data seems to be inconsistent and there is a lack thereof within United States populations. The goal of this study is to determine whether obesity is correlated to decreased CCS rates leading to delayed diagnosis and poor patient outcomes.

Materials & Methods:

This retrospective chart review is analyzing all persons with a cervix age 21-65 who are active patients at Legacy Medical Group (LMG) Internal Medicine (IM) or Family Practice (FP) clinics throughout Oregon and Washington. Patients who fall within the obese category, (BMI over 30) will be compared to patient's who fall within the healthy weight category (BMI 18.5-24.9). These patient's records will be reviewed for compliance of CCS by LMG's protocol of pap smear testing alone every 3 years for patients with a cervix age 21-30 and HPV and pap smear co-testing every 3 years for all persons with a cervix age 30-65.

Results:

Correlation between obesity and CCS will be determined by a statistician employed by Legacy Medical Group. The results of this study will be used to determine whether a quality control project is warranted to improve CCS within obese patients at LMG.

Conclusions:

This project has not yet been submitted to the IRB, conclusions and results are to be determined.

M

Mai Makhoulf, College of Osteopathic Medicine of Pacific

Advisor: Dr. Brooke Jenkins, Chapman University/ Crean College of Health and Behavioral Sciences; Psychology

Project Title: Asthma Study

Authors: Mai Makhoulf, Dr. Brooke Jenkins

Goals of the Study:

Asthma is one of the most common chronic condition affecting 7 million children in the U.S. Asthma is associated with a multitude of negative outcomes including school absences and restriction of daily physical activity. In the emerging literature, linking socioeconomic status to children's health and stress physiology has been described with measures such as parental income, education, and occupation. Stress and its resultant biological alterations have been hypothesized to be a key mechanism linked to socioeconomic status (SES); however subjective perceptions of SES have rarely been studied to link the effects of stress and measures of health particularly in pulmonary lung function tests. We hypothesize that perceived SES is positively correlated to Forced Expiratory Volume in 1 second (FEV1) and that perceived SES moderates the association between stress and FEV1.

Materials & Methods:

55 children between the ages of 12-17 with asthma conducted a baseline assessment. The Perceived Stress Scale (CPSS), a 14-item scale, was used to measure stress while a parental SES ladder was used as measure of perceived socioeconomic status. Pulmonary function tests were conducted by physicians to obtain FEV1 percent predicted as a measure of lung function status.

Results:

Using a linear regression model, it was shown that higher perceived SES marginally predicts lower FEV1, $b = -1.66$, $t = 0.081$, $p = 0.08$. Perceived SES did not significantly moderate the association between stress and FEV1, $p > .05$.

Conclusion:

Based off our findings, there may be an underlying phenomenon that could explain the negative correlation between SES and FEV1. The concept of resilience in the context of stress research has been widely discussed as an adaptation tool children utilize to overcome health conditions. Recruiting a large representative sample to study how resilience and stress may impact lung function in the lives of adolescents with asthma could be invaluable to the asthma treatment protocol.

Marfori, Alexandria, College of Veterinary Medicine

Advisor: Dr. Wael Khamas and Dr. Josep Rutllant – CVM

Project Title: Characterizing the histological/anatomical features of the invasive Argentinian Tegu's intestinal tract and associated glands

Goals of the Study:

The purpose of this research is to investigate if Argentine tegu as invasive reptiles exhibit anatomical and/ or histological adaptations facilitating survival or invasive potential under different environments than its own. This research explores the anatomy and histology of the large intestine, as well as the histology of the pancreas. Gross dissection and histological staining of tissues using H&E and Alcian Blue were used to obtain results.

Materials and Methods:

A Tegu was dissected and the intestinal tract and associated glands were analyzed histologically.

Results:

Grossly the large intestine is relatively short compared to the small intestine. Histologically, the large intestine is different than the small intestine by the presence of a muscularis mucosa, a larger circular tunica muscularis, and a drastic increase in the number of goblet cells present in the mucosa epithelium. The large intestine also has a greater presence of sulfate mucins believed to help aid in the colon's innate immunity.

The Tegu has both an endocrine and exocrine pancreas. However, the parenchyma of the exocrine pancreas appears more like branching tubules than typical acini seen in mammals. The islets of the endocrine pancreas also lack sharp demarcations.

Discussion:

The histological findings of the large intestine were what was expected when compared to other reptilian species. However, the histological findings of the pancreas seem to be unique to the Tegu. Further exploration on this subject would benefit our current research.

Martinez deCastro, Clarice and Stack, Madeleine, College of Osteopathic Medicine of Pacific Northwest

Advisor: Edie Sperling, DPT, COMP-NW

Project Title: Patient Perspectives on the Perceived Effectiveness, Ease of Use, and Satisfaction of Different Pain Rating Scales for People Living with Chronic Pain

Goals of the Study/Hypothesis

Pain is a complex, subjective experience that can be difficult to measure and ensuring that the tools utilized are accurately describing the patients' experiences is critical for better patient care. Our goal is to evaluate five common pain rating scales based on perceived effectiveness, ease of use, and patient satisfaction. We hypothesized that the descriptive scales will be preferred over the non-descriptive scales.

Materials and Methods

To better understand patient perspectives, we distributed a survey to patients living with chronic pain at the Oregon Health Sciences University Comprehensive Pain Center.

Results

Currently, nine patients have completed the survey with mixed results on patient preference. When asked to describe their pain, participants discussed their unique experiences including different types

of pain, varying levels of pain throughout the day, and how their pain is often complex, exhausting, and poorly understood with the current pain scales utilized in clinical practice. Three participants chose the Defense and Veterans Pain Rating Scale (DVPRS) as the most effective in describing their pain and three people chose the Brief Pain Inventory (BPI). Two participants chose the Mankoski Scale. One person selected the Verbal Pain Scale (VPS). No participants chose the Numerical Pain Scale (NRS) and many voiced concerns that ranking their pain with a single number was highly ineffective.

Conclusion

Trends in the data suggest patients prefer a pain scale that describes the experiential aspect of chronic pain which may explain why functional pain scales like the DVPRS and BPI were chosen by patients more frequently. Ensuring the scales we utilize to understand patients' pain appropriately represent the patients' experiences is critical to help translate the patient experience to clinicians. We hope to optimize survey accessibility, better determine the effectiveness of se scales, and subsequently help clinicians improve the quality of patient care.

Martiszus, Briana, College of Osteopathic Medicine of Pacific Northwest

Advisor: Dr. Edward Junkins, previously at COMP-NW currently at University of Notre Dame

Project Title: A Factorial Trial of Ultrasound and Manometry to Improve the Success of Thoracic Epidural Placement

Authors: Briana J. Martiszus, Ryan M. J. Ivie

Goals of the Study/Hypothesis:

In a variety of thoracic and abdominal surgeries, thoracic epidural (TE) placement is associated with better pain relief, less opioid consumption, and decreases in adverse perioperative cardiac events. Unfortunately, TE catheter placement is challenging and is not always successful. The epidural space in the thoracic region is especially difficult to access due to the steep and inferior angulation of most of the spinous processes. The primary objective of this study is to investigate the use of ultrasound and manometry to increase the success rate of TE placement. The use of ultrasound for lumbar epidural catheter placement is well established and is thought to assist in identifying an optimal skin entry point, depth to lamina and ligamentum flavum, and needle trajectory. The use of sterile manometry tubing to demonstrate a falling and oscillating fluid column has been described as a confirmatory test in the placement of lumbar epidurals. This study will determine if the efficacy of TE placement is improved if placement is performed with the use of either US, or manometry, or both techniques combined, compared with a standard landmark-based placement technique alone.

Materials & Methods:

This study utilized a randomized, controlled, single center trial with a factorial design to assess the primary endpoint of TE placement success as measured by diminished sensation to pinprick or ice in two or more adjacent dermatomes after 1.5% lidocaine catheter injection. Data acquisition was completed for 220 of 480 subjects. Exclusions were applied to 12 of the subjects. Preliminary analysis was performed; however, the data set was low powered.

Results:

No difference between groups was found in TE placement success rates, χ^2 (9, N= 208) = 9.57, p= .39.

Conclusions:

Validity cannot be assumed within this analysis, a thorough analysis on all 480 subjects remains needed to assess TE placement success rates between study groups.

Meister, Riley, College of Osteopathic Medicine of Pacific Northwest
Advisor: Dr. Elizabeth Guenther, COMP-NW
Project Title: Flow Diversion for Intracranial Aneurysms: An Assessment of Stratified Complications
Authors: Meister, Riley; Ile, David; Lesko, Alexandra; Deshmukh, Vivek

Goals of the Study/Hypothesis:

The use of flow-diverting stents to address intracranial aneurysms, while relatively new in the field of neurovascular treatment modalities, have made substantiated leaps in efficacy and safety since their inception within the last decade. However, management of off-label and complex aneurysms with flow diversion remains a relatively uninvestigated topic. In this retrospective analysis, patients meeting criteria (n=40) were stratified by demographic, aneurysm characteristics, complication, and follow-up history. Devices were placed in predominantly women with intracranial aneurysms considered to be small (aneurysm max diameter <10mm). Complications, which included thromboembolic, hemorrhagic, recurrent, stenotic, and groin, were most associated with aneurysms considered to be medium sized or greater. With a median first follow-up of six months, patients experiencing complications had a partial occlusion (n=8, 72.7%) while a majority of patients who did not experience any complication had full occlusion (n=17, 70.8%). No patients were reported to have significant stroke symptoms post-flow diversion. These numbers support pre-existing literature, suggesting efficacy of flow diversion in the treatment of intracranial aneurysms, however further data collection and analysis is required to elaborate on off label use, residual aneurysm incidence, complex aneurysm morphology, and specific demographics.

Hypothesis / Research Question 1: Flow diverters as a treatment modality for intracranial aneurysms: identifying and analyzing pertinent health outcomes associated with hemorrhagic and thromboembolic complications.

Hypothesis / Research Question 2: Identifying and analyzing health outcomes for individuals with residual post-FD aneurysms

Goal 1 / Primary Objective: Identify demographic, aneurysm, and procedural variables that correlate with incidence, location, severity, or timing of hemorrhagic complications, thromboembolic complications and sustained residual aneurysms following placement of a flow diversion device

Goal 2 / Secondary Objectives:

- a) Organize and comprehensively analyze clinical data from a remarkably large number of flow diverter recipients in order to add statistical significance to the existing literature in areas that have previously lacked adequate power.
- b) Identify health outcome differences between on-label and off-label application of flow diverters.
- c) Identify any demographic information that stratifies health outcomes in recipients of flow diverters.

Materials & Methods:

Patient data from September 2015 – January 2021 were extracted from the Providence Cloud Data Warehouse (CDW) and used for retrospective analysis. Inclusion criteria were patients age 18 years or older who underwent mobilization procedures for a unruptured cerebral aneurysm. Exclusion criteria were age under 18 years and diagnosis with ruptured or bifurcated aneurysms. Patients were grouped by any complication(s) (AC) or no complications (NC) following procedure for all descriptive outcomes. Post-procedure complications included any one or multiple of the following: ICH Hemorrhage, Thromboembolic, midline shift, groin puncture infection, blood transfusion reaction, in-hospital mortality, retreatment of the same aneurysm, and/or parent artery stenosis. Primary measures included age, body mass index (BMI), aneurysm max diameter (AMD; categorized by “small <10mm, medium 10-12mm, large 12.1-25 mm, giant>25.1mm), and follow-up time to first appointment (months). Secondary measures reported are sex, race, as well as percent occlusion (categorized as “full”, “partial”, “unchanged from pre procedure”) and NIHSS score (categorized as

“No, mild, moderate, moderately severe and severe stroke symptoms”) at first follow-up appointment. Percentages, medians, and interquartile ranges [IQR] are reported.

Results:

12 AC and 27 NC patients met inclusion criteria and were included in this study. More women (n=30, 76.9%) than men (n=9, 23.1%) received a device and more women had complications following procedure (n=7, 58.3% vs. n=5, 41.7%). AC patients were younger (50.5 yrs [25.5]) vs. 55 yrs.[17.0]) and had a higher BMI (28.1 [:8.4] vs. 27.8 [10.1]) compared to NC patients. Both AC (n=7, 63.6% and NC (n=21, 80.8%) had more patients within their group with a small AMD compared to all other AMD groups combined. A larger percentage of AC patients had a medium, large, or giant AMD compared to NC patients (36.4% vs. 19.2%). No differences in race were found, as the majority of this cohort was white (n=33, 87.0%). Median time to first follow-up appointment was 6 months for both groups (NC IQR: 1.0; AC IQR:2.0). A majority of AC patients had a partial occlusion (n=8, 72.7%) while a majority of NC patients had a full occlusion (n=17, 70.8%) at time of first follow-up. Neither AC (n=11) or NC n=23) had significant stroke symptoms with 100% of patients in “no” or “mild stroke symptoms”.

Conclusions:

We report an increased incidence of complications in patients who are younger and demonstrate partial occlusion post-flow diversion—especially in individuals with aneurysm considered to be of medium size or larger. Analysis is currently most limited by size of the data set, therefore future abstraction and analysis is required to highlight differences in pertinent health outcomes that may be stratified by race, ethnicity, complex aneurysm morphology, off-label use, and procedural events. Nonetheless, this analysis supports findings from current literature on the efficacy of flow diversion as a modality in addressing intracranial aneurysms.

O

Emily Ong, College of Osteopathic Medicine of Pacific

Advisor: Dr. Nuriya Robinson, Harbor-UCLA Medical Center

Project Title: A Comprehensive Review of Women's Unanswered Questions Following Miscarriage on Different Social Media Platforms

Authors: Emily Ong, Lauren Davis, Alyssa Sanchez, Rachel Curiel, Hindi E. Stohl, MD, Anita Nelson, MD, and Nuriya Robinson, MD

Goals of the Study/Hypothesis:

The purpose of this study was to investigate common questions and the accuracy of advice related to miscarriage that women post on social media to identify any gaps in miscarriage care and counseling.

Materials & Methods:

Public social media posts between January 1st 2019 and June 30th 2021 were searched using the keywords “miscarriage”, “preterm birth”, “pregnancy loss”, “early pregnancy loss”, “early fetal loss”, “spontaneous abortion”, “spontaneous pregnancy loss” and “#IHadAMiscarriage”. Only posts in English were included. The inclusion criteria for posts varied by site: all posts in public Facebook Miscarriage groups, YouTube videos with ≥ 1000 views, Reddit r/Miscarriage with ≥ 175 upvotes, Instagram photos with ≥ 50 likes and Tweets with ≥ 1 interaction were analyzed for mentions of questions and advice. Each theme in a post was counted. Advice was classified into categories of “accurate” if it was supported by current guidelines, including the American College of Obstetricians and Gynecologists (ACOG). “Insufficient evidence” was advice only supported by published reports, and “inaccurate” if any part was unsupported.

Results:

103 posts were identified for common themes including: questions on grief (20.4%), blame (19.4%), quality of post-partum counseling (14.6%), and inadequate medical support (13.6%). 82.9% of advice mentioned the emotional consequences of loss. 17.1% of posts offered medical advice eligible for evaluation, with the most accurate platforms being YouTube (66.6%), Instagram (100%) and Reddit (100%). The least accurate platform was Facebook (33.3%). Twitter yielded the fewest results that met the inclusion criteria.

Conclusions:

Women post on social media to destigmatize the fear and guilt surrounding miscarriage. The majority of the online miscarriage community offer advice related to grief rather than medical questions about their miscarriage. Clinicians may advise patients to use YouTube, Instagram or Reddit as accurate resources and to connect with Hayes and Mears others in their grief.

S

Sin, Crystal and Williams, Hannah, College of Optometry and College of Osteopathic Medicine of Pacific

Advisor: Dr. Jasmine Yumori and Josh Matacotta

Project Title: Health Sciences Graduate Students Coping Mechanisms during the COVID-19 Pandemic

Authors: Crystal Sin, Hanah Williams, Jasmine Yumori, Josh Matacotta

Goals of the Study/Hypothesis:

During the COVID-19 pandemic, health professional students at Western University of Health Sciences transitioned to virtual learning and used various coping mechanisms to manage stress, fatigue, and their quality of life. We plan to use the abbreviated version of the COPE Inventory by Dr. Charles Carver, PH.D and the Multidimensional Scale of Perceived Social Support to survey coping mechanisms used by second and third-year optometry and osteopathic medicine students at Western University of Health Sciences. Collecting and comparing coping mechanisms can lead to insight regarding how programs can support students. Results and conclusions are pending. Health Graduate Students, Covid-19, Coping Mechanisms, Virtual Learning, Mental Health Mental health and the effects of constant stress and high expectations are serious and complex issues. According to Chirikov (YEAR), 71% of the graduate student population screened positive for either major depressive disorder or generalized anxiety disorder during the COVID-19 pandemic. The aim of this study is to survey WesternU second- and third-year optometry and osteopathic medicine students regarding coping mechanisms used during the COVID-19 pandemic. We aim furthermore to determine if there are any differences between the professional programs, gender, and social support.

W

Wallace, Jessica, College of Osteopathic Medicine of Pacific Northwest

Advisor: Dr. Elisabeth Guenther, COMP-NW

Project Title: Evaluating Eligibility Criteria for Thrombectomy Patient Selection

Authors: Jessie Wallace, Alyx Lesko

Goals of the Study/Hypothesis:

In 2015, multiple randomized clinical trials (RCTs) demonstrated the benefit of thrombectomy as a treatment for stroke patients with large vessel occlusion (LVO) presenting to the hospital within 6 hours of last known well (LKW) time. In addition to having an LVO, patients enrolled in these trials also needed to have strokes in the proximal anterior circulation with moderate to severe symptoms at onset and be functionally independent prior to their stroke. These studies resulted in an update to the AHA/ASA Stroke Guidelines, which now recommend thrombectomy for patients with an LVO stroke who meet criteria developed by the original RCTs. However, it is still unclear if there are patients who do not meet these criteria that may benefit from the procedure. For this reason, some patients are sent for thrombectomy by the treating neurologist and neuro-interventionalist even if they do not meet all criteria in the AHA/ASA guidelines. The purpose of this project was to evaluate patients who underwent thrombectomy at two stroke centers in Portland, Oregon with the goal of comparing clinical outcomes between those who do not meet the AHA/ASA recommendation criteria for treatment and those who do. Our hypothesis is that patients not meeting criteria will have comparable outcomes to patients that do. Modified Rankin score at 90 days was used as the primary outcome measure.

Materials & Methods:

Data from patients with primary or secondary diagnosis at hospital discharge with LVO strokes from October 2017 to February 2021 who arrived within 6 hours of LKW were retrospectively abstracted from electronic medical records. Patients under 18 or with posterior circulation stroke were excluded. Patients were grouped by criteria for thrombectomy treatment, MET (M) vs. NOT-MET (NM), based on definitions for treatment developed by multiple clinical trials. For the purposes of this study, the M group criteria were defined as arrival Modified Rankin Score (mRS) 0-1, Involved vessels of internal carotid artery (ICA) or middle cerebral artery (M1), and NIH Stroke Score (NIHSS) of ≥ 6 on arrival. NM were patients that had any of the following: an mRS > 1 , an involved vessel beyond ICA or M1, or an NIHSS < 6 . The mRS scale assesses disability and ranges from 0-6 with 6 being “death” and 0 being “no disability”. The NIHSS scale measures stroke severity and ranges from 0-42 with 0 being “no stroke symptoms” and 21-42 being “severe stroke symptoms”. An interim analysis was performed after 2 months of data collection to assess the current study population. Descriptive statistics were used to assess patient demographics and outcomes including sex, median age, median mRS at arrival and 90-days for M vs. NM groups.

Results:

Among 88 patients who met inclusion criteria for the study, 57 (61.3%) M and 31 (33.3%) NM patients were identified. A greater proportion of women were in the NM group, 61.3% (n=19), than men, 38.7% (n=12). NM patients were older, (81.0; [interquartile range (IQR)=24] vs. 73.0; [IQR=15]) compared to M patients. NM patients had worse mRS scores on arrival (2.0; [IQR=3.0] vs. 0.0; [IQR=0]) and at 90-days (5.0; [IQR=3.0] vs. 2.0; [IQR=3.0]) compared to M patients. Likewise, NM patients arrived with worse NIHSS scores than M patients (18.0; [IQR=16.0] vs. 17.0 [IQR=11]).

Conclusions:

Our results suggest that patients who do not meet criteria for thrombectomy have worse outcomes at 90 days as measured by mRS scores. However, no adjustments were made for age, sex, baseline stroke severity (NIHSS) or baseline disability (mRS) in this analysis. Given that all NM patients had to have a baseline mRS of at least 2 (indicating slight disability but still able to live independently), it is not surprising that this group would also have a higher score at 90 days. Finally, it is important to note that this is an interim analysis with a smaller sample size than planned for the final analysis. Therefore, it may not be fully representative of the actual population. The sample size once data collection is complete is expected to be approximately 250-300 patients.

Wang, Li, College of Osteopathic Medicine of Pacific

Advisor: Dr. Airani Sathananthan, COMP

Project Title: Assessment of Third Year Medical Students in Effectively Retrieving Evidence for Clinical Questions to Advance Patient Care

Authors: Li Wang, Kelli Hines, Dr. Fanglong Dong, Dr. Airani Sathananthan

Goals of the Study/Hypothesis:

The American Association of Colleges of Osteopathic Medicine's Core Entrustable Professional Activities (Core EPA) define key functions and provide guidelines for expected competencies of entrustable learners. By assessing WesternU-COMP students against EPA7: Forming Clinical Questions and Retrieving Evidence to Advance Patient Care, we hope to obtain results that will act as baseline measurements for the literature retrieval aspect of clinical medical education at WesternU-COMP, against the national expectation for entering residents.

We aim to assess student proficiency in literature retrieval and information presentation. We hypothesize that the clinical medical education at WesternU-COMP allows students to meet Core EPA7 standards, and that a greater proficiency will be correlated to those who place greater value in life-long learning and demonstrate greater motivation and initiative for knowledge acquisition.

Materials and Methods:

Students were given the Jefferson Scale of Physician Life-Long Learning (JSPLL) to evaluate individual values regarding life-long learning. They were then given a clinical encounter that posed a medical question, with which they used to complete an unguided literature search and Fresno Test. Finally, they completed a video recording of information delivery. Review of the videos and Fresno Test are in progress. The JSPLL and Fresno Test results will be reviewed in conjunction to determine any correlations.

Results:

Preliminary data include 66 Likert Scale responses to the JSPLL (1=strongly disagree, 4=strongly agree). Participants rated the statement 'life-long learning is a professional responsibility of all physicians' with an average of 3.73 ± 0.45 . The statement 'I enjoy reading articles in which issues of medicine are discussed' had an average of 3.08 ± 0.44 . Scoring of the videos and Fresno Test are in progress.

Conclusions: Preliminary results show participants agree that physicians have a duty to life-long learning. Further analysis of the surveys will determine correlation between life-long learning and literature retrieval proficiency.